Proceedings

Regional Workshop For Strengthening National Information Communication Management Focal Units in Near East Region

Muscat – Oman, 8 - 10 January, 2008

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LIST OF ACROMNYMS

AARINENA	Association of Agricultural Research Institutions in the Near East and North Africa
AST	Agricultural Science and Technology
AGRIS	International Information System for Agricultural Sciences and Technology
AGROVOC	Multilingual Agricultural Thesaurus
AOAD	Arab Organization for Agricultural development
ARD	Agricultural Research and Development
CLAES	Central Laboratory for Agricultural Expert Systems
CMS	Content Management System
FAO	Food and Agriculture Organization of the United Nations
GFAR	Global Forum on Agricultural Research
ICM	Information and Communication Management
ICM4ARD	Information and Communication Management for Agricultural Research and Development
IKM	Information and Knowledge Management
ICT/ICM	Information and Communication Technology/Management
IMARK	Information Management Resource Kit
NARIMS	National Agricultural Research Information Management System
NARS	National Agricultural Research System
NENA	Near East and North Africa
NERAKIN	Near East and North Africa Rural and Agricultural Knowledge and Information Network
NIFU	National Information Focal Units
RAIS	Regional Agricultural Information System
RNE	FAO Regional Office for the Near East
WAICENT	World Agricultural Information Centre of FAO

1. Background and Introduction

1. The agricultural sector represents a major part of the economies of the many of the countries in the Near East and North Africa (NENA) region, and yet it remains a vulnerable sector. The potential for increasing agricultural outputs in the region is great. Crop and livestock yields under farmers' conditions are markedly lower than results obtained under comparable conditions elsewhere. The durable solution for improving agricultural performance in the countries of the region depends largely on the transformation of its agriculture research and development systems to render it capable of generating and transferring productivity enhancing technologies.

2. However, agricultural development in the NENA region continues to be hampered by relatively poor access to and ineffective exchange of knowledge and information, which are contribute to poverty eradication, food security, sustainable development and increased productivity and competitiveness. Yet, science-based agricultural systems have delivered real benefits to farmers, processors and consumers through the development and implementation of new knowledge exchange systems. Policy makers need to understand national needs, capacities, agricultural production, and other information to plan for agricultural development and the research to support it. In the research sector itself, scientists need to keep themselves up-to-date with international research.

3. Modern Information and Communication Technologies (ICTs) have introduced a new dimension and, if properly applied, can help in promoting knowledge and information exchange. Knowledge-based systems and decision support technologies can be used to allow the various stakeholder groups to encapsulate technical information that they generate in a suitable form to make it available to others. Web-based technologies can be used to create platform-independent systems that can be accessed remotely, either interactively online or in passive mode offline. Internet connectivity allows dissemination of information and knowledge within regions, and can give instant access to global information and knowledge resources.

4. AARINENA has recognized for some time the value of expanding the use of modern ICTs in agricultural research for development in NENA Region will facilitate the exchange of information and knowledge among certain key stakeholders, and thereby facilitate the sustainable development of the region. To this end, the AARINENA Executive Committee agreed in December 2001 to establish a Regional Agricultural Information System (RAIS), and approved the proposal of Agricultural Research and Education Organization (AREO), Iran, to host the AARINENA-RAIS Secretariat. The RAIS serves as an information repository and exchange mechanism at the regional level, aiming to strengthen, coordinate, and add value to initiatives by national programs and those coordinated by regional and international organizations. The RAIS stakeholders included National Agriculture Research Systems (NARSs), Advanced Research Institutions (ARIs), Non-Governmental Organizations (NGOs), International Agriculture Research Centers (IARCs), the private sector, farmers' organizations, and development assistance agencies.

5. AARINENA, in collaboration with the Global Forum on Agricultural Research (GFAR) and the Food and Agriculture Organization (FAO), has worked to establish the RAIS through a series of technical consultations and workshops. The first of these was held at the AARINENA 7th General Conference in Beirut in March 2000 which approved the Regional Information Strategy for Agricultural Research Development, followed by an expert consultation meeting in Cairo in

October 2000 to develop a plan for implementation of this strategy for the NENA region. The plan included preparation of a project proposal to develop the RAIS and establishment of a web site. The AARINENA website has been operational since July 2002 hosted by AREO, Iran as a portal containing useful information, related to national agricultural research organizations and universities, as well as to NGOs, and farmers' organizations in the region. The Arabic version of the website was enhanced in collaboration with FAO/RNE.

6. The AARINENA ICT–RAIS Steering Committee was established in February 2003. The Committee included the representatives of the five AARINENA sub-regions (West Asian, North African, Arabian Peninsula, Nile valley and Red Sea, and Mashreq sub-region) and from FAO, ICARDA, AOAD, GFAR and latterly Bioversity International.

7. At the ICT Inter-regional meeting held at Cairo, May 2005, the National Agricultural Information Systems (NAIS) were recognized as the building blocks of the RAIS providing information on institutions, experts, research projects and, research outputs, as well as contributing to international systems.

8. The main constraints affecting the building of an efficient RAIS were identified as being weak national capacities in information and communication management and technology (ICM/T) in many of the AARINENA member countries, and a lack of cooperation and coordination between the member countries. The need to strengthen NAIS was also identified as a prerequisite to strengthening the RAIS.

9. The Central Lab for Agricultural Expert Systems (CLAES), Egypt, developed a project on a "National Agricultural Research Information Management System" (NARIMS), with the support of FAO, between July 2004 and July 2006. CLAES then put in place a second phase focused on development of the NARIMS tools in 2007, with the support of GFAR.

10. In May 2007, the AARINENA Executive Committee and the ICT-RAIS Steering Committee both endorsed the establishment of a Near East Rural and Agricultural Knowledge and Information Network (NERAKIN), as proposed by FAO. Representatives from member countries were introduced to the concept during a workshop on "Information Systems for Agricultural Research for Development" organized by AARINENA in Cairo from May 2007. The NERAKIN platform has been adopted by AARINENA, with continuing facilitation by FAO and support from GFAR, taking into consideration the following factors: (1) NERAKIN is complementary to and strengthening the existing RAIS and its governance structure; (2) AARINENA is responsible for monitoring of the network; and (3) the activities of the network must be NARS-driven.

11. The ICT-RAIS Steering Committee held its third meeting in Amman in 2006, where new members were elected and a three year work plan was agreed. Establishment of National Information Focal Units (NIFUs) in each country was identified as a high priority.

12. The fourth meeting of the ICT-RAIS Steering Committee in May 30, 2007 agreed on the need for development of the capacity of NIFUs, starting with a workshop to be conducted in Oman in 2008.

13. On this basis, AARINENA with support from FAO and GFAR organized a regional training

workshop on "Strengthening National Information Communication Management/Technology (ICM/ICT) Focal Units in Near East and North Africa", from 8 – 10 January 2008 in Muscat, Oman. The workshop was hosted by the Ministry of Agriculture and Livestock under the auspices of H.E. Eng. Khalfan Saleh Al-Naabi, Deputy Minister of Agriculture and Livestock of the Sultanate of Oman, with the participation of information management specialists from NIFUs in 11 countries (Cyprus, Egypt, Jordan, Lebanon, Libya, Oman, Morocco, Sudan, Syria, Tunisia, and Yemen).

14. This regional workshop was designed to strengthen the capabilities of representatives of NIFUs for analyzing the situations of their NAIS, and to use their national experiences to identify strengths, weaknesses, and threats/challenges affecting seven key areas influencing development of NAIS, namely: (i) strategy/policy, (ii) institutional aspects, (iii) stakeholders, (iv) content, (v) people, (vi) infrastructure, and (vii) financial aspects. Possible solutions for the key weaknesses and threats/challenges were defined by participants. Finally, the countries' priorities for early implementation were identified drawing on the list of solutions/ recommendations in their own contexts. The regional workshop was also designed to follow-up on the progress made on the NERAKIN knowledge sharing and collaboration platform, in terms of providing training to the stakeholders in the region.

2. Goals and Objectives

15. The main objectives of the regional workshop were as follows:

- To build the capacity of participants representing NIFUs from 11 countries in Near East and North Africa region in ICM and KM to contribute not only to the development of their NAIS but also to the NERAKIN regional network;

- To strengthen the capacities of participants in documenting key weakness and threats as well as challenges and opportunities using SWOT analysis and putting forward solutions/recommendations at national level;

- To strengthen the capacities of participants in identifying their national country priorities for early implementation along with actions required to be taken for successful implementation that will play an important role in the development of their NAIS;

- To raise awareness of participants to the potential for improving linkages and sharing information and knowledge between researchers and other stakeholders using ICM tools;

- To increase participants understanding and participation in Regional Agricultural Information System and the concept, structure and management of NERAKIN, and to identify necessary changes to adapt it to the needs of participating countries.

3. Agenda and List of Participants

16. AARINENA with support from FAO and GFAR organized the Information and Communication Management and Technology (ICM/ICT) Nodal Units Workshop, which was held during the period 8 – 10 January 2008 in Muscat, Oman, and hosted by the Ministry of Agriculture and Livestock.

17. The agenda of the regional workshop is shown in Annex I. There were a total of 22 participants, from national organizations in 11 countries, AARINENA officers, and representatives from FAO, GFAR and ICARDA (Annex II). Each sub-region was represented:
    - North African sub-region: Libya, Morocco and Tunisia
    - Arabian Peninsula sub-region: Oman
    - Nile valley and Red Sea sub-region: Egypt, Sudan, and Yemen
    - Mashreq sub-region: Cyprus, Jordan, Lebanon and Syria

4. Workshop Approach

18. The participants were technical persons specialized in information management and networking and representing ICM Focal/Nodal Units. The technical content of the workshop was based on training materials and presentations developed and provided in collaboration with FAO and GFAR. The format included interactive presentations and working group discussions. The workshop was held over three days in January 2008.

19. The first part of the workshop comprised one half day and aimed at raising the awareness of the role of information and knowledge in support of agricultural innovation, and the potential for improving information and knowledge sharing between researchers and other stakeholders using ICT. Participants were also informed about the elements of good practice in institutional information networks and systems in agricultural science and technology.

20. The second part of the workshop comprised three interactive working groups held over two days with the following themes:
    - Analysis of national experiences: to identify and document key strengths, weakness, opportunities and threats (SWOT analysis) in existing NAIS;
    - Strategic options at national level: to devise solutions/recommendations for actions to address challenges at national level; and
    - Country priorities for development: to identify and document the priorities for early implementation along with actions required for successful implementation that will play an important role in the development of the various NAIS.

21. The third part of the workshop extended for half day through lectures and interactive discussions during and following to the presentations to perform the following:
    - To enhance awareness and understanding of the concept, structure and management of NERAKIN, and to identify possible enhancements in terms of adaptations to existing components or development of new ones.
    - To build the capacity of participants to contribute to the NERAKIN regional network in the context of development of their NAIS.
    - To present to participants experiences on development of a NAIS in Egypt

Workshop Opening Session

5. Workshop Opening Session

5.1 Workshop Opening Statements

22. H.E. Eng. Khalfan Saleh Al-Naabi, Deputy Minister of Agriculture of sultanate of Oman, welcomed all participants attending this workshop. He emphasized the vital role that ICT can play in the development of agriculture in the countries of the NENA region and the commitment to strengthen the capacity of the MOA for the effective information management and knowledge exchange in support of agricultural and rural development in Sultanate of Oman. He thanked the organizers and sponsors, giving his best wishes for a successful workshop, and he welcomed the participants to the Sultanate of Oman.

23. Dr. Stephen Rudgard, Chief of WAICENT Capacity Building and Outreach, FAO, gave a speech in which he emphasized that FAO is facilitating and supporting Information and Communication Management/Technologies (ICM/T) activities for development in the NENA region and other regions around the world as strengthening the capacity to access and exchange information and knowledge is very essential for the development objectives of poverty eradication, food security, sustainable rural and agricultural development and increased productivity and competitiveness.

24. Dr. Ajit Maru in his opening statement stated that information and communications management (ICM) for agricultural research for development (ARD) was one of the major areas of action through collaboration by GFAR stakeholders. He traced the development of the global agenda for improving ICM that included advocacy for increased and improved investment in ICM, capacity development of information managers in NARS, integration and coherence of information and improving governance of ARD information flows. He recalled the continued collaboration of the FAO and CGIAR as also other international actors in contributing to the improvement of ICM in NARS with the Regional Forums. He also stated that the focus in developing information systems is shifting for investing in infrastructure to investing in content and in future issues in integrating information at the NARS, regional and global levels will come to the forefront. The Workshop in Oman will contribute to building capacity and meeting these new challenges.

25. AARINENA President, Dr. Ahmed Al-Bakri, in his speech welcomed all participants and informed them that Agricultural development in this region could be enhanced by effective and efficient exchange of knowledge and information. Stakeholders in agricultural research for development have major problems in obtaining accurate and timely information. On the other hand, it was recognized that modern ICT could help in promoting exchange of information among all the stakeholders.

25. He stated that ICM is one of the key activities in the AARINENA work plan. AARINENA in collaboration with GFAR has held a series of consultations and workshops to establish the RAIS. He requested participants to contribute actively during the working groups dealing with strengths, weaknesses, opportunities and threats of their national systems. He reminded participants that it is essential to strengthen their national agricultural information systems by resolving the constraints and weaknesses, as a prerequisite to strengthen regional agricultural information system. He noted that capacity development for the establishment of NIFUs is one of the priority issues identified during the previous meetings of AARINENA-RAIS.

26. The AARINENA President took this opportunity to thank the organizers and cosponsors of this meeting, GFAR and FAO for providing the financial and technical support. The valuable efforts of the staff of the Ministry of Agriculture in Oman for providing the local logistics and facilities were highly appreciated. His special thanks were due to H.E. Eng. Khalfan Saleh Al-Naabi for having spared his valuable time from his busy schedule to honor this session. Special thanks were also given to Dr. Ibrahim Hamdan for his explicit and invaluable contributions in various ways to the organization of the workshop. Finally, he wished all participants a successful and productive meeting.

5.2 An overview of Information Needs for Agricultural Innovation.

27. Mr. Ajit Maru, the Senior Agriculture Officer of GFAR, made a presentation on "An overview of Information Needs for Agricultural Innovation and the possible role of AARINENA and WANA Region NARS to satisfy these needs". His presentation covered the following areas:
    - Agriculture development, knowledge and innovation and GFAR's role;
    - Understanding agricultural innovation and agricultural innovation systems;
    - Enabling information and knowledge systems for agricultural innovation;
    - Examples of information and knowledge systems that contribute to agricultural innovation;
    - Strategy and interventions by ARD Stakeholders.

28. Agricultural development depends to a great extent on how successfully knowledge is generated, shared and applied *for innovation.* GFAR has emphasized the need for all ARD stakeholders to enable agricultural innovation systems and promote agricultural innovation for development. A key question was identified as how NARS leaders and information systems managers can contribute to enabling (information and) knowledge systems that support agricultural innovation systems. The determinants of innovation are effective interactions between people sharing their ideas, and the social setting of these interactions and relations.

29. Agricultural innovation reaches beyond research. "It is not a linear process of research institutes being creators of knowledge and technology, extension as its diffuser and farmers as adopters". Agriculture innovation can involve any actor(s), such as producers and processors (in a value addition/market chain), input provider, intermediaries, and consumers. It is difficult to clearly define an Agricultural Innovation System (AIS), especially in the context of smallholder producers in developing countries.

30. Innovation systems thinking recognizes that innovation and change can originate and be catalyzed anywhere in the network in an activity and that relations among the actors are key to knowledge sharing and application. Innovation processes can be enhanced by creating more possibilities for actors to interact. This is the core determinant for starting information support for agricultural innovation. In innovation systems, information and knowledge is usually shared across a community bound by common needs, interests, values etc and not by "scientific disciplines" or "professions".

31. Information needs of innovators in agriculture are complex and driven by the need to be competitive, to reduce cost, to decrease time in production or processing, to improve quality

and/or to reduce risk. The information needs for innovation are now related to participation in markets, how others are solving similar problems, and awareness about available solutions.

32. There are several sources of information for actors in agricultural innovation, in terms of market-related information and technical "know how". The sources for "know where" and "know who" however are weak. In many instances, information producers are themselves also consumers of information ("Prosumers"). New "guilds" or organization of groups of actors in the agricultural value addition chain are emerging as providers of information and knowledge, for example seed, fertilizer and pesticide suppliers, market intermediaries and producer organizations. These groups must be promoted and supported in their ICM and KM activities

33. Information flows in agricultural innovation systems are complex. ICTs remove geographic limitations to sharing of information and knowledge. The strategy should be to enable information and knowledge services through a wide range of agricultural stakeholders including the farmer organizations, community based organizations, NGOs, private sector, in addition to mainstream research and education institutions in the "NARS".

34. There is also need for a need for new institutional frameworks and approaches to support information and knowledge services for agricultural innovation harnessing support from the public sector, the private sector, civil society, and partnerships between them. In addition, we need to know: How to tackle issues of "Intellectual Property" on knowledge generated through a community, How to enable greater coherence in information flows related to agriculture and its development, and How to create "Learning Opportunities" that enable knowledge access equitably in a community and globally.

35. There is need for new capacities such as in: using new information technologies and tools to support ICM and KM, generating and managing information and knowledge objects, enabling and promoting ICT enabled social networks, and creating and supporting learning opportunities.

36. GFAR's contribution. along with other international actors, can be to:
    - Create awareness and advocate at the policy level on how ICTs, information and knowledge systems can contribute to agricultural innovation;
    - Strengthen the capacities of individuals in its stakeholder groups in ICM;
    - Contribute to development of robust institutional frameworks for supporting agricultural innovation through coherence and governance through standards and norms, tools and applications, and governance structures.

5.3 Elements of Good Practice in Institutional Information Networks in Agricultural Science and Technology.

37. Mr. Stephen Rudgard, FAO Chief of WAICENT of Capacity Building and Outreach, made a presentation on elements of good practice in International Information Systems in Agricultural Sciences and Technology (IISAST).

38. The main activities carried out by the international partnership have been expert consultations (October 2005 and September 2007), task forces (Advocacy and Content Management), regional networking activities, and national pilot networks.

39. He briefed the participants on AGRIS which is a Network of over 200 organizations worldwide collaborating on the shared objective of improving access and exchange of information on agricultural science and technology. It is launched in 1975 and new vision developed in 2002 http://www.fao.org/agris/.

40. A new AGRIS vision introduced in 2002 comprised the following elements: (i) *decentralized* approach, (ii) greater *diversity* of participating organizations, (iii) strengthened role in *capacity building*, (iv) focus on *full text* documents, (v) greater availability of *associated information* about activities/organizations/people, and (vi) a set of *web-enabled* standards and tools**.** The principal challenges for the implementation of AGRIS new vision were: (a) Decentralization: establishment of national networks – institutions and policies, (b) Capacity building: supporting decentralization, (c) Content management: common approaches (standards and tools), and (d) Partnerships: at regional/international level

41. GFAR established two initiatives (the Global.RAIS and a Global Partnership Programme) in 2003-5 to promote information and communication management for agricultural research for development (ICM4ARD), by reaching out to regional and international stakeholders as well as to countries. In 2005 and 2007, several international institutions including FAO and GFAR collaborated to organize expert consultations on "International Information Systems for Agricultural Sciences and Technology" (IISAST) indicating the urgent needs for stronger national information **policies and strategies** for ICM in agricultural research and development; clear **ICM plans and investments** at national and institutional levels; better **information products and services** delivered to local and national stakeholders by international/regional systems and services; and one **"international approach"** with all key stakeholders.

42. The principal messages for decision-makers in NAIS identified by the Regional Forums are:
    - Planning in NARS is essential for strong ICM – comprising: vision, strategy, policy framework, operational plans, monitoring and evaluation and the objectives are to address information needs/demands of (internal and external) stakeholders and to use/build ICM (human and technological) capacities effectively
    - The lack of ICM planning means: (i) outputs are not disseminated effectively, (ii) research and development resources are wasted, (iii) the public image of NARS is poor due to lack of credibility and (iv) NARS institutions may become obsolete

43. The major factors affecting agricultural information networks/systems are: Strategy/Policy, Institutional aspects, Stakeholders, People, Content, Infrastructure, and Financial aspects/Sustainability. These major factors affecting agricultural information networks/systems

can be portrayed in a model formulated during the Expert Consultations held in Rome in 2005 and 2007.

Figure: Major factors affecting agricultural information networks/systems

44. Six case Studies for national pilot networks were presented to workshop participants:
    - Egypt: National Agricultural Research Information Management System (NARIMS);
    - Ghana: Ghana Agricultural Information Network System (GAINS);
    - Kenya: Kenya Agricultural Information Network (KAINet);
    - Madagascar: Scientific and Technical Information System (SIST);
    - Peru: Red Peruana de Intercambio de Información Agraria (AGRORED);
    - Thailand: Thai AGRIS Centre.

Workshop Working Groups Sessions

6. Workshop Working Sessions

45. Participants were placed in three working groups (three/four countries per group). The first working group was composed of three countries: Cyprus, Lebanon and Sudan. The second working group was consisted of four countries: Egypt, Libya, Oman and Yemen. Jordan, Morocco, Syria and Tunisia (Four countries) were participated in the third working group.

Countries Group 1	Countries Group 2	Countries Group 3
Cyprus	Egypt	Jordan
Lebanon	Libya	Morocco
Sudan	Oman	Syria
	Yemen	Tunisia
Three Countries	Four Countries	Four Countries

46. The four resource persons acting as facilitators of the working groups were: Stephen Rudgard and Magdi Latif, FAO, Ajit Maru, GFAR, and Nihad Maliha, ICARDA.

47. On 8th to 10th January 2008, the Regional Workshop for Strengthening AARINENA ICM Focal Units was conducted in MOA. First working session was conducted on 8th of January 2008. The second working session was organized on 9th January 2008. The third working session was carried out on 10th January 2008.

6.1 First Working Session – Analysis of National Experiences

48. The first session on 8th January was dealing with analysis of national experiences to identify the main strengthens and weaknesses of their agricultural research information systems. Participants were placed in three working groups (three/four countries per group).

49. Analysis of national experiences was required to be performed by participants during the first session to develop a guideline for analysis of the information network/system at national level and to identify the major factors affecting the establishment and development of agricultural information network/system.

50. A SWOT analysis was introduced to the workshop participants as it is best completed by pooling inputs through meetings of groups of stakeholders and it is also most effective in a "brainstorming" mode, where a group of colleagues contribute perceptions and ideas. Participants were asked to identify for their own country based on their own knowledge and any research prior to the workshop at least 1-3 key points (strengths, weaknesses, threats/ challenges) affecting each of the following issues: strategy/policy, institutional aspects, stakeholders, content, people, IT infrastructure, financial aspects.

51. These key points were then shared within the working group. The pooled points were analyzed with the guidance of the facilitator, to highlight points unique to one country or common to many, and prioritized across countries.

52. Each group reported its findings to plenary. The outputs of the three groups were pooled and duplicate points merged to produce the outcome that covers issues affecting the development of

national agricultural information systems and national challenges/opportunities

53. The *main challenges/Opportunities* for an appropriate implementation for factors affecting the development of a National Agricultural Information System/network *(IKM Strategy/policy*, *Institutional Aspects*, *stakeholders*, *people*, *Content*, *IT Infrastructure*, and Financial aspects) and they are shown in the following table:

Analysis of National Experiences

Factor/Issue	Challenges/Opportunities
Strategy/Policy	• lack of ICM strategies at national and institutional levels and associated implementation plan (3) • need to raise awareness/understanding of policymakers of strategic issues, including of impact of information on development (2) • need to define process for development and implementation of strategies and policies • need to find lead body towards establishing national strategy • lack of resources to implement strategy • need for continuous support from decision-makers for strategy implementation • need to integrate existing sector-based information approaches/strategies • need to create national information policies
Institutional aspects	• lack of incentives and standards • lack of information sharing culture, and incentives for staff to share information (2) • lack of processes/mechanisms for sharing of information • lack of suitable institutional champion(s) • lack of coordination, cooperation and communication within and between institutions leading to duplication of efforts (3) • lack of institutional incentives establishment of agricultural information centre(s) • lack of resources for access to systems in remote/rural areas (All) • need to institutionalize ICT/ICM activities • high level of variability in resources among institutions within country • lack of steering (publishing) committee(s) to ensure coordination and content validation • need to establish interest groups in thematic areas
Stakeholders	• inadequate awareness of and familiarity with potential users' needs (2) • development of user-oriented information services – especially for farmers • lack of communication among stakeholders • need to encourage communication between various stakeholder groups
People	• inadequate skills in ICM and/or IT at central and decentralized levels (3) • loss of IM skills from public sector to private sector (brain-drain) (2) • shortage of specialized training for ICM/IT specialists (2)

Analysis of National Experiences

Factor/Issue	Challenges/Opportunities
	• lack of training resources • lack of full-time resources in ICM • support from regional/international organizations for human resources development • lack of human resource development policies in ICM • lack of appreciation among managers and policymakers of value of information professionals • confusion around emerging information and knowledge management concepts
Content	• inadequate appropriate technical content (in digital format) – especially local content • inadequate institutional management information • cost of developing digital content is high • inadequate ICM tools/systems for information acquisition, processing, and sharing (2) • lack of content in appropriate languages • need for quality control of information content • lack of common standards and methodologies (2) • lack of researchers' motivation to provide content for the system • content is not easily accessible (in digital format) and is fragmented and scattered (2) • unclear IP ownership and data security (2) • need to manage different types of information objects
IT Infrastructure	• poor quality of connectivity and low bandwidth (3) • poor IT infrastructure in remote/rural areas (2) • use of mobile services and advanced telecoms technology • use of GPRN communication • uneven distribution of IT equipment among staff • ineffective utilization of available resources • need for adequate maintenance and upgrading of hardware and software
Financial aspects	• inadequate investments in information systems (although information provision is an essential service) • insufficient (public) funding allocated to agricultural ICM activities and IT development (3) • misuse of available funding due to inappropriate implementation • need to prepare bid(s) for financial support from potential donors • need to ensure proper distribution of financial resources to ensure better delivery of outputs

6.2 Second Working Session – Strategic Options at National Level

54. The second session was conducted on 9th January for identifying strategic options at national level. Participants remained in the same three working groups as in the first session. Participants were asked to work in the context of their own group's findings to analyze the key weaknesses and threats/challenges identified in the first session, and to define possible solutions to them. These solutions were shared within the working group, and comparisons drawn between countries when they shared similar points. Each group reported its findings to plenary. The outputs of the three groups were pooled and duplicate points merged to produce an outcome covering issues and potential solutions/ recommendations.

55. Participants found that the potential solutions/recommendations for appropriately implementing the major factors affecting the development of a National Agricultural Information System/ network *(IKM Strategy/policy, Institutional Aspects, stakeholders, people, Content, IT Infrastructure*, and Financial aspects) and they are described in the following table:

Strategic Options at National Level

Factor/Issue	Potential Solutions/Recommendations
Strategy/Policy	• develop an (national/institutional) IKM strategy and associated policies using the following initial steps: – organize a (steering) committee for IKM representing all types of stakeholders and headed by a senior official (e.g. Director-General, Under-Secretary) – define activities/tasks for committee with specific deadlines – develop a plan/roadmap for the creation of the strategy/policies – in consultation with MOA and NARS units – bring in international/regional organizations that can take a significant role in strategy formulation – survey existing policies/strategies by main NARS (questionnaire and workshops) • advocate/promote awareness and understanding amongst decision-makers of importance and impact of information on agricultural development through the following: – short (one day maximum) advocacy workshops for senior managers and decision-makers where funds are available [N.B. needs a senior champion] – sharing lessons learned from other countries' experiences in the form of briefing notes • utilize and exploit a variety of opportunities/tools to convince decision-makers: – develop a pilot IKM system that can be demonstrated to decision-makers (to gain political and financial support) – organize expert consultation on IKM (lead NARS, IARCs, FAO, GFAR) • identify sources of funding to ensure sustainability of activities

Strategic Options at National Level

Factor/Issue	Potential Solutions/Recommendations
Institutional Aspects	• identify a national/institutional IKM focal unit, and take the following actions: – empower it with clear TORs – assign responsibility/authority for duties – establish a (IKM) steering committee within the lead organization – build its capacity – with inputs from national, regional, international levels as appropriate – let it lead institutional development process in collaboration with concerned depts./authorities • develop international contacts to benefit from wider experiences • identify a suitable senior champion, who can be outside the focal unit • change attitudes of scientists and technical professionals regarding information and knowledge sharing by introducing concepts of culture change, including IM processes, procedures, and workflows - through external consultant(s), seminars and workshops • develop IM workflow(s) to ensure proper (coordinated) processing of information objects within the institution – [see People] build capacity of all staff/stakeholders involved in the workflow(s) – using external resource persons • assign responsibility to the steering committee to facilitate collaboration and cooperation among institutions
Stakeholders	• enhance institution's capacity to undertake a user needs assessment (market research) – identify (external) users of information content produced by institution – e.g. researchers, academics, students, policy makers, extension workers, farmers and NGOs – establish users' needs by ethnographic approach, site visits, meetings, interviews, workshops, discussion groups • decide how the institution can meet these needs – using proposed system(s) • ensure strong relationships with content contributors: researchers, academics, information professionals etc • enhance stakeholder engagement in development of national/institutional IKM strategy and policies • ensure proper monitoring of stakeholders through regular collection of feedback • develop stakeholders' awareness and capacity to contribute/use information • develop regular communication with/among stakeholders – e.g. using latest web 2 technologies (Wikis, blogs)
People	• lobby decision-makers and authorities to recruit full-time specialized IM/IT staff on permanent basis • attract and retain IM/IT staff through incentives and career structures • ensure equal opportunities amongst IM/IT professionals – i.e. gender,

Strategic Options at National Level

Factor/Issue	Potential Solutions/Recommendations
	youth • create human resource development plans for IM/IT staff – to ensure the right people are in the right place with adequate motivation and incentives [responsibility of steering committee – in coordination with internal and external service providers] • develop external contacts, including with regional and international organizations, to support capacity building of staff • use public-private partnerships to support and sustain IKM training
Content	• survey existing information resources to define available content and format(s) • existing content (non-digital): a stepwise process should be developed including: – [see People] capacity building for librarian, information managers and info-mediaries – digitization – scanning and OCR through automated tools/systems – processing for retrieval – cataloging, indexing, bookmarks • new content (in digital formats): new tools should be used to develop content customized for specific output media, namely web-based systems, mobile telephony, or audio/visual aids • develop institutional digital libraries/archives of a range of types of information object • adopt/adapt appropriate international standards for information management in collaboration with regional/international organizations (e.g. MARK 21 for cataloguing, AGRIS Application Profile, AGROVOC thesaurus, XML formats) • define content management work flows, and identify individuals/focal points responsible for content input and processing
IT Infrastructure	• survey and regularly monitor ICT infrastructure in stakeholder institutions within the country • determine system/connectivity requirements (hardware and software) necessary to access/contribute to information and knowledge services • influence policy-makers to create awareness of the need for adequate investment in ICT infrastructure • coordinate with Min. of Communication to extend and support ICT infrastructure • reduce cost of connectivity through a "bandwidth consortium" of key research/academic institutions • expand connectivity at key central system location(s) • build appropriate ICT infrastructure at each participating location • consider development of services based on wireless technology/ies (e.g. mobile phone(s), GPRN etc) for stakeholders with poor Internet access • ensure adequate network security and monitor continuously for viruses • develop and monitor policies for Internet use

Strategic Options at National Level

Factor/Issue	Potential Solutions/Recommendations
	• develop a policy for regular system upgrade and maintenance
Financial aspects	• secure financial support from government sources for information systems/network • use public-private partnerships to support and sustain information systems/network (e.g. Microsoft) • secure financial support from external public sector donors (national and international)

6.3 Third Working Session – ICM Country Priorities for Development

56. The third working session on 10th January was designated for country priorities for development. Participants were requested to analyze the list of solutions/recommendations in the context of their own countries and to choose three that would be priorities for early implementation in support of the development of their NAIS.

57. The most commonly selected priority options selected by the countries are shown below:

A. Develop an information and knowledge management strategy at national/institutional levels. [selected by six countries]

B. Develop information management workflow(s) to ensure proper (coordinated) processing of information objects within the institution, and identify individuals/ focal points responsible for content input and processing. [selected by five countries].
Note: NERAKIN modules have inbuilt workflows.

C. Advocate/promote awareness and understanding amongst decision-makers of the full potential of ICM/T in agricultural research for development. [selected by four countries].
Note: Planning in NARS is essential for strong ICM comprising vision, strategy, policy framework, operational plans, monitoring and evaluation in order to address needs/demands of internal/external stakeholders and to use/build effectively ICM (human and technological) capabilities for agricultural research for development. This is because the lack of ICM planning means outputs are not disseminated effectively and therefore research and development resources are wasted and the NARS public image is poor due to lack of credibility.

ICM Country priority for Development

Country	Action to be taken
Cyprus	• develop an (national/institutional) IKM strategy and associated policies sharing lessons learned from other countries' experiences • advocate/promote awareness and understanding amongst decision-makers of importance and impact of information on agricultural development through short (one day maximum) advocacy workshops for senior managers and decision-makers where funds are available [N.B. needs a senior champion]

ICM Country priority for Development

Country	Action to be taken
	• enhance institution's capacity to undertake a user needs assessment (market research); identify (external) users of information content produced by institution – e.g. researchers, academics, students, policy makers, extension workers, farmers and NGOs
Egypt	• change attitudes of scientists and technical professionals regarding information and knowledge sharing by introducing concepts of culture change, including IM processes, procedures, and workflows - through external consultant(s), seminars and workshops • develop IM workflow(s) to ensure proper (coordinated) processing of information objects within the institution - build capacity of all staff/stakeholders involved in the workflow(s) – using external resource persons • existing content (non-digital): scanning and OCR through automated tools/systems
Jordan	• develop an (national/institutional) IKM strategy and associated policies using the initial step of development of a plan/roadmap for the creation of the strategy/policies – in consultation with MOA and NARS units • identify a national/institutional IKM focal unit, and take the following actions: – empower it with clear TORs – assign responsibility/authority for duties – establish a (IKM) steering committee within the lead organization – build its capacity – with inputs from national, regional, international levels as appropriate – let it lead institutional development process in collaboration with concerned depts./authorities • survey existing information resources to define available content and format(s)
Lebanon	• organize a (steering) committee for IKM representing all types of stakeholders and headed by a senior official (e.g. Director-General, Under-Secretary) • develop external contacts, including with regional and international organizations, to support capacity building of staff • consider development of services based on wireless technology/ies (e.g. mobile phone(s), GPRN etc) for stakeholders with poor Internet access
Libya	• advocate/promote awareness and understanding amongst decision-makers of importance and impact of information on agricultural development • identify a national/institutional IKM focal unit, and take the following actions: – empower it with clear TORs – assign responsibility/authority for duties – establish a (IKM) steering committee within the lead organization – build its capacity – with inputs from national, regional, international levels as appropriate – let it lead institutional development process in collaboration with concerned depts./authorities • enhance stakeholder engagement in development of national/institutional IKM strategy and policies

ICM Country priority for Development

Country	Action to be taken
Morocco	• advocate/promote awareness and understanding amongst decision-makers of importance and impact of information on agricultural development • develop IM workflow(s) to ensure proper (coordinated) processing of information objects within the institution - build capacity of all staff/stakeholders involved in the workflow(s) – using external resource persons • existing content (non-digital): a stepwise process should be developed including: – capacity building for librarian, information managers and info-mediaries – digitization - scanning and OCR through automated tools/systems – processing for retrieval – cataloging, indexing, bookmarks
Oman	• create human resource development plans for IM/IT staff – to ensure the right people are in the right place with adequate motivation and incentives [responsibility of steering committee - in coordination with internal and external service providers] • define content management work flows, and identify individuals/focal points responsible for content input and processing • determine system/connectivity requirements (hardware and software) necessary to access/contribute to information and knowledge services
Sudan	• develop an (national/institutional) IKM strategy and associated policies • existing content (non-digital): a stepwise process should be developed including: – capacity building for librarian, information managers and info-mediaries – digitization - scanning and OCR through automated tools/systems – processing for retrieval - cataloging, indexing, bookmarks • secure financial support from government sources for information systems/network
Syria	• develop an (national/institutional) IKM strategy and associated policies using the following initial steps: – organize a (steering) committee for IKM representing all types of stakeholders and headed by a senior official (e.g. Director-General, Under-Secretary) – define activities/tasks for committee with specific deadlines – develop a plan/roadmap for the creation of the strategy/policies – in consultation with MOA and NARS units – bring in international/regional organizations that can take a significant role in strategy formulation – survey existing policies/strategies by main NARS (questionnaire and workshops) • advocate/promote awareness and understanding amongst decision-makers of importance and impact of information on agricultural development • develop IM workflow(s) to ensure proper (coordinated) processing of information objects within the institution - build capacity of all staff/stakeholders involved in the workflow(s) – using external resource persons
Tunisia	• develop an (national/institutional) IKM strategy and associated policies using the following initial steps: – organize a (steering) committee for IKM representing all types of stakeholders

ICM Country priority for Development

Country	Action to be taken
	and headed by a senior official (e.g. Director-General, Under-Secretary) – define activities/tasks for committee with specific deadlines – develop a plan/roadmap for the creation of the strategy/policies – in consultation with MOA and NARS units – bring in international/regional organizations that can take a significant role in strategy formulation – survey existing policies/strategies by main NARS (questionnaire and workshops) • identify a national/institutional IKM focal unit • develop IM workflow(s) to ensure proper (coordinated) processing of information objects within the institution - build capacity of all staff/stakeholders involved in the workflow(s) – using external resource persons
Yemen	• develop a plan/roadmap for the creation of the strategy/policies – in consultation with MOA and NARS units • develop external contacts, including with regional and international organizations, to support capacity building of staff` • survey and regularly monitor ICT infrastructure in stakeholder institutions within the country

6.4 Enhanced Web-based NERAKIN - Knowledge Sharing for Development Platform

58. Magdi Latif (FAO) also made a presentation on NERAKIN during the fourth session of the workshop. He defined NERAKIN as a platform for knowledge sharing and collaboration for Rural and Agricultural Development for target groups and stakeholders on a regional level in NENA.

59. The development objective for NERAKIN is to enhance rural and agricultural development in the NENA region through strengthening information and knowledge access and exchange, providing mechanisms to (a) strengthen, coordinate, and add value to national and regional agricultural initiatives, and (b) improve performance of farmers and agrarian businesses in order to increase agricultural production and improve food security in NENA countries. The immediate objective of NERAKIN is to strengthen the capacity of the Ministries of Agriculture and agricultural and rural research institutions for effective information management and knowledge exchange in support of rural and agricultural development in the region. The regional initiative aims to add value in a coherent way to national system/networks, not substitute them.

60. The NERAKIN phase I outputs achieved in 2007 were as follows:
    a. A pilot NERAKIN regional web-based information system for content management and information exchange (completed October);
    b. Identification of technical institutions committed to capacity building in IKM;
    c. Selected national technical staff sensitized on how to use NERAKIN Regional System;
    d. Pilot national knowledge and information management systems/networks (i.e. Egypt,

Jordan, Oman, etc.).

61. Presentations were made of the NERAKIN user interface (regional or national) which provides the functionalities for information retrieval/browsing, and the administrator (backend) interface which provides data management functionalities that enable input/updating/deletion of data The content management system of NERAKIN was also briefly demonstrated online. Other features of NERAKIN were presented as follows:
    - incorporation of international data exchange standards and tools for content management (AGMES – Agricultural Metadata Element Set, Application Profiles for Organizations, Experts, and Projects, AGROVOC thesaurus);
    - Open System Architecture: dynamic system, developed using object-oriented concepts;
    - Centralized or Distributed System: The NERAKIN architecture will enable participating institutions (i) to upload content into a centralized system, and (ii) to manage content in distributed systems at institutional level.

62. Development of NERAKIN in 2008/2009 would focus on the following outputs:
    - official launch of NERAKIN regional portal;
    - development of the regional collaborative network based on partnerships for enhanced knowledge-sharing and learning at national level.
    - training of selected national technical staff to contribute to the NERAKIN system;
    - securing active commitment from stakeholders to develop national ICM systems/networks;
    - development of the regional thematic knowledge networks (See Annexes 3 and 4), starting with the Biotechnology Network.

63. The benefits of regional and national partnerships in the development of networks were presented, that had been identified at an international expert consultation in Rome in 2005:
    - a collaborative system and effective communication,
    - exchange of information and knowledge,
    - enhanced technical cooperation,
    - reduced costs of operation,
    - synergies in information management, and
    - use of agreed standards, methodologies and tools.

64. A series of generic good practices success factors for regional networks were presented, that had been identified at an international expert consultation in Rome in 2005:
    - Commitment for contribution/collaboration at national level;
    - Focus on capacity building at national level;
    - Existence of a regional information strategy;
    - Development of a Secretariat role for regional activities;
    - Focus on community of practice amongst the info specialists;
    - Raising awareness of ICM issues at Manager./political levels; and
    - Formation of strategic partnerships amongst the major stakeholder organizations.

65. A series of generic good practices for national networking were presented, that had been identified at an international expert consultation in Rome in 2005:
    - Existence of a clearly defined strategy and objectives;
    - Tangible commitment to the strategy from major players including government;
    - Assurance of adequate funding resources for the network members;

- Strong but sensitive leadership provided by a national focal point;
- Participatory approach in the national network with appropriate recognition of all partners;
- Development of information repositories of documents (metadata/full text) and people/ organizations/activities;
- Adoption of a single model for IM with common formats and standards;
- Focus on content quality; and
- Focus on development of human resources

6.5 Lessons Learned from National Case Study of Institutional Information System and NARIMS Tools:

66. Mr. Mahmoud Rafea, Director of CLAES, presented the Egypt National Agricultural Research Information Management System (NARIMS) and the lessons learned during its development and implementation, which are summarized as follows:

- Define a strategy for agriculture information management. Factors for successful strategy to be followed are (a) clear mission; (b) defined objectives that will accomplish the mission; (c) promotion of the strategy to get support from decision makers; (d) preparation of an operational plan.
- Establish a steering committee to create an enabling policy environment, facilitate management and ensure sustainability;
- Identify a champion, preferably from the agriculture top management, as a key factor for success to motivate the development and solve managerial problems and overcome institutional resistance,
- Build capacities by training of trainers on ICM/T, including automation and systems development. In Egypt-NARIMS, stakeholders completed training on the NARIMS toolset, use of the Arabic AGRIS Application Profile, document indexing, and cataloging. However, the quantity and the quality of input into the system are still low.
- Restructure the organization, including establishment of a central information management unit, or focal point, with efficient structures which facilitate information management and enhance sustainability. With reference to Egypt-NARIMS, a National Agricultural Research Information Centre (NARIC) was introduced into the structure of the Agricultural Research Centre (ARC)
- Be prepared to address problems and inefficiencies in the system administration and in quality of information, using approaches such as reporting staff performance to their institutions/management,
- Build supportive alliances to ensure quality of the system, reduce risk failure, minimize production time, and minimize effort and money in addition to adapting existing standards, tools and methodologies, particularly those developed by FAO such as the AGRIS Application Profile (AGRIS AP) selected as the metadata standard, and AGROVOC thesaurus (available both in English and Arabic) adopted for indexing,
- Design and implement a robust network infrastructure develop systems and tools using appropriate technology [Infrastructure, Computer hardware (servers), Software (OS, Services, DBMS)], and
- Ensure appropriate financial aspects for sustainability as continuous government support is essential

6.6 Plenary discussion on development of information systems tools

67. The issue of language implementation, and specifically the French language, in the NERAKIN system was raised, and it was confirmed that the system is already enabled in Arabic and English, and a French version will be implemented in 2008. Participants from Tunisia and Morocco agreed to contribute to its development.

68. Emphasis was placed on the role of NERAKIN as a potential platform to be adopted for a NAIS, rather than a regional facility, given the lack of compatibility with some existing national systems tools. It was recognized that development of web-services technology would be needed in NERAKIN in order for it to harvest information across diverse technology platforms and to function well as a true regional facility. FAO committed to developing such a facility by 2009.

69. In addition, Open Archive Initiative/Protocol (http://www.openarchives.org/) will be implemented in the NERAKIN system to support interoperability and facilitate the efficient dissemination of content. This facility will be available in June 2008.

Workshop Conclusions

7. Workshop Conclusions

70. The regional workshop succeeded in strengthening the awareness and understanding of participants of ICM Focal/Nodal Units from eleven countries in the NENA region. Country representatives were able to present their own national reports (See Annex 5) to the workshop participants during the working groups sessions. The workshop provided a perspective on the strengths, weaknesses, threats/challenges and opportunity at national level for issues affecting the development of NAIS. Key weaknesses, threats, and challenges were documented and potential solutions/recommendations at national level identified. The country priorities for early implementation along with actions required to be taken for successful implementation were also identified.

71. It was recognized that, as development of the NAIS is an ongoing process, priorities would need to be reviewed and updated on a regular basis at each year by the NIFUs. It was noted that regular (annual) work plans and progress reports should be made to AARINENA (e.g. January of each year), with indicators and means of verification for the seven major factors affecting the development of NAIS (Strategy/Policy, Institutional Aspects, Stakeholders, People, Content, IT Infrastructure, and Financial Aspects).

72. It was recommended that ICT-RAIS Steering Committee should lead the follow-up to this workshop in order to ensure sustainability of the initiative, and that the NIFUs provide the appropriate contributions as above as a condition of benefiting from the capacity building activities managed by AARINENA and its partners (FAO, GFAR and ICARDA). Further, it was recognized that members of the ICT-RAIS Steering Committee should play a significant role in supporting and monitoring progress of the NIFUs in their sub-region as part of their role in the Steering Committee as follows:
    - Assist in and monitor development of the NAIS in their sub-region;
    - Assist in the improvement of national ICM policies and strategies;
    - Facilitate sharing of skills, knowledge and experiences among NIFUs

73. The decision of the AARINENA Executive Committee taken on 7 January 2008 were noted, mainly to launch the NERAKIN system informally in January 2008 to the NIFUs, and to launch it formally in the 11th General Conference of AARINENA in Damascus in 12-14 October 2008.

74. The next actions regarding the launching, further development, and data input to the NERAKIN network and system were noted, together with the need for capacity building at national level. Implementation of the Open Archive Initiative Protocol (http://www.openarchives.org/) in the NERAKIN system was also recognized as being important, together with the necessary features to support the regional functionality across diverse technology platforms.

75. Support is still required for strengthening national agricultural information systems especially that of capacity building and the development of appropriate mechanisms that could enhance openness and transparency in exchanging information and making use of experience and success stories between the different regional fora.

76. NARS ICM/ICT National Focal Points and RAIS-ICT Steering Committee representatives are encouraged to work closely to look for creative ways to advocate the benefits of knowledge sharing leading to innovations which contribute to the increasing food security.

77. Support from FAO and GFAR and other international development organizations is certainly needed for creating a global advocacy platform and building committed leadership to champion the cause of ICM4ARD that could be important steps in this regard.

78. Continuous support from FAO is still imperative to provide the countries of the region with the appropriate technology tools required for the generation and management of knowledge and information at the national and regional levels building on the existing tools/systems.

ANNEXES

Annex 1

Agenda

Regional Workshop for Strengthening ICM/ICT Focal Units
Muscat- Oman
8-10 January, 2008

Day One - 8 January, 2008 (Tuesday) *- Chairs: Dr. M. Sallam and Dr.* S. *Rudgard*	
8:30-9:00	Registration
9:00-10:00	**Opening Session** - H. E. Eng. Khalfan Al-Naabi, Under Secretary of the Ministry of Agriculture in Oman - Dr Ahmed Al-Bakry- President of AARINENA - Dr. Ajit Maru, GFAR, Rome - Dr. Stephen Rudgard, FAO, Rome
10:00-10:30	Coffee Break
10:30-11:30	Presentation on "An overview of Information Needs for Agricultural Innovation and the possible role of AARINENA and WANA Region NARS to satisfy these needs": by Dr. Ajit Maru
11:30-12:30	Presentation on "Elements of good practice in institutional information networks and systems": by Dr. Stephen Rudgard.
12:30-14:00	Lunch Break
14:00-15:45	**First Working Groups Session – Analysis of National Experiences.** Working Groups on analyses of national experiences in information networks and systems (participants' contributions).
15:45-16:00	Coffee Break
16:00-17:00	Plenary presentations of working group outputs and discussions.
Day Two - 9 January, 2008 (Wednesday) - *Chair: Dr. Ajit Maru*	
09:00-10:00	**Second Working Groups Session – Strategic Options at National Level**. Working Groups are requested to analyze the key weaknesses and threats/ challenges identified in the first session, and to define possible solutions to them. The outputs of the groups are pooled and duplicate points merged to produce an outcome covering issues and potential solutions/recommendations.
10:00-10:30	Coffee Break
10:30-11:30	Working Groups continued.
12:00-12:30	Plenary presentations of working group outputs
12:30-14:00	Lunch Break
12:30-14:00	Plenary discussion on working group outputs
15:00-15:30	Tea/Coffee Break

15:30-16:15	Presentation on enhanced web-based NERAKIN: by Dr. M. Latif
16:15-17:00	Presentation on lessons learned from national case study of institutional information system and NARIMS tools: by Dr. Mahmoud Rafea
17:00-17:30	Plenary discussion on further development of information systems tools
Day Three - 10 January, 2008 (Thursday) - Chair: Dr. S. *Rudgard*	
09:00-10:00	**Third Working Session – Country Priorities for Development.** Working Groups are requested to analyze the list of solutions/recommendations in the context of their own countries and to choose three that would be priorities for early implementation for the development of the national agricultural information systems.
10:00-10:30	Coffee Break
10:30-11:30	Plenary Discussion on next actions
11:30-12:30	Finalizing recommendations
12:30-13:30	**Closing Session**: Statements by Dr. Ibrahim Hamdan, Dr. Stephen Rudgard, and Dr. Ajit Maru.
13:30 -	Lunch Break
	Visit to Agricultural research Centre of Ministry of Agriculture of Sultanate of Oman

Annex 2

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Strengthening ICM Focal Units Regional Workshop
Muscat, Oman 8 – 10 January 2008

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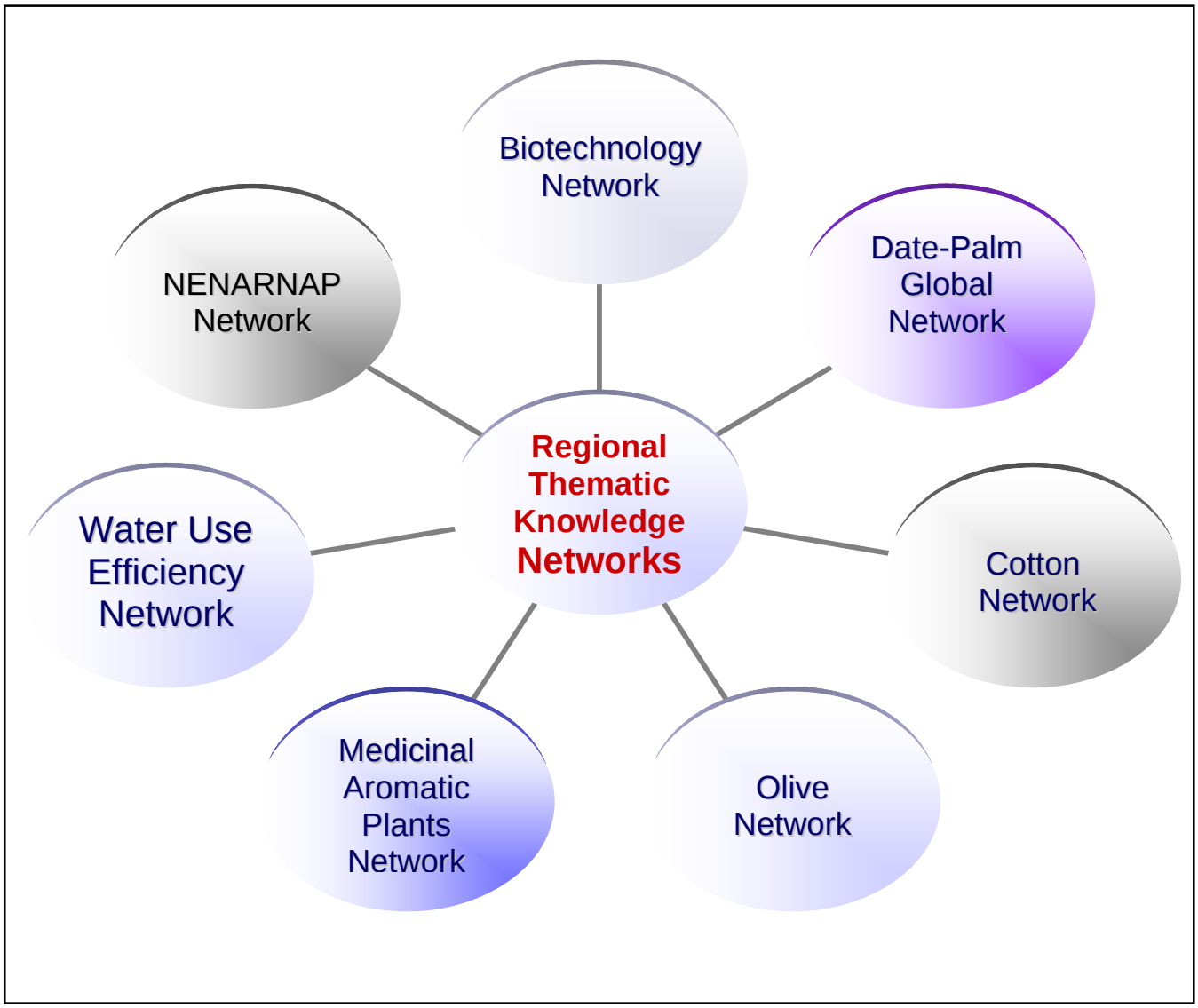
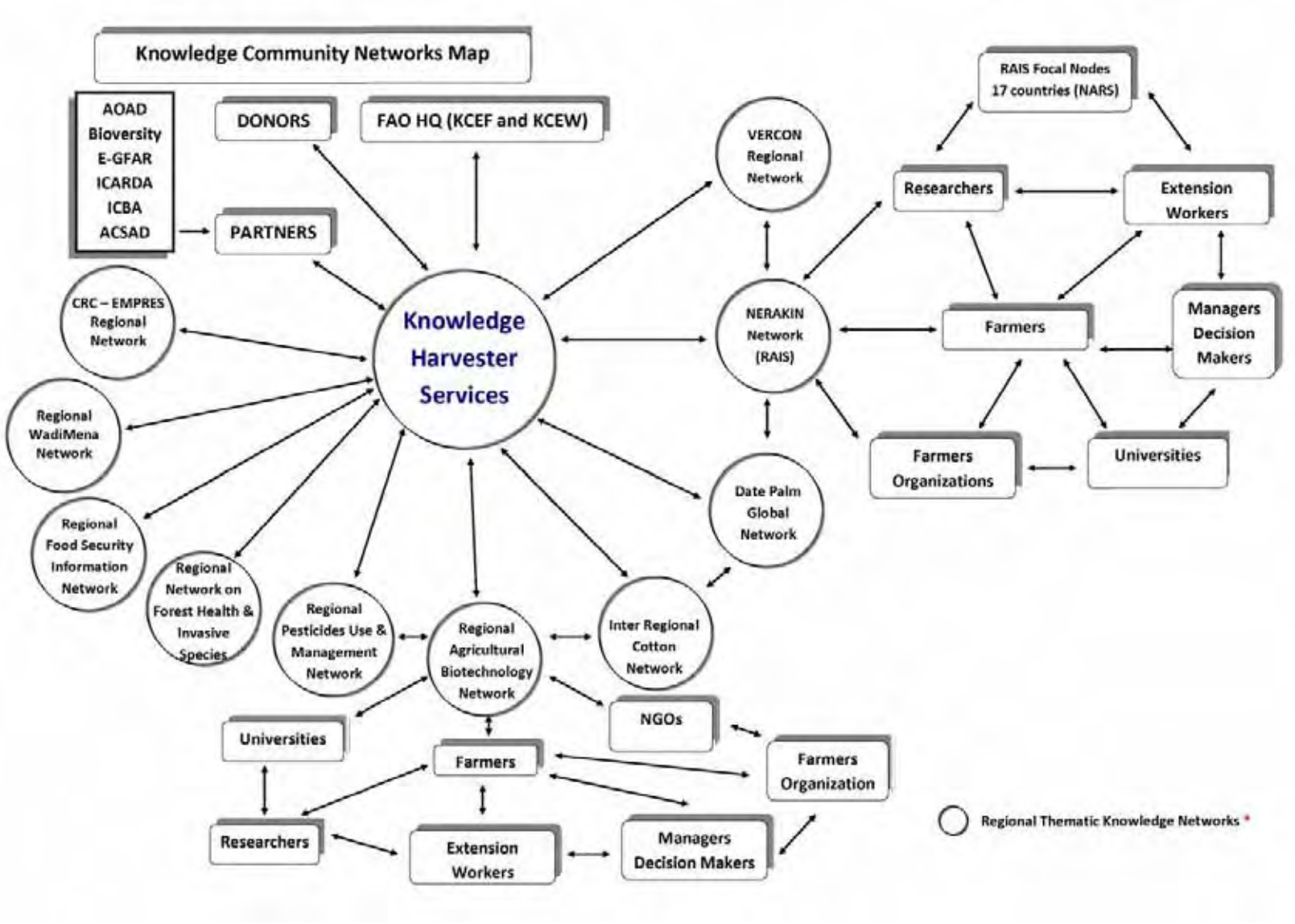
Annex 3

AARINENA Regional/Inter-Regional Thematic Networks

Established in collaboration with GFAR, FAO and ICARDA



Annex 4


Knowledge Community Networks Map
AOAD
Bioversity
E-GFAR
ICARDA
ICBA
ACSAD
DONORS
FAO HQ (KCEF and KCEW)
PARTNERS
CRC – EMPRES Regional Network
Regional WadiMena Network
Regional Food Security Information Network
Regional Network on Forest Health & Invasive Species
Regional Pesticides Use & Management Network
Regional Agricultural Biotechnology Network
Inter Regional Cotton Network
Knowledge Harvester Services
VERCON Regional Network
NERAKIN Network (RAIS)
Date Palm Global Network
RAIS Focal Nodes 17 countries (NARS)
Researchers
Extension Workers
Farmers
Managers Decision Makers
Farmers Organizations
Universities
Universities
Researchers
Farmers
Extension Workers
NGOs
Farmers Organization
Managers Decision Makers
Regional Thematic Knowledge Networks *

Annex 5

National Country Reports

National Information and Communication Management System/Network

Annex 5-1

Cyprus Country Report

Status of National Agricultural Information System in Cyprus

Prepared by: George Adamides[1]

1. General Overview

Cyprus is the third largest island in the Mediterranean Sea with an area of 9,251 km². The latitude of Cyprus is 34°,33' to 35°,34' North and its longitude is 32°,16' to 34°,37' East.

The population of Cyprus is estimated at 837,3 thousand at the end of 2004. The ethnic composition of the population is 77.8 % Greeks, 10.5 % Turks and 11.7 % foreign residents (Source: Cyprus Statistical Service). Official languages are Greek and Turkish.

The Republic of Cyprus entered the European Union on May 1, 2004.

2. National Research and Development Policy

Steps taken in recent years to upgrade research activities in Cyprus include:

- Establishment of the University of Cyprus in 1992 – http://www.ucy.ac.cy
- Establishment of the Technological University of Cyprus in 2007 http://www.tucy.ac.cy
- Expansion of research activities of two internationally recognized institutes in Cyprus, the Institute of Neurology and Genetics http://www.cing.ac.cy/EN/index.html, and the Agricultural Research Institute http://www.ari.gov.cy
- Creation of research departments in the fast expanding tertiary education sector institutions
- Establishment, in 1996, of the Research Promotion Foundation http://www.research.org.cy – an institution responsible for the co-ordination, support and funding of research activities in Cyprus
- The Harvard School of Public Health (HSPH) and the government of Cyprus have established an international research, education, and technology initiative for the environment and public health to address key environmental issues in Cyprus and the Mediterranean region. Towards this end, two new research and training entities have been created: The Cyprus International Institute (CII) for the Environment and Public Health located in Nicosia, Cyprus, and the HSPH-Cyprus Program (HCP) located in Boston, Massachusetts, USA.- http://www.hsph.harvard.edu/cyprus/start.html
- Participation of Cyprus in the Framework and other European Programmes
- Establishment of business incubators within the framework of the "New Industrial Policy".

The national research system is under the authority of the Planning Bureau http://www.planning.gov.cy/, the Research Promotion Foundation and four Government Ministries: (a) Commerce and Industry (b) Agriculture, Natural Resources and Environment, (c) Education and (d) Health.

[1] Agriculture Research Officer - ARI

2.1 The Specific Structure of the Agricultural Research System

The national agricultural research system is mainly under the authority of the Ministry of Agriculture, Natural Resources and Environment http://www.moa.gov.cy . One of its departments, namely the Agricultural Research Institute (ARI) http://www.ari.gov.cy, was the only Cyprus institution engaged exclusively in agricultural research, until 2007, covering the wider domain of crop and animal production. In 2007 the Technological University of Cyprus - http://www.tucy.ac.cy - started its operations and one of the Schools, the Department of agricultural production and food science and technology, will also engage research and educational activities.

The research strategies and priorities of ARI are formulated by the Agricultural Research and Development Council chaired by the Permanent Secretary of the Ministry. Members of this Council are the Director of ARI, representatives of farmers unions, professional societies, the University of Cyprus and other stakeholders.

The ARI was established in 1962 and is one of the Departments of the Ministry of Agriculture; Natural Resources and. ARI undertakes applied and basic research within the wider domain of plant and animal production. Its mission is to provide high quality scientific research using methods that are financially, environmentally and socially sustainable. Since its establishment, ARI has substantially contributed to the solution of actual problems and to the introduction of new technological methods and approaches in agricultural production.

The ARI is organized into two divisions. The production division includes the disciplines of crop breeding and genetics, fruit tree and viticulture, vegetable production, floriculture, animal production, molecular biology, molecular genetics, biotechnology and tissue culture. The support division provides services and scientific support to the production division. Among its disciplines are plant protection (entomology, plant pathology, nematology and weed science), insect toxicology and pesticide residues, soil fertility, plant nutrition, irrigation, environmental impact, experimental statistics and agricultural economics.

The ARI has specialized laboratories (chemistry, toxicology, molecular biology, tissue culture, radioisotopes etc.), research stations and other facilities, and houses the national herbarium and the national plant gene bank. ARI employs 40 scientists, most of them PhD and MSc holders, 65 technicians, 14 administrative and accounting personnel and a permanent labour force of 73 persons.

The ARI actively cooperates with regional and international organizations, Universities and research centers all over the world and was recognized by the EU as a Centre of Excellence in Agriculture and Environment.

2.2 Capacity Building of ARI towards ICT

The Institute has recently redesigned and enhanced its website http://www.ari.gov.cy , using the XOOPS platform with various web services such as: Calendar, News, Forum, Weblinks, Google Search, Contact form etc. It provides information about its various departments and their research activities, access to web-mail and library information (as described below) and contact information with the scientific personnel.

The Institute has received a teleconference unit (AERTHA) which will support the communication mechanisms of its personnel with other partners.

The Institute is the national AGRIS Centre collecting, cataloguing and indexing the agricultural literature published in Cyprus http://library.ari.gov.cy/agris/ , and is also the national CARIS Centre collating information on on-going research. All this information is supplied to FAO for inclusion in the global data bases of the AGRIS and CARIS systems. In order to facilitate this service the Institute has scanned and digitized all its own publications from 1965 onwards (about 300 in total) and has made them freely – full-text – available to the public.

2.3 Financing of Research and Development

It is estimated that the Research and Development expenditure in 2004 accounted for 0,4% of the GDP, i.e. about CYP 29 million (€ 50 million). It must be noted that between 2000 and 2004 research expenditure doubled.

Regarding research activities by sector, in 2003 the government accounted for 41.4%, the higher education institutions for 29.7%, the enterprises for 19.2% and the private non-profit institutions for 9.7% of total R&D expenditure. Agricultural research received 23.2% of the total R&D expenditure.

2.4 Research Performers

Research Performers, fall into two main categories (a) Academic Institutions and (b) Non-Academic Institutions.

2.4.1 Academic Institutions

- The University of Cyprus (http://www.ucy.ac.cy)
- The Cyprus Technological University (http://www.tucy.ac.cy)

2.4.2 Non-Academic Institutions

- The Cyprus Institute of Neurology and Genetics (http://www.cing.ac.cy/)
- The Cyprus Institute of Energy
- The Cyprus Telecommunication Authority (http://www.cyta.com.cy)
- The Institute of Technology (http://www.technology.org.cy)
- The State General Laboratory (http://www.moh.gov.cy/MOH/SGL)
- The Cyprus International Institute for the Environment and Public Health (http://www.hsph.harvard.edu/cyprus/)
- The Agricultural Research Institute (http://www.ari.gov.cy)

3. Information and Communication Technologies in Cyprus

The penetration rate of Internet in Cyprus is swelling although it constitutes a small portion compared with European levels. As shown in Figure 1, in 2004, only 32% of the people in Cyprus use the Internet. More specifically, 82% of enterprises were using the Internet while 2 % of households and 35% of enterprises had a broadband connection. Simultaneously, 35% of all enterprises were using the Internet for obtaining information from public authorities. (Source: Statistical Service of Cyprus).

Figure 1: Growth of Internet users in Cyprus

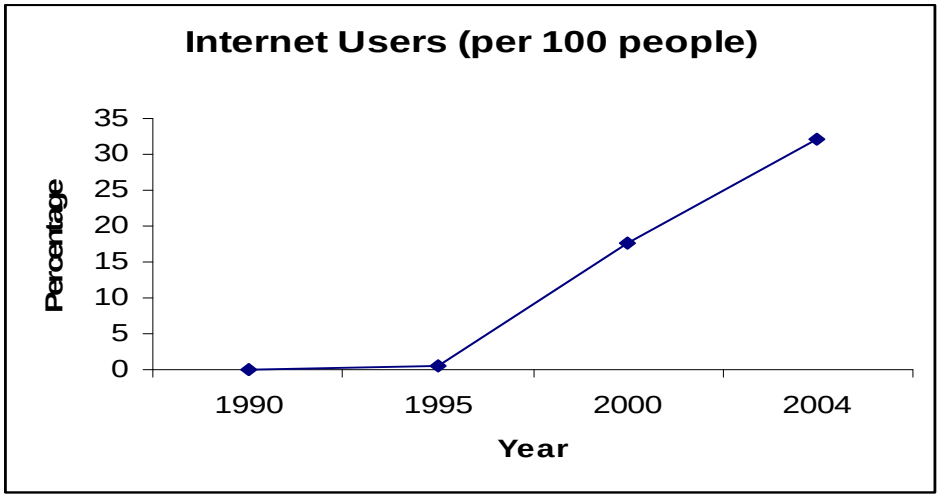


Table 1: Cyprus Telecommunications Fact Sheet (Source: Press and Information Office, 2005)

Telecommunications:
Regulatory environment. As from 1/1/2003 the market has been liberalized
Penetration. June 2003 – 69% PSTN : 59,29 lines / 100 pop ISDN : 9,71 channels / 100 pop
Fixed Lines. June 2003 – 493.365 lines 423.933 PSTN lines 69.432 ISDN channels
Services offered. Most class services, ISP, ISDN, ATM, Frame Relay, ADSL.
Cellular. June 2003 – GSM 900/1800 - 478.600 subscribers (Penetration 66,94%) Post Paid Service - 286.858 subscribers (Penetration 40,12%) GSM Prepaid Mobile Service - 191.742 subscribers (Penetration 26,82%)
Network 100% digital Fiber (1.7 K Km) on the intercity routes (SDH based), National ATM/ FR, Extensive submarine links with Eastern Asia, the Middle East and Western Europe.
Internet Service Providers (ISPs) Internet hosts: 5,901 (2004) Internet users: 210,000 (2004)

3.1 Cyprus National Research and Education Network

CyNet is Cyprus' National Research and Education Network. It provides a network infrastructure for the Cypriot Research and Education Community. CyNet connects universities and research institutions. The national backbone of CyNet is connected to the European backbone GEANT2 that is a part of the worldwide community of research and education networks. Through this connection

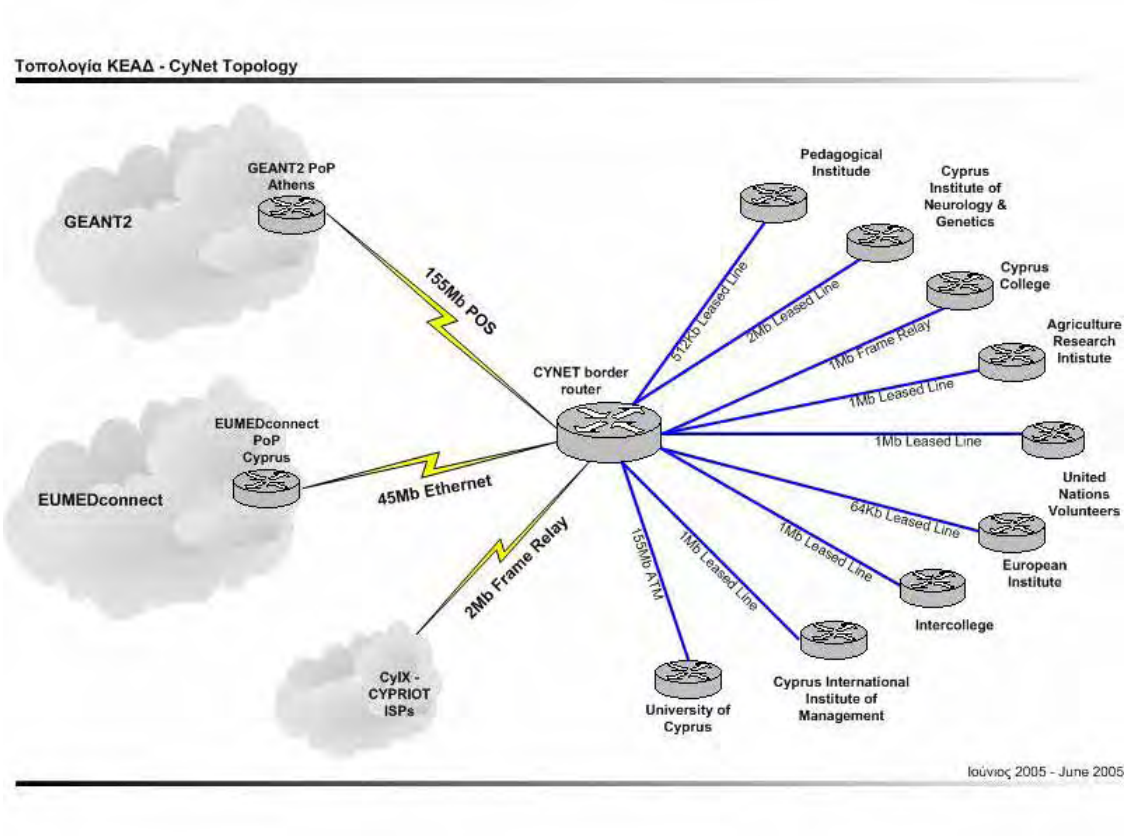
the CyNet backbone is connected to the Global Internet as well.

The services of CyNet are used to support the research and academic activity. These services are available to Academic and Research Organizations as well as branches of organizations engaged in open research. The services are made available to members who agree to the official AUP, and comply with any obligations that result from it.

For an organization or entity to be accepted as a CyNet member, it must belong to one of the following categories:

1. Tertiary Education Organizations (public or private).
2. Organizations or entities which have been awarded research grants from official funding bodies (government or other institutions).
3. Any other entity which is acknowledged as carrying out research or academic activity.

Figure 2: CyNET Topology Map



3.2 ICT Usage for Agriculture

Ongoing research has shown that approximately 18% of the farmers have access to a computer, 15% have access to the internet and 82% have a mobile phone. Currently there are no special measures to promote the use of computers in farms, however, the Ministry of Agriculture, Natural Resources and Environment is considering a plan to promote strategies and policies for the

development of ICT in agriculture and in rural areas within the framework of the new Agricultural Development Plan for 2007-2013.

3.2.1 ICT Usage in the Agricultural Research Institute

The Statistics and Agricultural Economics Section implements the Farm Accountancy Data Network (FADN - http://ec.europa.eu/agriculture/rica/) which is a conventional commitment of Cyprus to the EU. It carries out agro-economic studies and maintains time-series data regarding the production and prices of agricultural commodities, export and import data, trends in the consumption patterns of agricultural products and the use of production factors.

The section is also responsible to maintain and manage various web pages related to ARI activities such as the official website of the Institute (http://www.ari.gov.cy), the website for the Institute's Library (http://library.ari.gov.cy/agirs/), the ARI Web-mail (http://www.ari.gov.cy:3000) and other project websites. It also provides internet access and training to the ARI staff on computer software use. Finally, it provides software and hardware support to the ARI staff members.

A teleconferencing system between CIHEAM/AIDCO participants project has been established and it is currently in use to serve the needs of the scientific personnel of the Institute.

Finally, in 2003 the Financial Management Accounting System (FIMAS) was installed for the needs of the Accounting Office.

3.2.2 Geographic Information Systems in Agriculture

The Integrated Administration & Control System (IACS), a department of the Cyprus Agricultural Payments Organization (http://www.capo.gov.cy), is responsible for the development, application and control of Single Area Payment Scheme (SAPS), which is funded from the European Union and from the Government of the Republic of Cyprus.

Annex 5-2

Egypt Country Report

Status of National Agricultural Information System in Egypt

A. Case Study of National Agricultural Research Information Management System (NARIMS)

Prepared by: Mahmoud Rafea[2], Robert Portegies[3], and Magdi Latif[4]

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

[2] Director of CLAES, ARC, Egypt
[3] FAO Information Systems Officer
[4] FAO Regional Information Management Officer

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[5] 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 of recommendations for the implementation of the system.

[5] AGRIS: International Information System for the Agricultural Sciences and Technology
CARIS: Current Agricultural Research Information 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 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 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.

B. Information Management and Knowledge Exchange at the Agricultural Research Centre, Egypt

Prepared by: Ahmed Rafea[6]

Agricultural Research Centre (ARC)

- Mandates:
  - Conducting applied and basic research to generate a continuous flow of technologies o 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

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

Period	Project	FAO Project
2004-2006	**NARIMS**: National Agricultural Research Information System	TCP/EGY/3001

Information & Knowledge Resources

VERCON/RADCON	NARIMS
- Information Resources: Extension Documents, Expert Systems, Statistical Data, NGO working in Rural Development, Small Project Knowledge Base, Woman Corner Knowledge Base, Environment Conservation Knowledge Base	- Information Resources: Institutional Data, Researcher Data, Projects Data, Publications Data, ARC Research Plan
- Information and Knowledge Exchange: 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	10	8	10
(RRS) Other locations		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

Annex 5-3

Jordan Country Report

Status of National Agricultural Information System in Jordan

Prepared by: Hesham Athamneh [7], Robert Portegies[8], and Magdi Latif[9]

I. BACKGROUND

Reason for establishment

The agricultural sector of Jordan employs seven percent of the labour force, and contributes 16 percent to the country's exports. While primary agriculture accounts for only five percent of the GDP, the entire food and agricultural sector (upstream and downstream linkages like agribusiness services and agro-industry) contributes about 29 percent. Despite the country's insufficient water and cultivable land resources, the agricultural sector is considered as one of the most important economic pillars for integrated development in Jordan.

Reliable agricultural information constitutes a corner stone in the planning of agricultural development and formulating relevant policies. The availability of this information is critical in order to enable those involved in the agricultural sector, whether they are individuals or institutions, to make decisions on valid and scientific bases. However, the currently available agricultural information in Jordan is inadequate as a result of many factors, in particular:

- The array of institutions that collect agricultural data and information, and the diversity of the methodologies they use, which often leads to contradictory and unreliable information.
- The lack of certain types of data and information required in support of the development of the agricultural sector.
- The lack of coordination and collaboration between institutions concerned with data collection and information provision on the one hand, and information users in the public and private sectors on the other.

The National Agricultural Development Strategy (2002-2010), which was approved by His Majesty the King on 15 July 2002, referred specifically to the development of information and communication capabilities at a national and sub-national level. In order to address this issue, the Minister of Agriculture convened a Consultative Workshop on the Development of an Agricultural Information System in Jordan, which was held on 16 July 2002. The workshop brought together senior managers in the Ministry to discuss the development of a national system for agricultural information.

The common vision derived from the workshop was to establish a National Agricultural Information System (NAIS) that would strengthen and improve agricultural information generation, management, dissemination and exchange for policy-makers, senior managers and national stakeholder groups, using web-based applications and tools. In particular, the envisaged NAIS was

[7] Supervisor for Electronic Resources and Publishers, NCARE, Jordan
[8] FAO Information Systems Officer
[9] FAO Regional Information Management Officer

expected to assemble and make accessible information that would:

- Support policy and decision-making in relation to national planning.
- Provide the basis for monitoring and assessing agricultural production and development.
- Support research and development, and disseminate the outputs.
- Support extension services.
- Provide an institutional memory for the MOA.

The following groups of stakeholders in the NAIS were identified in a preliminary way, and it was recognized that these groups and their needs and demands needed to be further defined:

- Policy-makers in agriculture and rural development, especially in the MOA.
- Department heads and professional technical officers within the MOA.
- Other Ministries related to rural development.
- Universities and colleges with agriculturally-related faculties and departments.
- Farmers' and producers' organizations.
- Credit and marketing associations and Chambers of Commerce.
- Private sector involved in agricultural and rural development.
- Non-Governmental Organizations involved in agricultural development and food security.
- Regional and International Organizations involved in agricultural development and food security.
- General Public.

The development of the NAIS shall be underpinned by the establishment of the necessary management bodies and organizational structures that offer flexibility and adaptability, so that the NAIS can respond to the rapidly changing environment of information systems and technologies. The workshop recommended that a Technical Committee be set up to provide technical oversight of the NAIS, to set strategy and approve and review progress on annual work plans, and to monitor administrative aspects including finances. In addition, an Advisory Group should be constituted to provide advice and input on the overall direction of the NAIS, acting on reports produced by the Technical Committee. The Advisory Group should be chaired by the Secretary General of Agriculture, and comprise selected senior officers of the MOA, heads of government bodies collaborating with the MO such as the Department of Statistics, the National Information Centre (NIC), the Agricultural Credit Cooperation, Ministry of Irrigation, the Royal Geographic Centre, and universities and colleges of agriculture.

The development of a relevant, effective and harmonized National Agricultural Information System (NAIS) is expected to preserve needed resources, make maximize use of the results of other projects and database applications, prevent redundancy and duplication of data and efforts, and ensure maximum co-ordination among various agricultural institutes, programmes and personnel.

The establishment of the NAIS is a long-term goal which will have to be achieved in several stages. As a first step, a sustainable information systems infrastructure will be designed, drawing on the requirements that will be identified during a consultative workshop. The design shall comprise a functional specification for the NAIS, as well as a technical specification of its software/hardware components. During its initial phase, the NAIS will specifically include the following, structurally-linked, modules:

- Document repository: a web based bilingual system capturing and disseminating information on technical reports and documents produced by the entire Ministry of Agriculture (MOA) and

other relevant sources in Jordan; the possibility to develop a national Open Archive on Agricultural Information will be explored.

- Institutes and Experts directory: two web based bilingual systems capturing and disseminating information about institutes, departments, laboratories and subject experts (gender disaggregated) in the agricultural sector.
- Project information system: a web based bilingual system capturing and disseminating information about agricultural development and research projects carried out in the entire Ministry of Agriculture (MOA) and elsewhere in the agricultural sector, including project title, location, subject, objectives, summary, dates, main findings and funding agency.

The tools and methodologies developed by FAO's World Agricultural Information Centre (WAICENT), and other tools developed and packaged by national institutes collaborating with FAO, are considered to be particularly applicable in establishing the NAIS. In order to proceed with their introduction, to start promoting the use of modern information technologies so as to obtain access to already available information, and to assume its role as coordinator of the NAIS, the Ministry of Agriculture intends to strengthen its information management capacity without delay.

For the rapid achievement of the important and urgent first step towards the establishment of the NAIS, the Government of Jordan requested the assistance of the Organization under its Technical Cooperation Programme. The NAIS project was commenced in October 2007 and is supposed to be completed by December 2009. The successful implementation and long-term viability of the NAIS will be ensured by the Government's commitment to support the system and provide it with adequate resources for sustainability.

Key Organizer

The Information and Computers Department (ICD) of the MOA: It will be responsible for the coordination of NAIS activities. The ICD was established fairly recently with the aim of bringing together and coordinate various data and information functions that used to be scattered all over the Ministry of Agriculture. Information management expertise and resources that have been developed within the various MOA units in an uncoordinated way shall be incorporated into the NAIS in a manner which benefits the rest of the system while not undermining the enterprise that has fostered them. Standards and procedures for information management in the NAIS, specifically for data quality, processing, and dissemination, shall be developed and adopted, in compliance with relevant regional and international standards.

The ICD Division is responsible for collecting, storing and analyzing the statistical data/information of agricultural production (areas and production of field crops) and animal production on regular basis and at village/district/directorate/governorate levels.

The Division is provider for 52 types of data/information and user of 22 types of data/information from various sources in Jordan. Fifty five persons are working in the 35 agricultural directorates to collect the data, and five persons in the MOA to store, process, analyze and present these data to support managers in the decision making in MOA and other relevant ministries such as Ministry of Irrigation and Ministry of Planning.

The Information Division is also in charge of a marketing information decision support system that has the capability to brief the decision makers on the annual area and production of crops in Jordan, the amount needed for consumption, and the amount required to be imported to satisfy the national

requirement. The Division is collecting data using individual surveys. The data is stored and managed (processed, quality controlled and stored in an accessible format for specific analysis) in database applications developed by a private company using Oracle l0g and further development is given to Royal Scientific Society/ ITC to satisfy user requirements in MOA. The data is analyzed and the resulting information is communicated through reports generated to support managers in their decision making.

The National Center of Agricultural Research and Extension (NCARE ex-NCARTT**)**: It is the leading agricultural research and extension institute in Jordan and has responsibility for applied and adaptive research in all areas of agriculture, and for associated technology transfer to farmers. As both an important producer and user of agricultural information, NCARE will be a major partner in the establishment of the NAIS. During the project formulation was identified as a major stakeholder in the envisaged NAIS. NCARE hosts the National Library for Agricultural Information (NLAI), which is considered to be one of the most important specialized agricultural libraries in Jordan, as well as Jordoc (Jordan Documentation Center), the national AGRIS centre.

The National Library provides its services through the following:

1. Jordan Documentation Centre which is a part of Agris system where the agricultural information is supplied by different institution in Jordan are collected and documented according to the AGRIS system.
2. Agricultural databases such Agricola, Cab- abstract, Plant Genet, AGRIS database

The National Centre for Agricultural Research and Extension (NCARE) is also providing at national level the following: Soil maps, Irrigation Management Information System (IMIS), and Gene bank database. (www.ncare.gov.jo)

FAO during the NAIS inception project workshop assisted in the re-activation of the collaboration with the AGRIS network which had stopped in 2004. The reason for the discontinuation was that the person responsible for AGRIS had changed twice in the last four years and that there had not been any proper hand-over procedure.

The library uses the online services of AGROVOC thesaurus for indexing records, in addition to the Dewey classification. The repository currently includes some 8000 titles, some coming from FAO, ICARDA and other agricultural institutions. The role the NCARE library staff, as knowledgeable professionals in the field of cataloguing and indexing, could play in ensuring the quality of the future NAIS repository. WebAGRIS 2.0 was installed and support was provided for the migration of the legacy archive in the new WebAGRIS system. The Network Management & Information System Specialist is to follow up on any future system problems the NCARE Library may have. The cataloguers were also briefed on the use of the Data Entry module and on the use of the Export function, emphasizing the AGRIS AP as the guide to follow for the cataloguing of NCARE resources.

There are four employees in NCARE holding B.Sc. degree in computer science and Information technology, and 1 Master degree in computer information system.

The NCARE Director General and Deputy Director General are giving full support for the NAIS project and confirmed that NCARE is committed to cooperate and contribute to its establishment.

Other important stakeholders: They are the Department of Statistics, the Ministry of Water and Irrigation, the Faculties of Agriculture, Ministry of Transportation/Meteorology Department, The Higher Council for Science & Technology. This is because information databases related to the agricultural sectors in Jordan are distributed within the following Ministries/Department:

- Ministry of Agriculture (MOA): Productivity of ranges areas, type of plants, vegetation composition etc… (www.moa.gov.jo)
- Ministry of Water & Irrigation: Springs, surface water quantity, ground water quantity.
- Department of Statistics: Agriculture income, National income, Labors, Fertilizers (import/export), (Feed, meat, and milk import), amount of imported and exported seedlings. (www.dos.gov.jo)
- The Higher Council for Science & Technology: natural resources, range & range plants databases
- Ministry of Finance/Custom Department: Tobacco law, annual license, areas, Name of farmers, local production, amounts and values of import raw tobacco etc....
- Ministry of Transportation/Meteorology Department: Meteorological data, rainfall, humidity, soil, and air temperature.
- University of Jordan.
- University of Science & Technology.
- Mu'tah University:

Royal Scientific Society — Information Technology Centre (NGO – RSS/ITC)
The Royal Scientific Society is the largest applied research institution, consultation and technical service provider in Jordan; with more than 600 members of staff. It has seven technical centres and departments, housing 38 specialized laboratories. Since its establishment in 1970 as an independent, not-for-profit non-governmental organization (NGO), the RSS has been providing technical services, consultations and specialized training to both the public and private sectors locally, regionally and internationally.

In the IT sector, the major services are application system development, which involve detailed system study, analysis, design, programming, testing, system integration, data conversion, and user training, in addition to system maintenance, for several institutions including the Ministry of Agriculture.

The IT Hardware Infrastructure Facilities
The MOA network is composed of the following:
- Leased line for internet with 2 mbps through national information centre, 1 467 PC's Windows based operating system. in MOA headquarter and Directorates,
- Fujitsu SiemensTX200 web server,
- Fujitsu SiemensTX200 Dbase Server for hazardous management and control Database,
- Fujitsu siemens TX600 for internet, ISA & Exchange server,
- Dell power edge 1600 Sc for Archiving System for Human Resource (800 thousands image)
- Dell power edge 1600 Sc for Application Server For database Server,
- AIX APP Financial Archiving for Farmer Service Unit Application, and
- Fujitsu siemens TX600 for agricultural information systems.

However, this network is characterized by diversity and multiplicity of hubs and switches that might

have a negative effect on its performance. A disaster recovery plan does not exist, and it is essential to address this issue to avoid risk of losing information.

The NCARE existing hardware infrastructure is as follows:
- 250 PC Windows based operating system.
- LAN with 120 users.
- 1 server SUN 450, 2 X 167 MHz processors, 10 GB HD, Sun Solaris Operating system, 256 MB RAM used for Oracle 8i database.
- 1 Internet & Mail & Firewall server, 2 X 72 GB HD, 4 GB RAM, 2 X 1 GHz Processors, Sun Solaris OS.
- 1 PC server 1 GHz processor, 36 GB HD, windows 2003 server.
- 512 KB/s internet connection through leased line, 100 internet users.
- 1 (l28KBfs) leased line with the MOA.

NCARE has a GIS Laboratory and is implementing GIS projects in collaboration with national and regional organizations.

II. DEFINITION of NAIS

NAIS is a national platform for Information and knowledge sharing and exchange for Agricultural Research and Development (ARD) for target groups and stakeholders in Jordan.

III. OBJECTIVES of NAIS

1- To strengthen the capacity of the Ministry of Agriculture and other stakeholders to establish an effective and efficient information system that will support agricultural development and ensure food security in Jordan, based on the needs and demands of its stakeholders and integrating the various resources in the MOA.

2- To serve as an information and knowledge repository/exchange mechanism at the national level and a gateway to the national knowledge systems for Agricultural Research and Development (ARD) in Jordan, aiming for strengthening, coordinating, and adding value to initiatives by national programs and regional organizations in order to increase agricultural production and improve food security for the benefit of improving performance of farmers and agrarian businesses.

IV. NAIS PROJECT OUTPUTS (RESULTS)

During its first phase of three years of Operations (2007-2010)

1- A pilot National Agricultural Information System (NAIS), including modules on documents, institutions, experts and projects, facilitating access to other agricultural information services (e.g. marketing information) and databases (statistical, textual, hypermedia) relevant to the Jordanian agricultural sector, and enabling the exchange of information among NAIS stakeholder groups.

2- An elementary information network for the agricultural sector, consisting of the major stakeholders and a collaborative network of technical institutions and organizations committed to capacity building in this area, and coordinated by the ICD/MOA.

3- A team of nationally selected focal points and technical staff at the different agricultural institutions trained on how to adopt and integrate information from their institutions into the NAIS and to maintain it as a high-quality information and communication resource using NAIS content management system and modern information management. These trained staff will be expected to train others in the future.

4- Professional staff (agricultural specialists, researchers, and extension workers) and senior managers in the agricultural sector introduced to the use of modern information technologies as a means of accessing relevant information and to the strategic management approaches and skills required to implement new structures and procedures for effective information management using modern ICTs.

5- An implementation plan for the development of a virtual Jordan Agricultural Information Centre (JAIC) drawing on inputs from existing Departments within MOA, and functioning as an AGRIS Resource Centre.

6- A national information strategy for agricultural science and technology formulated, in compliance with the National Agricultural Development Strategy (2002-2010).

V. NAIS INCEPTION ACTIVITIES AND CURRENT DEVELOPMENT

NAIS INCEPTION ACTIVITIES

An inception project workshop has been conducted for the launching NAIS project activities in 20-26 October 2007. The workshop had three objectives: to engage stakeholders in the National Agricultural Information System project activities, to discuss and reach a consensus on the implementation plan for NAIS, and to contribute to the formulation of an information strategy for agricultural science and technology.

During the project inception workshop NAIS National Project Coordinator (NPC), explained that reliable agricultural information constitutes a corner stone in the planning of agricultural development and formulating relevant policies as the availability of this information is critical in order to enable those involved in the agricultural sector. She stated that the launching workshop brought together senior managers in the Ministry of Agriculture and other stakeholders to discuss the development of a national system for agricultural information. She mentioned to the attendees that the National Agricultural Information System Project (NAIS) should not be seen as the Ministry of Agriculture project or as FAO project, it is a National Development project aims at ultimately establishing a truly national agricultural information system to which all concerned will contribute and from which all will benefit. In this respect, it is encouraging to see the project steering committee been established with the participations of various stakeholders.

The Minister of Agriculture stated that information in the information is key of success in institutions and pleased to mention the *new royal initiative issued for information access right in Jordan*. He emphasized the vital role the Information that can play in the development of Agriculture and food security in Jordan and the commitment of MOA for improving Information availability, accessibility and dissemination with accuracy and regular update to provide a real contribution in development,. He stated that MOA has a wealth of information that covering all agricultural areas and the development of a relevant, effective and harmonized National

Agricultural Information System (NAIS) is expected to lead MOA, and other stakeholders to improve the capacity to access and exchange information, and to convert it into useful knowledge which is essential for the development objectives of poverty eradication, food security, sustainable development and increased productivity and competitiveness. He encouraged staff of MOA to carry out their best efforts and cooperate to formulate an applicable and practical national agricultural information strategy that the national agricultural development strategy. He thanked FAO Representative in Jordan and FAO technical team for their fruitful efforts related to NAIS project

FAO Representative in Jordan talked about the importance of the project and how FAO was interested in it. He briefed participants on NAIS projects objectives and outputs and the NAIS with the anticipated new information base and supporting capacity will facilitate strategic planning and strengthen institutional capacities in formulating, coordinating, monitoring and reviewing research policies in support of agricultural development and food security. He also briefed the attendees about the development of this project, and its importance to enable agricultural researchers and scientists to carry out research more effectively by creating access to research information from Jordan and elsewhere, as well as by providing modern tools for the management of agricultural projects. He emphasized that National Agricultural Information System (NAIS) would strengthen and improve agricultural information generation, management, dissemination and exchange for policy-makers, senior managers and national stakeholder groups, using web-based applications and tools. In particular, the envisaged NAIS was expected to assemble and make accessible information that would support policy and decision-making in relation to national planning, provide the basis for monitoring and assessing agricultural production and development, support research and development, and disseminate the outputs, support extension services and provide an institutional memory for the MOA.

Prior to the consultative workshop to launch the NAIS project, an official ceremony took place during which the project agreement of TCP/JOR/3102 was signed by His Excellency the Minister of Agriculture and the FAO Representative in Jordan in the presence of sixty four officials from various ministries and institutions form the agricultural sector, as well as press and media.

The stakeholders participated in the inception/consultative workshop had identified the following:

- The existing/required information sources which are accessible both internally and externally;
- The required sources which are not accessible both internally and externally;
- The existing and required mechanisms to access and share information; and
- List of Priorities

The existing/required information sources which are accessible both internally and externally:

Sources	**Existing/required information**
Ministry of Agriculture (MOA)/ National Centre for Agricultural Research and Extension (NCARE).	- Research Publication - Extension brochure - Projects - Institution - Experts and researchers - Extension service
Ministry of Agriculture (MOA).	- Areas/Production data on village, district, governorate, and national levels

Sources	Existing/required information
	- Marketing information: export, import, and prices - Vegetables/fruits data: types, volume and prices - Laws and legislation - Documents: annual reports and studies - Projects' information - Institutions and experts in formations
Department of Statistics.	- Agricultural census - National Statistics database: lane, water, production, areas, labors, food consumption, and trade
Ministry of Water and Irrigation.	- Data / information on: water resources, water requirement for agriculture, water quality and pricing, land information (areas, capital, classification), cropping pattern, climatic information, monitoring of agricultural resources, socio-economic data
Ministry of planning	- Projects information - National performance indicator (GDP / agriculture contribution) - Publications, reports, documents - Institutions - Experts - Country profile - Country profile by donors - Reports / studies by donors
Agriculture Credit Corporate (ACC).	- Studies on marketing information and reports on: loans, monitoring and evaluation, etc. - Extension brochure - Projects - Institutions information - Expert and researcher
Ministry of Transportation.	- Studies and reports - Maps - Institutions information - Expert and researcher - Meteorological data
Royal geographical centre.	- Maps and spatial information - Studies and reports
Universities: Jordan University, Jordan University for Science and Technology, and Mota University.	- Research studies, publications, and dissertations - Institutional information - Professors and teachers
NGO and Agricultural Organizations.	- Reports, studies, and advisory services documents - Institutions information - Expert and researcher - Projects information - Marketing information - Socioeconomic data and information

Sources	Existing/required information
Private sector.	- Reports, and studies - Institutions information

The required sources which are not accessible both internally and externally:

- GIS tools applications in agriculture
- Agriculture direct and indirect contribution in GDP
- Food nutrition requirements

The existing and required mechanisms to access and share information

Existing mechanisms	Required mechanisms
Hard copies	Internet web applications
Digital copies	E-Forum
Internet (Web)	E-Learning
TV/Radio	AGORA
Conferences	Video conferencing
Seminars	
Workshops	
AGORA	

Priorities

- Publications, documents, and studies
- Projects information
- Institution information
- Experts / researchers information
- Communication and educational tools ▪ E-forum ▪ E-learning
- Extension brochures
- Statistical data
- Maps – GI
- Laws, regulations / legislation and coding

The Key Issues Affecting the Development of a National Agricultural Information System were also identified by the project stakeholders:

Issue	Constraints	Strengths/Opportunities	Challenges
Strategy/Policies	• Lack of agricultural information strategy • Absence of cooperation protocols for	• Political commitment and support to give high priority for ICM • Availability of experience from	• Prepare agricultural information strategy, including implementation

Issue	Constraints	Strengths/Opportunities	Challenges
	information exchange	abroad/Lessons learned	plan • Create awareness to provide vision for strategy/policies for agriculture information for development • Improve public awareness related to information
Institutional context	• Overlap in rules and responsibilities • Lack of enforcement of missions/tasks Absence of champion in ICM • Inadequate organizational setup • Lack of coordination, cooperation and communication • Bureaucracy delays obtaining relevant information • Resistance against innovation • Lack of team work→ lack of job satisfaction	• Existence of national agriculture development strategy • Existence of permanent national experts committee on agricultural statistics • Sufficient institutions' capacities to start • Decision makers' support • Willingness of staff to contribute to the current efforts	• Avoid duplication of information • Identify an institution to lead the establishment of a national agriculture information center/unit for coordination, cooperation and communication on ICM • Develop a justified, solid and viable proposal for meeting the above mentioned challenge
People	• Lack of incentives • Lack of successive policy for human resources development • Lack of skills • Inadequate training for capacity	• Adequate national educational system	• Strengthen human resources and staff development plans for ICM to ensure that the right people are in the right place with adequate motivation and

Issue	Constraints	Strengths/Opportunities	Challenges
	building • Absence of linkages between training and human resources development • Brain drain		incentives
Content	• Shortage of information in Arabic on the Internet • Inadequate access to research information • Lack of standards, methodologies, tools/systems • Intellectual property rights for publications	• Capability for digitizing and publishing online existing Arabic/English content	• Implement international methodology and tools for data/information management and exchange • Development and management of web-based information systems
Stakeholders	• Absence of coordination/ cooperation • Lack of communication tools	• Willingness of stakeholders to contribute to the current efforts (to establish NAIS)	• Facilitate exchange of data/information
Infrastructure	• Ineffective distribution of facilities (computers, access to networks, etc.) among those who need it	• Acceptable overall information infrastructure • NITC partnership agreements on behalf of public sector with Microsoft academy, CISCO academy, and Oracle	• Maintenance and upgrading
Financial aspects/ sustainability	• Lack of financial institutional support	• Government guarantee of financial support to NAIS	• Prepare project proposals to be submitted to donor organizations

Outcomes of the project inception/consultative workshop

- A main conclusion of the consultative seminar was that most of the information required by stakeholders is available somewhere, but that it is not always well known or easily accessible.

- A key issue to be addressed by the project, therefore, is to establish better mechanisms for accessing and sharing the existing information. In order to achieve this, more details need to be obtained about the technical specifications of the systems and applications that currently exist at the various stakeholder organizations. This task would best be assigned to a national institution with a relevant mandate and technical expertise, e.g. the Information Technology Centre of the Royal Scientific Society (RSS) which has already been contracted by several NAIS stakeholder organizations for similar assignments.

- Priority list is required to be established and implemented in phases to meet the requirements of the stakeholders keeping in mind the available resources and considering NAIS Project is the first phase to be utilized to achieve the information needs requested by the stakeholders. National Agricultural Information Management Strategy to be prepared to provide further elaboration on the information needs and the priorities in National Agricultural Research System (NARS) in Jordan. It is required and essential to develop requirement specifications based on the information needs requested by the stakeholders to provide a brief description of the features that could be provided by National Agricultural Information System (NAIS) project and some technical requirements specifications to help both the project owners and the development team reach a vivid image of the project scope.

- The output of the working groups provided useful material, which will have to be reviewed and analyzed further during the project activity on the establishment of a National agricultural Information Strategy. Priorities will have to be established when trying to meet the information needs of the various stakeholders, keeping in mind the available resources. It would be useful to prepare a draft document of NAIS requirements specifications building on the outcomes and feedback received from the working groups. This document would provide a brief description of the features of the NAIS, along with some technical requirements specifications to help both the project owners and the development team reach a vivid image of the project scope.

- It has been confirmed that there is a general agreement among the various stakeholder institutions about the expediency of a National Agricultural Information System, as well as a willingness to cooperate and contribute to its establishment. The project's launching workshop was well attended by representatives from various stakeholder organizations, which are also represented in the project's Steering Committee.

- The lCD of the Ministry of Agriculture, which is the designated coordinating unit of the NAIS, is well positioned to assume this role, but its information management capacity is still rather weak. Therefore MOA is required to assign additional staff to its lCD, which shall benefit from the training provided by the project.

- The Secretary General of the Ministry of Agriculture, acting as the Chairman of the Steering Committee, underlined the importance of the present project and expressed his full support. He

emphasized that it should not be seen as a project for just the MOA, but that all stakeholders in the agricultural sector are expected to benefit from, and contribute to, the envisaged NAIS.

- The role of NCARE as a major stakeholder and potential collaboration modality in the NAIS project was clearly spelled out and the NCARE Director General and Deputy Director General gave their full support and confirmed that NCARE is committed to cooperate and contribute to its establishment.

NAIS CURRENT DEVELOPMENT IN JORDAN

- The NAIS project activities on a monthly basis to facilitate the actions required to be done by all concerned parties have been identified and under implementation accordance with workplan the approved by the project task force team and FAO. In addition, the training activities that are foreseen and budgeted under a contract are clearly identified and under implementation accordance with the approved workplan.

- Technical functional and functional requirements of NAIS are completed and submitted to government authority.

Stakeholders	Information Needs
Policy-makers in agriculture and rural development, especially in the MOA.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events Best Practice and Country Report Marketing Information Module (MOA developed using Oracle) Interfaces for technical applications developed using Oracle
Department heads and professional technical officers within the MOA.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Best Practice and Country Report Marketing Information Module (MOA developed using Oracle) Interfaces for technical applications developed using Oracle
Other Ministries related to rural development.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Best Practice and Country Report Marketing Information Module (MOA developed using Oracle)
Universities and colleges with agriculturally-related faculties and departments.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Best Practice and Country Report
Farmers' and producers' organizations.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Marketing Information Module (MOA developed using Oracle)

Stakeholders	Information Needs
Credit and marketing associations and Chambers of Commerce.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Marketing Information Module (MOA developed using Oracle)
Private sector involved in agricultural and rural development.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events Marketing Information Module (MOA developed using Oracle) Best Practice
Non-Governmental Organizations involved in agricultural development and food security.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Best Practice and Country Report Marketing Information Module (MOA developed using Oracle)
Regional and International Organizations involved in agricultural development.	Institutions, Projects, Experts/Researchers, Documents/ Publication, News and Events, Focal Points Best Practice and Country Report
General Public.	News and Events Best Practice and Country Report

- The NAIS system development is in progress and includes nine modules (Documents, Projects, Experts/Researchers and Institutions, News, Events and Focal Points, Best Practice, and Country Reports) in addition to the interfaces required to be developed in collaboration with national institute for the other technical applications developed by MOA using Oracle development tools and database. This is in addition to the existing marketing information module and statistical information agricultural/animal production). Laws and Legislations and Extension Documents Management Module should be considered at later stage, if possible and convenient.

Annex 5-4

Lebanon Country Report

Status of National Agricultural Information System in Lebanon

Prepared by: Robert Kalaily[10]

1. Steps recently taken in establishing focal units and current activities in:

Capacity Building Activities:

- Lebanese Government since the year 2005 started building the personnel capacities in the field of ICT at different levels. In the agricultural sector the training covered around 75% of the personnel. This operation was administered by OMSAR (Office of Minister of State for Administrative Reform).

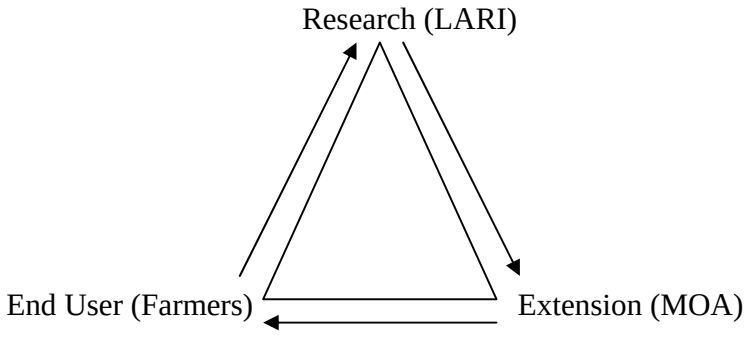
- The attendance of many workshops & trainings at the institutional, national, regional, and international level also gave an excellent push towards building a good NAIS.

Governance Structure of ICM with linkages to the NFU:

- The Ministry of Telecommunication www.mot.gov.lb is in charge of promoting ICT use within public sector.

- The Ministry of State for Administrative Reform is in charge of implementing the E-government for the whole ministries and other public sector through supporting hardware and various applications (Document Management Systems, GIS systems)

- The Ministry of Agriculture is responsible of supporting extension services, on the other hand LARI is supporting Agricultural Research:



Steps taken to integrate agriculture and agricultural research information in their NARS:

- At the national level: providing applications [Document Management Systems (DMS)/ GIS] to centralize Agricultural Information in common database formats, and to simplify access to this information.

[10] ICT Specialist, LARI

- At the International level: participation in many Networks which provides information sharing, such as: PGRFA project which was coordinated by FAO (LARI was the national focal point for this project) www.pgrfa.org.

2. **Current status and strategies in building information:**
   - At the institutional level: most of information is stored on central or distributed database servers, with fast access to all personnel.

   - At the national level: too much obstacles are facing its communication due to many problems (lack of sufficient number of specialized personnel, high costs of internet connections, political situation,). Even though, some networks are available and working properly.

   - Scientific and technical information are also published at the international level (websites, journals, CD-ROM)

   - Some universities started to educate their students on the importance of ICT, and few of them are going through e-learning technologies.

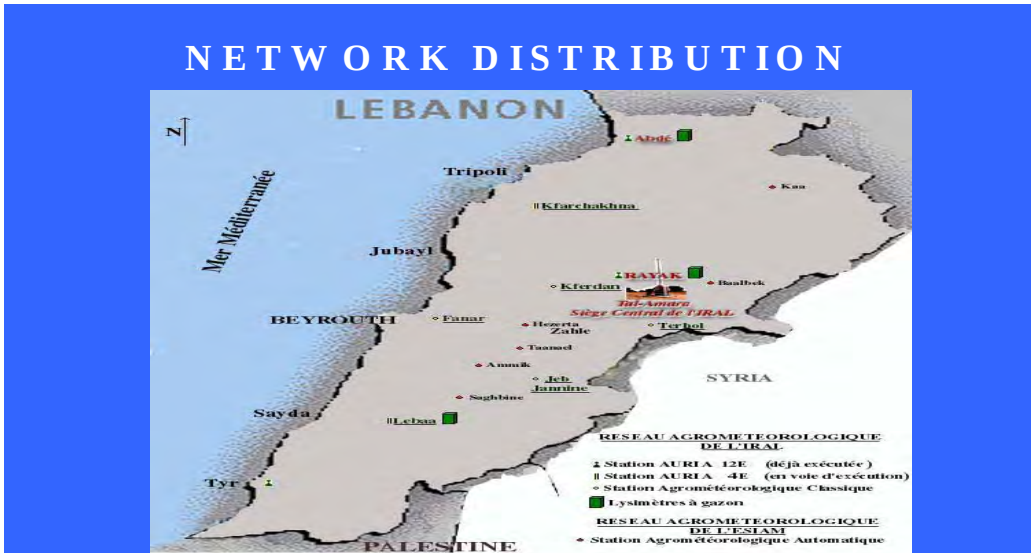
   - The EU is supporting Lebanon – MOA the ADP project (Agricultural Development Project).

3. **Available human resource capacities in ICT/M:**
   One of the main constraints is the lack of sufficient number specialized ICT/M personnel. This

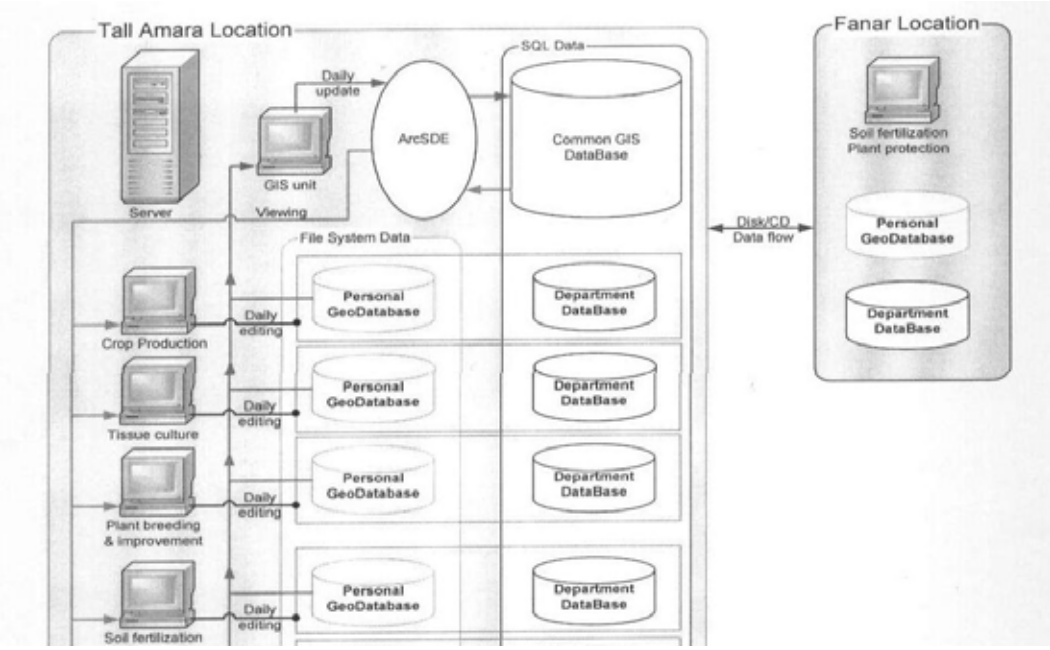
factor is slowing down the overall process. Even though, the available human resources are accomplishing many important operations.

4. Existing mechanisms of accessing and exchanging information.

- Agro-Meteo-Network: LARI is a sub-network of the IAB network (International Airport of Beirut) which contains 40 weather stations that are connected online. LARI's sub network contains 5 connected weather stations (data and weather forecasts are available on the website www.lari.gov.lb).



- GIS data distribution:



- DMS: document management system web application. Used to archive documents offering free text search and easy access to documents.

Detailed description of the data collection activity that is being supported by ADP project:

a. Meteorological data collection is being enhanced in all Lebanon through three major classes of meteorological stations:

- **Class A stations** collecting continuously around 11 to 20 parameters (including at least air temperatures, humidity, rainfall, wind, solar rays, atmospheric pressure, humidification) transferred directly to the central laboratory. These stations are installed in LARI main center offices.

- **Class B stations** collecting continuously around 6 to 8 parameters (including at least air temperatures, humidity, rainfall, wind, solar rays, humidification), daily transferred to the central laboratory. These stations are mainly installed in agricultural technical schools of the MOA and agricultural research sub-stations.

- **Class C stations** located at some farmer groups premises and collecting at least 4 parameters (including temperature, rainfall, humidity and humidification) to be daily transferred to the central laboratory.

- The agro-meteo concentrator is located in a central office at LARI.

- Development of reliable modem connection to collect daily meteorological data is essential.

- The involvement of agricultural technical schools as well as farmer groups supported by the project will be established through memorandum of agreement between LARI and all the partners. This will strengthen the development of an agro-meteorological and integrated pest management culture.

- An agro-meteorological department within LARI must become sustainable in a close future as the information collected and analyses are extremely valuable for economic indicators. However during an initial phase of three years it is necessary to support the establishment of this new LARI department especially regarding Human Resources in

order to make this department fully efficient and able to commercialize its output.

b. Pest and diseases data collection:
Each decentralized LARI lab will be assigned to collect in their region the information related to the following pest and diseases. The recognition of pest and disease will be done through traps and visual symptoms observations at the decentralized research stations and at each farmer group.

c. Human resources, training and other support:
Either for meteorological data or recognition of pest and diseases at the farmer group level training will be provided to the agronomists attached to the farmer groups as well as to some staff in the decentralized research stations in order to collect the information. In case of difficulties to identify the insect or the disease at the field, digital pictures will be transferred to the laboratory in charge of the crop and to be able to identify the pest or disease. Regional LARI centers will be equipped to facilitate the collection of data and their transfer to the department in charge at LARI main regional centers.

5. Available infrastructural and financial facilities.
- The main financial sources are:
- Ministry of Finance.
- Projects financed by the EU.
- Projects financed by European countries (Italy, Spain,)

6. Important constraints affecting the building of NAIS:
- Many strategies are available, but there is a lack of one reliable ICT strategy in the field of agriculture at the national level.
- Lack of sufficient number specialized ICT/M personnel. The big part of IT experts is working in the private sectors which offer higher salaries.
- The little amount of knowledge in how ICT can be useful in Agricultural Research Management Systems.
- The high costs required to build such systems.
- The complicated political situation in the country.

7. Required support at national, regional, and international:
At the National level:
- More importance must be given to the ICT in Agriculture. Everyone must know that ICT can be useful in Agricultural Research Management Systems. Not only sectors such as telecommunication, finance, needs ICT but also, the budgets allocated to ICT in Agriculture must be increased offering to increase the number of specialized personnel in this sector. ***A more reliable & unified ICT strategy in the field of agriculture must be done.***

At the regional and international level:
- Capacity building and staff training in information systems' development must continue.
- Exchange of experience between countries.
- Continuing efforts in the field of supporting a unified RAIS to be used by all countries at the national level.

Annex 5-5

Morocco Country Report

Status of National Agricultural Information System in Morocco

Prepared by: Otman Sebbata[11] and A. Bencherqi[12]

1. Introduction

Information is of key importance to INRA. Historically, INRA has supported adoption of new ICT in information management and access to online and Electronic information resources. In addition partnerships were made at national and international levels for information sharing. Collaboration through National and international information systems helps existing human resources to gain experience and to actively collaborate. INRA is seen as a major partner in the national agric information system. It is the leading Research institutions in the adoption on new ICT for information management and information sharing. INRA is coordinating several information systems dedicated to research data management. INRA is a potential and effective information producer and information consumer. Thus, the new role of INRA as a NAIS coordinator (National Focal Unit) will help to strengthen its position and contribution within the Moroccan NARS to help activate the existing NAIS for an effective output and benefit to all partners.

2. Steps recently taken in establishing focal units:

INRA made use of existing NAIS. Most important entities that were contacted are the training entities (IAVH II and ENA Meknes). There is an informal commitment from the training entities to collaborate within the RAIS.

At the Agris NFU, first contact showed that there is a need to reconstruct what was left by previous team of manager who retired (voluntary retirement)

At the RAIS focal unit, Decision makers are aware of the role of the NFU but no practical step was taken in terms of budget and Human resource means.

Recommend:

Need a facilitator from external NAIS to rebuild what was broken down by previous AGRIS national focal point.

2.1 Capacity building activities:

Scientific and technical information used to be considered by INRA as one of the most important aspects to invest in. In the nineties, a strategy was adopted for capacity building aiming at giving opportunities to information professionals for postgraduate studies (Master Degree) in ICM and ICT and short training in ICT at commercial companies and in ICM and ICT at IARCs. In the last five years, it became difficult to continue providing support for capacity building due to budget constraints and the only offered opportunities were those

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provided by international agricultural research centers such as ICARDA.

Opportunities:
Train the trainers on ICM and ICT
Capacity building activity may be seen as an added value to encourage information specialists to collaborate into the NAIS

Threats:
ICT is evolving so rapidly that the only continued training will help ICT and ICM professionals to keep the pace with the evolving technology

2.2 Governance structure of ICM:

The actual governance structure of ICM in INRA is 20 years old. At that time a Division dedicated to Information, Communication and Training was established. In 2003, The Information and Communication Division was created in the new structure of INRA. This new structure combines two integrated units: The Documentation Unit which facilitates access to scientific and technical information for all researchers and partners and the Communication Unit which act as the INRA editor besides the management of the communication with national and external stakeholders.

The Documentation unit plays a major role in supporting regional centers by:

- Providing financial means for Journal subscription, documentation acquisition, bibliographic databases updating.
- Providing logistical support (Hardware and software) for Information management
- Ensuring that the same standards and tools are used for information management
- Providing technical support to information professional. Short term training is currently organized in different aspects of ICM.
- Strengthening partnerships within national and international information systems

Strength:
There is one formal body in charge of information and communication management with financial and logistics means to fulfill its mission.

2.3 Steps to integrate agriculture and agricultural research information in their NARS

Information is seen by researcher as a key component for their research. New technologies were introduced since 1987. The Documentation Unit was first connected using PSTN to the ESA/IRS ISP via the national Documentation center. Shortly after, ICT was introduced for information management.

At regional centers were most Researchers are located there was a need to make existing information resources available. This was made possible firstly by giving access to online resources at the ESA/IRS ISP and then by making subscription to bibliographic databases on CDs ROM. In the nineties the documentation Unit played a key role in implementing LANs and Internet access. More recently, the documentation unit is working to install servers at regional centers for online access to electronic resources via the LAN. In addition, subscription to online database AGORA was made and training was given to End-users

Strength:
Human Resource at the Documentation Unit gained experience in internet management (INRA ISP) and LANs implementation and management

Weakness:
Accounting procedures does not allow to make money deposit at information providers such as INIST France or BLDSC in UK. In the nineties, the documentation unit used to buy coupons for document ordering. This service ended after the BLDSC changed its procedure and encourage online documentation ordering.

Opportunities:
Need to explore what is available as information resources for the benefits of the researcher's community

3. Current status and strategies in building info contents for:

3.1 STI: grey literature

Grey literature is as important as conventional literature to researchers. Due to cost of editing and budget constraints, researchers tend to make use of existing DTP software to publish their results. Consequently, it becomes more and more difficult for information professionals to have a comprehensive list of what is published as grey literature. At INRA, information professionals are facing the same problem for collecting grey literature. There is no specific methodology for grey literature processing and management. Existing grey literature is referred at the same database as conventional literature. In order to ensure large dissemination and access of grey literature, the Documentation unit is planning to develop electronic format of existing reports. The outputs will be made available in CD ROMs media and the INRA website. At national level, the National Research Center www.cnr.ma is planning to set a national information system for grey literature.

Weaknesses:

- Limited skilled information professionals to scan existing literature

Opportunities:

- Need to learn from other country experiences (success stories)
- Need to know of existing Electronic Document Management tools

Threats:
Unavailability or limited access to existing Grey literature

3.2 Research data management GIS and other aspects:

Most of them are undertaken by the research and development and the Training entities in conjunction with Other Moroccan Universities. Project research budgeting includes acquisition of Laboratories Hardware and data acquisition hardware. Quite often, computer and peripherals are included with applications software (word processing, Spreadsheets, DBMS, GIS, Expert Systems, and Statistical packages). Computer use has become in the late 80's a key components for data collection, processing, storage and exchange. Moreover, Computer use has contributed to new jobs creation "Electronic Journal Editing, proceedings,

and Posters" which are the basis of result dissemination to research and Extension managers and funding agencies.

3.2.1 National Plant Genetic Resources Conservation Morocco Gene bank:

There are over 4500 species of higher plants of which about 200 species are considered as rare or threatened. Following the agreement between Morocco and FAO Plant genetic resources undertaking and the adoption of the Global Plan of Action on plant genetic resources, INRA has developed a national Gene bank for medium and long term conservation and utilization of plant genetic resources. Information on Moroccan Gene bank is based on model used at genetic resources unit of ICARDA. The system allows users to create tables, query all fields in the database, and create labels for storage and distribution. Other system, GRIS was developed by IPGRI in collaboration with INRA to meet Moroccan Gene banks needs. A small program (database importer) was developed to transfer data from ICARDA to IPGRI model. The National gene bank holds more than 14522 accessions of different species. Those accessions were collected from different INRA research units or repatriated from international institutions and universities. More details can be found on www.inra.org.ma/ist/public.htm

3.2.2 Geographic Information Systems on Sustainable management of natural resources through development of decision making tools:

It is worth noting that improvement of a specific crop requires thorough data compilation on the soil and climatic factors of the country. Morocco is in a semi-arid region where rainfall is not regular and soil is varied because of geological substrate's of the country. There are no doubt that the use of new IT based methods for collecting, processing, storing and disseminating data will help to efficiently and effectively produce Moroccan land suitability maps.

Thus, this project make use of different IT hardware and software such as PC, Workstations, Table Digitizing, Scanners, GIS software, and Satellite data. The compilation of IT technology in conjunction with field observation will produce thematic map. Examples of thematic maps are:

- **Agro-climatic maps:** It is a join project between INRA and the Directorate of National Meteorology (www.mtpnet.gov.ma/vpm/MarocMaritime/Organismes/Organismes/Meteo.htm) with the objective of producing a decision tool related to limitations and constraints of agricultural development due to climate changes. International standards and models are used. The project is based on GIS tools (Arc view) and a database which stores data on climate and rainfall. In 2005, based on GIS tools a collection of thematic maps (growth period, potential yield mainly for cereals, relief) were published (cf. L'atlas agro-climatique in www.inra.org.ma/actualites/vparait.htm)

- **Land Suitability maps:** Land use and management is based on land suitability maps that combine ecologic, technologic, economic and social data. In order to optimize the use of land resources within Morocco, a collaborative project coordinated by INRA was initiated in 1999. Partners working on this project are: INRA, Hassan II of Agronomic and Veterinary science Institute "IAVH2", Directorates of Agriculture and Development Agricultural Agencies (ORMVA). In its first term, the project was targeting useful agricultural areas (SAU) which count for 5 Millions of hectares. So far, over 50% of the area has been covered. For Data processing, several tools and models are used based on international standards (FAO Ecocrop

Model, LGP "Lead Growth period" etc..) in addition a databases on soil, climate and agronomic data. Those data are combined using GIS tool "Arcview". In 2005, a collection of land suitability maps was published (cf. L'atlas des cartes de vocation agricoles in www.inra.org.ma/actualites/vparait.htm .

3.2.3 National Plant genetic resources

For the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture, as adopted by 150 countries at the International Technical Conference. INRA, was acting as a national coordinator for collecting data on plant genetic resources at national level and making this data available on a website. The Information and documentation Unit played a key role in providing technical assistance to national partner for training on data input.

Once data collected electronically, it was then, validated and merged in a national database prior to being made online at the following URL address www.inra.org.ma/ist/bdd.htm. The Website informs on institutions, contact persons, projects, taxon, cultivars, bib reference, and bilateral and multilateral agreements. In addition, other aspects were presented such as activities related to in situ and ex situ conservations, use of phytogenetic resources and capacity building of institutions

Strengths:

- Several projects involving National partners regarding GIS (Agro climatic maps, land suitability maps, Plant genetic resources are in progress in collaboration with IARCs
- INRA documentation Unit Human resources gained experience in PGR database and Web interface management

Weaknesses:

Most research databases are not accessed on line because of:

- Lack of an ICT strategy within the NARS.
- Fragmentation of scientific data
- Little use of database technology
- Stand-alone computing
- High risk of data loss
- No backup facilities
- Very limited Workgroup-based LANs at various locations with no file servers

Opportunities:

- Put in place a plan for capturing scientific data into structured databases
- Use web-based technology
- Need to learn from IPGRI, FAO and other IARC's experience in sharing information resources through the web based interface.

Threats:

- High risk of data loss

3.3 Research Management information:

3.3.1 Institutions:

Information on institutions is provided on published material. Most important one is outdated (1998). Very updated information has to be taken from the Ministry of Agriculture Department website www.madrpm.gov.ma/ministere bref.htm, High Commission for Water, Forests and Desertification www.eauxetforets.gov.ma in addition to related sites of agricultural institutions: INRA www.inra.org.ma , graduate schools such as Hassan II Institute of agronomic and veterinary science www.iav.ac.ma , National school of agriculture www.enameknes.ac.ma,state companies SOGETA www.sogeta.ma, SODEA www.sodea.com Public lab. Of analysis and chemical research www.loarc.co.ma , Institute of export coordination and control www.eacce.org.ma

With relation to Moroccan universities, information is provided by the Department of higher studies www.enssup.gov.ma/etablissements/listeuniv.htm. This website provides only information of universities affiliated to it.

With regard to information management related to institution, an extra work has to be done to group all existing data according to our needs and RAIS specifications.

3.3.2 Expertise:

At INRA level, data exists on researcher's expertise. Data was collected directly by the Information and Communication Division but not yet made available at the INRA site. For the training entities, the Hassan II institute of Agriculture and Veterinary science provide a list of professors and administrative staff on its related website www.iav.ac.ma/annuaire/aa.htm .

At the Research and Extension Directorate, a list of expertise within the ministry of agriculture is hold in electronic format.

Moreover, at the national level, the National Research Center www.cnr.ma is in charge of providing data on National research expertise

For a comprehensive list of agricultural experts, the National Agricultural of information system has to play a key role making available an updated list of experts according the RAIS requirements and specifications.

3.3.3 Projects:

By analogy to the Agris based scientific information system, information on Current agricultural research is of key importance to researchers, research managers. CARIS which is Current Agricultural Research Information System of the FAO was implemented by agricultural and Training Institutes to facilitate exchange of information about current agricultural research projects carried out by those Institutions. Training and Research Institutions use to contribute to the FAO input of CARIS. In late 90's, the first and last Moroccan CARIS Directory was produced by the Training, Research and Extension Directorate with assistance of INRA and IAVHII. As no coordination exists is this field, INRA current research projects are presented in its medium term program (2005-2008) (available on its website: www.inra.org.ma/activities/listpr.htm). The main entity for the PRMT is the Research Unit "RU" which depends on the Agric. Research Regional Centre. INRA's MIS project is integrating research module related to research program budgeting and management. The last aspect of the module (research program management) will incorporate CARIS aspect.

3.3.4 Projects outputs:

Agricultural Research projects are published in institutional journals. At INRA, the Division of Information and Communications (Communication Unit) is acting as a secretariat for two scientific journals Al Awamia and Les Cahiers de la Recherche Agronomique,

Researcher's papers are grouped at this unit and then sent to the scientific editor for evaluation by scientific readers. Once a paper is accepted it is published at either Al Awamia (116 issues) or les cahiers de la Recherche Agronomique Journals (43 issues).

In addition, technical collection of books and proceedings are also published. The Documentation Unit is maintaining an updated database of 1300 records for most of those publications using Agris standards and tools.

At the Training institutes, bibliographic information is kept updated for papers published in their respective scientific journals

Strengths:

- Information professionals are familiar with AGRIS & CARIS tools and methodology
- Existing data on INRA's publications and journals is updated and may be directly exported to the RAIS application software (Nerakin or Narims)

Weakness:

Existing data on Moroccan projects and expertise need to be updated. The process is time consuming

Information professionals are limited

Opportunities

IARCs support will benefit to sustain NAIS and boost information exchange and sharing at national and regional level

The web based system (NERAKIN) can help experts to online input data by themselves. IT professionals will intervene to validate and correct data

Threats:

Limited access to existing information resources

3.4 Extension and outreach information:

Agricultural extension is the primary responsibility of the ministry of Agriculture. The Directorate of Training, Research and extension has this mandate. This Directorate is providing finance support to publish written extension materials. The main extension newsletter is now available on CD ROM and on website (www.vulgarisation.net) The majority of smallholder farmers in Morocco today are relatively old (over 60 years) and are slow to replace this generation with young and educated farmers. Currently the department is running a number of specific programs to address this challenge, including educating the young, rural population, conducting gender and literacy campaigns and helping NGOs with

management skills. Extension messages are communicated by field demonstrations, extension bulletins, brochures, videos and radio and televisions programs.

INRA as the main entity of the NARS is playing a key role in agricultural technologies transfer within Moroccan National Agricultural System. In order to perform this task, a number of mechanisms are being used to strengthen these linkages and to ensure effective feedback, including the participation of extension staff in priority setting meeting, development of extension bulletins and brochures (over 70), periodic meetings of extension staff with INRA and regional centers, Participation in national technology transfer committees; active participation of senior management extension staff in INRA's National Technical Committee; and sharing of diagnostic information

Strength:
Extension material is available on electronic format

Weakness:
Online material in outdated

Opportunities:
Need to learn from other experiences

Threats:
Limited access to agricultural technologies by farmers resulting in unbalanced competition with countries where ICT is well integrated

3.5 Agricultural Education and E-learning :

It is still in its infancy. First attempt was made in 2002, when the Hassan II Institute of agriculture and veterinary science hosted an international meeting on ICT in academic networks in collaboration with the CIHEAM and CIDEFA. At that time IAV has stressed on existing ICT infrastructure aimed at developing e-learning material A multimedia center is already operational and helps professors developing training material in electronic format. In addition a conference room is provided with a videoconference material. For an online e-learning process, existing bandwidth for internet access is not suitable 1 MBPS.

Weakness:
Existing internet bandwidth is not suitable for E-learning

Opportunities:
Need to learn from other experiences

Threats:
E-learning can make the difference between institutions that have already developed e-learning material and those that are using traditional methods

3.6 Market information:

Currently, the Directorate of programming and Economic Affairs is in charge of all producing agricultural information statistics information. Most important is the Agricultural Census which provides valuable data on different agricultural aspects (land tenure, crop production,

animal production, cultivated area etc) In addition, this directorate is providing statistics on national market. Data is collected by means of survey from most important crop and animal markets in Morocco. Collected data is stored in a Database. Though no online access is provided, Statistics are published in serial monographies (Crop and animal production).

In addition, the directorate of Statistics (www.hcp.ma) which is under the High commissioner for Planning is also providing market information on different sectors including agriculture. Information is collected by means of survey according to their own objectives and criteria.

Weakness:
Data on agricultural statistics produced by the Ministry of agriculture is not online

Opportunities
Need to learn from other experience

Threats:
Limited access to Market information is harmful to decision makers, stakeholders and farmers

3.7 Communication infrastructure with NARS

Effective research requires rapid and reliable information exchange. Computer Networking was made possible after implementation of Internet in Morocco. Research and training entities were first to set up their own network.

The Research and Development entity "INRA" have made very important progress in the use of information technology. Over 400 of desktop computers are currently installed, most of which are Pentium 4 based but some are of old generations (Intel Pentium I/I I/I I I- based). Most scientists have their own PCs but some scientists have to share PCs because of the inadequacy of computers available. The PCs are running with mixture of windows XP, 2000, 98 and 95.

Servers are mostly based in central sites. They are using windows server NT, 2000 and 2003. In addition Linux and HP-UX are also used for internet services management.

For desktop applications, MS office is widely used. For scientific computing the following software programs are used: SAS and SPSS for statistics, Excel, access, ARC-INFO, ARC View for GIS and Imagine for remote sensing. In addition, one important application has been the implementation of ICARDA - developed Plant Genetics System for the INRA Gene bank.

Name	URL
The Ministry of Agriculture, rural development and Fisheries	www.madrpm.gov.ma (Dept of agriculture) www.mpm.gov.ma (Dept of fisheries)
The High commission for water and forestry	www.eauxetforets.gov.ma/
The National Institute of Agricultural Research	www.inra.org.ma
The Hassan II institute of Agriculture and	www.iavcha.ac.ma

Name	URL
Veterinary Science: the School of Horticulture in Agadir	
The National School of Agriculture in Meknes	www.enameknes.ac.ma
Directorate of Training, Research and Development	www.vulgarisation.net/
Haouz Regional office of agricultural development	www.agriinvest-marrakech.org.ma/
Agricultural association (irrigation and drainage)	www.anafid.org
Agricultural Portals in the Maghreb	http://membres.lycos.fr/marocagri/

Strength:
The majority of the Moroccan NARS are using ICT (LANs), have Internet access and Websites

Weakness:
ICT infrastructure of old generation
Most Existing websites are descriptive and does not include a web-based database interface.
Existing IT Human resources are very limited

Opportunities:
Existing IARCs facilities (software applications) can benefit to NARS information centres

Threats:
Limited use of ICT can be a barrier to collaboration and communication between NARS

4. Available human resource capacities in ICT/M :

There are over 250 of information professionals around the Ministry of agriculture and autonomous institute, of which 40% are working in ICT/M. The rest is doing administrative work. This situation was worsened two years ago when the government gave incentives for a voluntary retirement.

At INRA, there are 12 information specialists of which only 50% are working in ICM.

Weakness:

- Skilled Human resources on ICM and ICT are very limited
- Low percentage of Information professionals involved in ICM
- Capacity building of existing Human Resource is limited due to budget contrtaints and limited opportunities at national level

Opportunities:
IARCs can contribute to Human Resource capacity building

Threats:
There are difficulties to keep with the pace of the rapid evolving ICT technology.

5. Existing mechanism of accessing and exchanging info

in mid 60's, information on agriculture was the first aspect to be considered by the creation of national information center (CND). CND was assigned the task of collecting, processing, storing and disseminating Moroccan agricultural information. The process of information collection includes all agricultural organizations (public as well as quasi governmental). In addition CND plays a coordination role within information centers in order to maintain the use of the same standards and to assess the compatibility of any newly developed system within the national agricultural information.

In mid 80's, the national agricultural Information system was established because of: Importance of agriculture in the national economy and existing infrastructure and qualified personnel in this sector. The NAIS called REDOCAM was based on four entities:

- Research and Development Entity, composed mainly by the National Institute of Agricultural Research.
- Training Entity composed of three main postgraduate Institutes the Hassan II of Agronomic and Veterinary science Institute "IAVH2" in Rabat, Tbe
  National School of Forestry "ENFI" in Salé and the National College of
  Agriculture "ENAM" in Meknes. Those three Institutes provide training on all discipline of Agricultural Science
- The Ministry of Agriculture Entity composed of Major Centralized Directorates, Regional Directorates "DPA" and Regional Agricultural Development Agencies "ORMVA" supervising agriculture in rain fed and irrigated areas.
- The last Entity is composed of Quasi Governmental Organizations,
  Professional Associations, NGO and the private sector.

The NAIS did not fulfill its objectives because the NAIS coordinator at the Directorate of economic affairs and programming did not share the same interests as the Research and training entities. For this reason, a bilateral agreement was signed between the Research and the Training entities. The two entities are collaborating on a complementary basis to avoid duplication of work in journal subscriptions and also technical collaboration. In addition, INRA is exchanging its publications mainly the two journals with over 70 institutions at national and international (30 countries) levels.

Strengths:
Good collaboration between INRA and the training entities

Weakness:
Collaboration among institutions is not well developed due to lack of coordination by former Moroccan NFU which only act as the AGRIS NFU
Moroccan NAIS is not serving NARS partners and the research community

Opportunities:
Need restructuring based on successful experience and IARCs support

AARINENA RAIS project will be a good opportunity to re-dynamize existing NAIS Need restructuring based on other successful experience from regional countries

Threats:
Access to national information is very limited and there is a risk of duplication of work and research.

6. Available Infrastructure and financial facilities:

- **Hardware /software**

Agricultural information has been the first area in which Moroccan government provides means for restructuring. Early in the 80's, Information centers at the IAV HII and INRA were equipped with Minicomputer and information management software (Minisis). In the Nineties, most agricultural information centers introduced Microcomputers using Win/ISIS and AGRIS Standards. In addition, the French cooperation provides technical assistance, IT facilities, SDI "Selective Dissemination of Information" via Internet to main agricultural institutions.

- **Standards and Tools:**

Are mainly based on AGRIS standards and Agrovoc Thesaurus (French Version)

- **LAN and Internet:**

All Information centers have Internet access via their Local area Network

- **Budget:**

Most information centers have their own budget dedicated to Journal subscription, acquisition of books and Electronic databases, and subscription to Online access to AGORA Database.

Strengths:
Most Information centers have ICT infrastructure and Internet access

Weakness:
Existing IT facilities are of old generations
Lack of coordination leading to duplication of work and expenses for journal subscription

Opportunities:
IARCs support to set an advocacy program to decision makers to support and sustain existing infrastructure

Threats:
Limited access to available information resources can be a barrier to development of agricultural sector

7. Important Constraint affecting the building of their NAIS :

- **NAIS strategy:**

Existing NAIS strategy does not respond to institutional expectations. It is more targeted to AGRIS objectives. The national AGRIS focal point was serving as a national database site. Focal point located at DPAE is not functioning. Data input to Agris stopped since 2000 (227

records sent in 1999-2000 to AGRIS). This situation worsened after most ICM managers retired within a voluntary retirement program.

Recommend:
Need to re-activate the existing Agricultural information system to better collaborate nationally and within regional fora.

- **Decision makers:**

Previous experience with the National agric information system "REDOCAM" showed that the system did not fulfill its objectives. There is a conflict of interests between the different agric. Directorates due to absence of a national strategy on information resources sharing.

Recommend:
Need a advocacy program to Decision makers

- **Human Resources:**

Limited number and lack of skilled ICT & ICM specialists:

- Problem of regular database input and information processing at regional and central site.
- Absence of a continuous training for ICT and ICM

- **Standards and Tools:**
  - Translating information databases into a Arabic and English may be time consuming and seen as an extra unuseful work for partners.
  - Existing databases at partners level may be of different format according to the used software (ISIS family software, MS software) and processing tools

- **ICT Infrastructure:**

At national level: some institutions have bad or no internet connection. Decision makers' problem related as they sought internet access not important to their staff and also lack of qualified ICT staff.

8. Required support at national regional and international

Most constraints are related to human resources (professionals) and Decision makers aptitude to collaborate and facilitate the work within the NAIS For these reasons, required support must be targeted toward those two aspects

- **Advocacy issue**

Some steps related to advocacy need to be taken to facilitate and boost the NAIS Implementation within NARS partners

- **NAIS charter:**

Need a facilitator for a one day workshop to define the NAIS charter that will clearly define membership and objectives of the NAIS and get a formal commitment of the NARS partners and define the work-plan activities for the starting year.

- **Training**

- Train the trainers on Web based application, Tools and methodology
- Continuous training of existing Human resources on ICT and ICM to keep pace with the evolving technology
- Training must be on two levels:

  NFU for coordinating partners contribution
  Partner level to facilitate input within the NAIS

- ICT infrastructure:
Improve existing infrastructure at the partners level (PCs) and NFU level (Server, Laptop)

- TOOLS, Standards and application software:
A package including the necessary tools, methodology, tutorials and the application software need to be prepared distributed to NIFU's with a defined work-plan of activities

9. Conclusion:
INRA and some training entities are already committed to collaborate within the RAIS. Thus by supporting development at national level, the RAIS will be more and more effective helping fostering partnership at regional level for the benefit of the research community. AARINENA and the collaborating IARC's must give specific attention to support the starting of the RAIS in order to join the existing RAIS fora for an effective collaboration.

10. **Summary Table**

Summary Table

	Current status	Strength	Weakness	Opportunities	Threats
Governance structure of ICM	A Division dedicated to information and communication is involved in ICM and ICT	one formal body in charge of information and communication management			
Steps to integrate agriculture and agricultural research information in their NARS	Use of ICT to share existing electronic resources (CD ROMs) online and via the LANs)				
Grey literature	No specific methodology and database.	Very important	Limited skilled information professionals to scan existing literature	Need to learn from other country experiences Need to know of existing non commercial EDM tools	Unavailability or limited access to existing Grey literature
Research data management	Several projects involving	Human resources	- Lack of an ICT strategy	Need to learn of IARCs (IPGRI)	High risk of data loss

	Current status	Strength	Weakness	Opportunities	Threats
	National partners regarding GIS (Agro climatic maps, land suitability maps, Plant genetic resources are in progress in collaboration with IARCs	Gained experience of using tools and Software application. Some projects are available online	within the NARS. - Fragmentation of scientific data - Little use of database technology -Stand-alone computing No backup facilities - Very limited Workgroup-based LANs at various locations with no file servers	experience in sharing information resources through the Web- based interface. Existing thematic networks and fora will help communication among research community and improve the use of ICT	
Research management information	With exception to research outputs which is referred in databases. Research projects and institutions data need to be updated	ICM/ICT specialists are more familiar with international standards and tools used for information management Existing data on INRA's publications and journals is updated and may be directly exported to the RAIS interface	Existing data on Moroccan projects and institutions has to be updated. The process is time consuming and collected data is incomplete	IARCs support will benefit to sustain NAIS and boost information exchange and sharing at national and regional level	limited access to existing information resources
Agric Education and E-learning	Is in its infancy (2002). Existing ICT facilities and infrastructure aimed at developing e-learning material		Existing bandwidth is not suitable for video conference	Need to learn from other experience	e-learning can make the difference between institutions that have already developed e-learning material and those that are using traditional methods
Market information	Two body responsible for market information	Data is in electronic format	Access to information is still in hard copy format and not online	Need to learn from other experience	Market information
Communication	Most NARS are	ICT is fully	ICT of old	Existing IARCs	Limited use of

	Current status	Strength	Weakness	Opportunities	Threats
infrastructure with NARS	using ICT (LANS), have internet access and Websites	integrated in NARS	Generation Bad on no internet Access Existing websites are not dynamic	facilities (application software) can benefit to NARS	ICT can be a barrier to collaboration and communication between NARS
Human Resources capacities	Existing ICT and ICM professionals are very limited and only a small percentage of available HR are involved in ICM activity		Exisitng skilled ICT/M professionals are limited Lower percentage of Information professionals involved in ICM Capacity building of existing HR is limited due to limited offered opportunities at national level	IARCs can contribute to HR capacity building	Difficulties to keep with the pace of the rapid evolving ICT technology.
Existing mechanism of accessing and exchanging info	The Moroccan NAIS was historically supported and established by the government. Existing agric. Institutions are grouped under four entities	On-going collaboration between INRA and the training entities	Existing NAIS is not functioning Collaboration among institutions is not well developed due to lack of coordination by former Moroccan NFU which only act as the AGRIS NFU	Need restructuring based on successful experience and IARCs support AARINENA RAIS project will be a good opportunity to re-activate existing NAIS	Access to national information is very limited and there is a risk of duplication of work and research.
Available infrastructure and financial facilities	ICT is used Intern. l standards and tools are used Existing budget dedicated to journal subscription and books acquisition	Most Information centers have ICT infrastructure	IT facilities are of old generation Lack of coordination lead to duplication of expenses (journal subscription) and work	IARCs support on advocacy to decision makers to support and develop existing infrastructure	Limited access to available information resources can be a barrier to development of agricultural sector

Annex 5-6

Sudan Country Report

Status of National Agricultural Information System in Sudan

Prepared by: Kamal El-Siddig Ahmed[13] and Ahlam Ismail Musa[14]

Introduction

Sudan is a vast agricultural and pastoral country with a rich cultural diversity. It is the largest country in Africa with about 2 500 000 km² of land, a total population of well over 30 million, out of which 75% live in rural areas. Agriculture is the dominant sector in the Sudanese economy. It contributes about 45% to the Gross Domestic Product (GDP), generates over 85% of the foreign exchange earnings, and provides the raw materials for agro-industries and employment for over 80% of the labour force. About 87% of economically active people are depended on agricultural or pastoral activities and related enterprises for their livelihoods. Forest resources contribute about 10 % to the GDP, while livestock, which is predominantly kept by the traditional nomadic people, contributes about 8 % of GDP.

Agricultural research started in the Sudan in 1902 to explore the possibility of growing cotton under irrigation in the North and under rain in the South. It expands rapidly to include research activities in different crops and ecological zones in the country. Contribution of agricultural research projects completed during the period 1983-1993 to the total research projects in other sectors in the Sudan was between 35%-68%. The Agricultural Research Corporation (ARC) was affiliated to the Ministry of Agriculture until 2001 it has been moved to the Ministry of Science and Technology (MOST).

The National Agricultural Information System (NAIS) of the Sudan

The National Agricultural Information System (NAIS) of the Sudan consists of different institutions fall under the following categories:

1- International and regional agricultural organizations such as the agricultural libraries and information centers of FAO Khartoum office, the Arab Center of Documentation and Information (ACADI) of the Arab Organization of Agricultural Development (AOAD) and the library of the Arab Authority of Agricultural Investment and Development (AAAID)
2- Governmental and Semi-governmental agricultural research and extension institutions, e.g., the Central Library of Agricultural Research Corporation (ARC) and the Documentation and Information Center (DIC) of the national center of Research (NCR)
3- Government Ministries.
4- University agricultural college libraries

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[14] Ahlam Ismail Musa**,** Central Library, Agricultural Research Corporation, AGRIS Resource Center of the Sudan

Sudan has put in place a policy that seeks to promote research and development in basic and applied sciences including agriculture. It has also developed long, medium and short- term national strategies in science and technology that are aimed at achieving sustainable socio-economic development in the country. Scientific research is conducted by multidisciplinary teams composed of scientists with differing specialization, working in multiple locations in different parts of the country. These have generated massive information that needs to be properly managed and made available to all the different stakeholders.

Steps recently taken to establish focal units in the Sudan

The first workshop for the establishment of the Sudan National Agricultural Information Network (SNAIN) was held on Monday and Tuesday 30-31st of August 2004 at the Conference Hall of the Training Centre, Agricultural Bank of Sudan at Khartoum. About 66 individuals attended the workshop and participated in its deliberations. Participants came from all parts of the country and represented a wide spectrum of stakeholders involved in the generation, dissemination and utilization of agricultural information such as agricultural research and extension institutions, agricultural training institutions, federal Ministry of Agriculture, state Ministries of Agriculture, various agricultural departments, farmers' and pastoralists' trade unions as well as development partners such as NGOs, and regional and international organizations. The main results of the workshop were the establishment and agreement of the Sudan National Agricultural Information Network (SNAIN). National Steering Committee (NSC) for SNAIN has been established and five national institutions have been selected for the initial involvement in the activities of SNAIN. These institutions are:

1. Agricultural Research Corporation (ARC).
2. University of Khartoum
3. University of Gezira.
4. Agricultural Economics and Statistics Administration, Ministry of Agriculture and Forestry.
5. Documentation and Information Centre (DIC), National Centre for Research (NCR).

Capacity Building activities in the Sudan

A number of activities have been carried to develop institutional and human capacity building of agricultural information in the Sudan. These activities led by government ministries, the Agricultural Research Corporation (ARC) as the NARIs of the Sudan, the national Council of Research and some national Universities. The most recent activity is the AGRIS/IMARK national training workshop that was held during the period 8-16 March 2006 at the ARC, Wad Medani. This workshop organized by the Sudan National Agricultural Information Network (SNAIN) under the leadership of the ARC and the support of the Regional Agricultural Information Network (RAIN) of the Association of Strengthening the Agricultural Research in Eastern and Central Africa (ASARECA). Highly appreciated technical support for this activity had been provided through FAORNE-Cairo and FAO/FAORAF-Ghana. National resource persons and trainers came from the ARC, the Arab Organization of Agricultural Development (AOAD), FAO Khartoum office and other national institutions. The workshop consisted of lecture and practical training for 23 participants present 10 national institutions.

It is worthy of consideration to mention the WEBLIS national training workshop that had been organized in the Sudan last August 4-9, 2007 under the sponsorship of the Sudanese Association of Library and Information (SALI) and the Sudan Academy of Science (SAS). Professor Egbert de

Smet, training manager of INASP was the chief trainer of this national workshop program.

However, there are many government and private institutions in the Sudan provide training in ICT/ICM. An example is the most recent and active program, the Information and Communication Technologies Programs Coordination Council (ICT-CC) of the Sudan Academy of Sciences (SAS), http://www.sas-sd.net, Ministry of Science and technology, http://www.most.gov.sd . The ICT-CC was established in 2004 and its main tasks are to coordinate different capacity building skills and research programs in ICT in the country for social and economic development. It collaborates with the following Institutions to perform its tasks:

- Informatics Industry Sector, Ministry of Science and Technology
- National Centre For Research
- Documentation and Information Centre (Registrar Office and Laboratory)
- Remote Sensing Authority
- Agricultural Research Corporation (the NARIs of the Sudan and Coordination Council for Agricultural Research Programs in the Sudan Academy of Sciences- SAS as well as the focal point of national, regional and international agricultural information networks/systems)
- National Corporation for Telecommunication
- Sudatel, the largest telecommunication company in the Sudan and the region
- Miraag for Space Technologies Company.
- Kuch Company
- National Centre for Information

Current Status and Strategies in Building Information Content

Agricultural research institutions in the Sudan produce massive types of information content. This information includes research repots, journals, theses, conference proceedings, research guides and so on. Such information is well proceed and organized at most of the library and information centers. There is a common agree to use FAO standards to process and disseminate agricultural information in the Sudan. Electronic journals are the most preferred type of information used by agricultural research scientists followed by abstracts and research reports. There are national trends towards the use of internet and open access initiatives. Plans are underway to provide access to various value- added information services and resources through the website.

Available human resource capacities in ICT/M

Although there is shortage of qualified human resources in ICT in the Sudan, but the existed cadre of agricultural is capable to lead the country's trends towards the use of agricultural information for development.

Existing mechanism of accessing and exchange information

Most of the agricultural libraries and information centres in the Sudan have developed their local databases and internet/intranet websites. Most institutions has move from printed to electronic resources and the internet has become new way of accessing information than any source. AGORA play significant rule in accessing electronic journals in the Sudan. The Essential Electronic Library (TEEAL) introduced at the Central library, ARC since 2002. LAN TEEAL, the Local Area version of TEEAL has been introduced at the Central library in 2006. AGRIS database and CAB abstracts also considered as the most commonly used source of agricultural information. It is expected that

AGRIS standards and methodologies would support the national trends to establish the national agricultural information network.

Available infrastructure and financial facilities

As mentioned previously, the national agricultural information infrastructure in Sudan is made up of university libraries, agricultural research institutions, documentation and information centers, statistics bureaus, and agricultural extension service units and international and regional agricultural development organizations. These library and information centers play a very important role in the management and dissemination of agricultural information in support of the peoples' livelihoods. They have considerable sources of information in different format, covering different sectors of the national economy, including agriculture, education, economy, industry, finance, natural resources, social welfare and research. Agricultural libraries and information centers in the Sudan have suitably developed their local databases, web sites and produced full-text institutional documents. WebAGRIS and Arabized WINISIS are the most widely used database management systems. Also, the country has formulated a twenty-five year strategic plan since 2002 that included activities in the ICT domain.

The Agricultural Research Corporation (ARC) work endeavor to develop and maintain efficient ICT infrastructures. The main infrastructure of agricultural information available at the ARC, Sudan:

- Establishment of WAN and connection through frame relay link with CISCO 710 Router of 1 MBPS support with fiber link. 5 ARC research stations and centers at deferent parts of the Sudan are part of the ARC/WAN. The work continues to connect the other ARC research stations and centers
- Establishment of remote Video Conference Hall at the ARC H.Q
- Establishment of specialized Computer Training Laboratory at the ARC H. Q, Wad Medani to provide continuous training to The ARC scientists and ICT staff
- Development of intranet that provide full-text access to the ARC journal articles. The work continues to publish full-text of the other ARC publications.
- Utilization of the use of internet, e-mail, AGORA, HINARI and the other available web resources
- Development of the ARC website at the URL: http://www.arcsudan.sd
- Introduction and application of LAN TEEAL, the Local Area Network version of the Essential Electronic Agricultural Library (TEEAL).
- Development and collaboration of national, regional and international agricultural information networks and partners such as SNAIN, AGRIS, AARINENA/RAIS, ASARECA/RAIN, the Twining of the Agricultural Information System Project (Sudan, Egypt and ICARDA) as well as other partners such as AOAD, FARA, ITOCA and TEEAL

Constraints affecting the building of NAIS in the Sudan

The Sudan agricultural information system is facing several challenges, which are also affecting other information and knowledge systems in the country. Overall, the existing organizations and their resources are inadequate for the country's needs. This is further compounded by the fact that there is no coordination in the management and provision of information, and this brings with it certain weakness in the system, and issues such as complete neglect of certain areas of agricultural knowledge, fragmentation of information resources, inadequacy of the services provided, and costly

duplication of information materials and services. Among the major challenges facing the development of a well-coordinated agricultural information network in Sudan are the following:

- Absence of effective national agricultural information management policy
- Absence of institutional information management strategies and policies
- Failure to use common agricultural information management standards and tools in agricultural libraries and information centers, making it difficult to share information resources in digital format
- Weakness of cooperation and coordination among agricultural libraries and information centers
- Failure by some agricultural information professionals and library managers to change and adopt new ways of managing information resources
- Ineffective capacity building programs and inadequate training on technologies related to information and knowledge and management
- Shortage of funds to purchase modern equipment for information management and dissemination

Conclusion and recommendation

The agricultural information sector in Sudan has a relatively weak technological base and insufficient scientific, technical and educational capacity and thus it needs substantial capacity building. There is also a dire need for radical change in the Sudanese agricultural information system, if widespread management and dissemination of information and knowledge in digital format is to take root. This change can be driven by building partnerships among agricultural information professionals in the country, the government and international and regional partners such as FAO, AARINENA/RAIS, ICARDA, AOAD and ASARECA.

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Annex 5-7

Tunisia Country Report

Status of National Agricultural Information System in Tunisia

Prepared by: Mohammed Bergaoui[15] and Mohsen Krichi[16]

1. Steps recently taken in establishing focal units and current activities:

At the Agricultural higher education Research Institution (IRESA) we have a whole Division in charge of ICT (DTTIC: Division of information technology and communication), which is managed by a Director who is assisted by two assistant Directors, and a group of engineers and technicians (4 engineers: 3 in computer network and 1 in computer programming, 3 analyst in computer programming), besides the secretariat administrative unit. Therefore, the NIFU is located within this Division, and is represented by Mohammed Bergaoui, and Mohsen Krichi, respectively Director and Assistant Director of this Division.

IRESA is an Internet Service Provider (ISP) and this division (DTTIC) ensures this activity (web and information system hosting, E-mail provider, security, management of the national agricultural network, development and management of RAIS).

IRESA has an internet website: (www.iresa.agrinet.tn) which is composed of the following items: News, research, higher education, international cooperation, scientific events, cultural events, student space, and intranet.

The intranet website is composed of these items: directory of e-mails, Assets of Agricultural research, documentary base, Experts Information base, annual research outputs and others databases related to water resources, dams, agricultural production,

All research and high education institutes have web pages under the IRESA website.

2. Current status and strategies in building information content:

Library information systems

IRESA use Horizon software for virtual library. IRESA has installed and deployed a solution with the aim to improve the library information systems such as:

- procurement ,
- cataloguing and classification,
- circulation,
- provision.

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[16] Assistant Director of ICT Division, IRESA

The library of the agricultural scientific resources allows reaching electronic resources with knowing: - the national and foreign collective catalogues in the agricultural field - bibliographical databases - dictionaries and thesaurus - electronic resources (thesis, memories,). This library is actually accessible from the intranet.

Tunisian Agricultural Map

In order to have powerful instruments of diagnosis, analysis and decision-making, the Ministry of the Agriculture and the Hydraulic Resources comes to equip its services with an integrated information system materialized by the regional agricultural Map.

These Maps which allow having a global vision on the agricultural space, its resources, its potentialities, its strong points and its places of vulnerability, having the following objectives:

- To know in a reliable and dynamic way inventory of fixtures as regards natural resources (ground, water, forests), basic infrastructures (hydraulic, transport) and economic (units of transformation, conditioning and collection of the agricultural produce).
- To know the inventory of fixtures of the current allowance of the grounds as a final resultant of technical-economic choice and currently systems of production,
- To spatially simulate and visualize scenarios of decision on the basis of modification concerning a certain number of parameters such as the costs inputs, the producer prices, the outputs, the incentives...

The Regional Agricultural Maps comprises approximately 50 geographical layers of information. These layers are gathered into four topics: chart "melt of charts", ground occupation chart, agronomic chart of vocation and agro-economic chart of vocation.

Completed in 2004 for all the governorships of the country, the study on the agricultural charts made it possible to set up geographical information comprising nearly 50 layers.

For better developing and capitalizing the assets of the regional agricultural charts, a joint action to undertake permanent updates and improvement of the databases proves to be essential.

3. Available human resource capacities in ICT/M :

- 4 engineers (3 in computer network , 1 in computer programming)
- analysts (computer programming)

The IRESA technical staff has developed a distance learning system and some data bases in the agricultural research system. So they have the ability:

- To develop an ICT enabled Information Systems,
- To develop computer applications,
- To manage an ICT enabled Information System,
- To manage digital content.

4. Existing mechanisms of accessing and exchanging information:

- All scientific and technical staff of the NARS has an internet access from their office and E-mail.
- All institutes have electronic library subscriptions such as American Chemical Society, Blackwell, Elsevier, IEEE, Informs, Proquest and Thomson Scientific. All of their scientific staff has access to these libraries.
- The technical staff of IRESA support and assist the scientific staff of all institutes in using ICT. E-discussion is used by teachers and students in the distance learning system;

5. Available infrastructure and financial facilities :

All institutes are connected to the internet and intranet by the national agricultural network (AGRINET) which is managed by the IRESA (DTTIC).

- Number of computers in the NARS: 600
- Number of computers with Internet access: 600

Access to computers and Internet:

- Ratio of Number of computers with Number of Scientific Staff: 1
- Ratio of Number of computers with Internet connection with Number of Scientific Staff:1

An action of levelling the AGRINET started since 2003 with the objectives to improve the quality of service and the high availability and to reinforce security.

6. Important constraints affecting the building of their NAIS

- Limited number of technical staff specialized in ICT

7. Required support at national, regional and international

Knowledge sharing and collaboration is highly appreciated.
Training programs in these items:

- Network security
- Expert systems
- Web2.0

Annex 5-8

Yemen Country Report

Status of National Agricultural Information System in Yemen

Prepare by: Mohamed Noaman Sallam[17] and Mohamed Al-Najhi[18]

1. Introduction

Information is very crucial element for enhancing effectiveness and efficiency of development programs. The Rapid expansion on the use of information technology and agricultural information system during the past 10-15 years came as a result of the growing needs of the agricultural sector. The reduction of the overall research budgets, the call on proper efficiency in research activities made it necessary to analyze and improve research programs.

The Agricultural Research and Extension Authority (AREA) is seen as the leading institute in the agricultural research in Yemen. It is considered as the major partner in the agricultural information systems at national, regional and international level. It is therefore important to improve the role of AREA in the development of agricultural information systems. This report provides an analysis of the development and use of information systems in Yemen, particularly within the agricultural sector.

2. SWOT analysis for information systems in Yemen

2.1 Strengths

- Coverage of AREA scope of work at all agro ecological zones (8 regional research stations)
- Presence of specialized research centers under AREA umbrella (Food and post harvest, livestock, genetic resources, renewable resources, Qat Research Unit)
- Presence of national agricultural training centre
- Project-based research developed as a new research approach of AREA
- Comprehensive data base system developed as data management tool for research , financial, and personnel information systems, using visual basic system and Microsoft access software
- Technology dissemination general directorate at notional level established to insure technology integration and information disseminations well as to develop technology dissemination methodologies.
- Computer directorate at national level established to develop information network system.
- Establishment of well-equipped GIS section with varied specialized electronic data bases
- Information Focal Unit established
- Infrastructure for building local area network provided

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[18] Director of Computer Department, AREA

- Availability of IT resources (100 computers)
- Improved awareness of information management among staff and decision makers at national level
- Internet is connected to most of the offices
- Possession of a relatively recent but acceptable website, (www.area.gov.ye).
- Availability of annual staff training program on various aspects including computer use, establishment of data bases, and computerized statistical analysis.
- Issuance of at least 4 scientific and technical information periodicals within the whole AREA system.
- Presence of local research coordinators network.

2.2 Weaknesses

- Proper strategies and policies in the efficient use and the development of ICT/M within AREA is lacking
- No specialized IT staff within AREA
- Weak data management at local levels
- Proper ICT technical skills are lacking
- Awareness of information management at local levels is lacking
- Low capacity building for ICT/M staff
- Lack of Staff motivation
- Lack of interconnectivity between AREA headquarters and regional research stations and centers
- Organizational overlapping and Task Duplication relating to documentation, information and communication/dissemination.

2.3 Opportunities:

- Information policy changes encouraged by donor agencies
- Updated agricultural statistics within MAI
- Improved agricultural marketing information systems within MAI
- Established General Directorate of Extension and Multi Media within MAI
- Electronic government
- National Information Centre

2.4 Threats:

- Lack of National information strategies and policies
- Lack of IT enabled services
- Lack of information awareness among decision makers within different ministries.
- Lack of national IT staff recruitment strategies
- Lack of incentives for ICT staff within the public sector
- Lack of data exchange systems between national agencies
- Lack of standards, principles and procedures for enforced ICT/M application
- Weak links to AGRIS and CARIS systems.

3. Information Management

3.1 Within Agricultural Research Institutions:

The Agricultural Research and Extension Authority (AREA) is the main agricultural research institution in Yemen that serve as an important source of agricultural farm information at the national level. AREA has 13 branches and centers of which 8 regional research stations, 4 specialized national research centers, and one national agricultural training centre (NATC). The 4 specialized research centers are concerned with food and post harvest research, livestock research, renewable natural resources, and genetic resources collection and preservation.

At the national level, AREA has three general directorates concerned with research planning, monitoring and evaluation, information management and exchange. These general directorates are the General Directorate of Research (GDR), the General Directorate of Information and Documentation (GDID), and the General Directorate of Technology Dissemination (GDTD). GDID is responsible for documentation, reorganizing research reports, and planning training programs. GDTD is responsible for data collection, data processing, data retrieval, and publishing information through leaflets, newsletters and periodical journals.

AREA has its own library and documentation section where all received books, journals, bulletins, and reports are stored and made ready for use by researchers, university students, and other information users. Until the year 1990, AREA Library and documentation section was involved in receiving AGRIS information packages and started to develop data entry under CDS/ISIS run by DOS system. But this was stopped, as the responsibility of this work was shifted to the Documentation and Agricultural Information Centre in the Ministry of Agriculture and Irrigation. The DA!C, then could not continue with the process due to several reasons of which lack of specialized persons and the week links with local and regional institutions.

Research Information is published in AREA scientific journal, research and extension linkage periodical, and AREA compendiums of improved and new research technologies. The General Directorate of Technology Dissemination is responsible for processing and publishing research information through the above mentioned journal and periodicals. Research articles are submitted to the specialized publishing section within GDTD, where 3 copies are sent to different auditors before it is published. To communicate its own research outputs, AREA has its own website, www.area.qov.ve.

GIS & Remote Sensing Department was established in 1995, by AREA and an FAO funded project, to make use of available data in various fields soil, land use, water, agronomy etc. for the design and implementation of rural land use plans. The section was equipped with hard ware and GIS & Remote Sensing software as Arclnfo, ArcView and analysis programs in GIS, AIMS and ERDAS Remote Sensing in activities. Several agricultural maps were produced using the new computerized technology of GIS and Remote Sensing applications using the following data sources:

- Satellite imagery - Land sat ™ 7 band (27 scenes)
- Spot Satellite imagery.
- Aerial photos.
- Topographic maps

An ICT/M development move towards establishing information systems within AREA was made in the year 2000 by initiating financial and personnel information systems. In the year 2005, a directorate of computer system was established. Some progress was also made by the attempts of AREA to establish its own local area network. This attempt is still on progress.

For the development of research information management system, a new move was made in the year 2005 where the yearly research activities were converted into 3-5 years research projects. This move aimed at linking research into clear input and output continuum. A research med-term plan (2006-2010) that compiles all research projects was developed.

A National Information Focal Unit (NIFU) was established in the year 2006 under the supervision of the General Directorate of Technology Dissemination. The new focal unit, with the support of a previously formed information network development team, started to build a date base system that provides a data entry system for research institutions, research experts, research projects, and research outputs using visual basic system and Microsoft access software.

Research priorities are defined through surveys and joint meetings and linking mechanisms with extension and rural development agencies. Extension staff participates with researchers during on farm technology adaptation and integration. Annual meeting is also held at the research station in the presence of extension staff and other concerned stakeholders to discuss research and extension progress reports and future plans.

3.2 Within other related institutions:

At the central level, different institutions and departments that deal with agricultural information could be found within the different ministries of the public sector. Within the Ministry of Agriculture and Irrigation, the General Directorate of Agricultural Statistics (GDAS), the General Directorate of Agricultural Marketing (GDAM), the Documentation and Agricultural Information Centre (DAIC), the General Directorate of Agricultural Extension and Multi Media (GDEMM), are all concerned with collecting, processing, documentation and communication of agricultural information. The Central Statistics Organization (CSO), within the Ministry of Planning and Development (MPD), is also an important source of agricultural statistical data.

The GDEMM is supervising agricultural extension and multi media activities in the whole country. It provides financial support for all extension directorates at governorates level. Extension information are published by the GDEMM through its extension bulletin. Extension messages are broadcasted by the GDEMM through the national radio and television programs.

The GDAS is the most specialized directorate in agricultural information/statistics within the Ministry of Agriculture and Irrigation (MAI). The directorate is a central organization that is concerned with the establishment and renewal of the agricultural database/statistics. The Directorate conducts a general agricultural census every 10 years. Processed data/statistics is then yearly renewed by conducting sample surveys in the different governorates of the country. Agricultural statistics are processed and published in a yearly agricultural statistics books.

The GDAM is also dealing with market information systems in various fields such as price information, import and export information, and marketing extension information. Marketing information systems are developed through assistance of the European Union. Market

information are collected from various sources of which agricultural markets are the major source. This information are processed and communicated through the yearly marketing report and some media channels. GDAM has also its own website, www.yemengdam.com .

CSO is a central organization that deals with general statistics including agricultural information, which are mostly used by the Ministry of Planning and Development for the preparation of development plans. While other organizations such as NATC, MMC, and AIDC process and utilize agricultural information for training, dissemination and training purposes.

4. Information Technology Assessment

During the past 10 years, a rapid expansion on the use of information technology and agricultural information system took place in the Yemen. More than 20 new governmental and non-governmental institution concerned with research and information in various fields were established since the year 1995. Also new information technology was introduced, as many computer systems were installed and many government and private communication and telecommunication companies were established.

Nevertheless, the above mentioned expansion of information and communication technology was not associated with the development of proper national information and communication strategies and policies. Due to lack of clear policies, confusion and mismatch in division of tasks was created between the different government institutions.

During the past 10-15 years, there has been also a lot of emphasis in the development of agricultural research and rural development strategies to achieve efficient use of agricultural technology. The different agricultural development strategies pinpointed the need for complementarity among the development partners concerning the exchange of information and experience. Decentralization, and the effective use of information systems based on stakeholders needs were among the important points emphasized in these strategies.

However, the use of properly organized agricultural information systems and information technology could not grow parallel with the objectives of the new strategies. In general, it could be indicated that there is still a lack of a real basis of information systems, particularly in the agricultural and rural development sectors. Despite the introduction of computerized information systems, the capabilities of these systems are still exaggerated, as the critical aspects of information systems, such as the need for accurate data to strengthen decision making, are ignored.

Moreover, there is a lack of survey data on information systems, as very few studies or surveys are conducted.

Accordingly, within the government budget, there has been a slight increase in the allocated funds for information and communication technology. However, this increase in budgets was not enough to develop a comprehensive information systems not only in terms of the introduction of new computers but in terms of improving mechanisms for collecting, analyzing, and exchange of agricultural information that are relevant, accurate and useful for decision makers. Moreover, there is no clear policy for recruiting new IT specialists, particularly within the public sector as compared to the private sector.

5. Required support to improve ICT/M in the future

Donor agencies and external support could play an important role in facilitating the development of agricultural information systems in Yemen. Based on the above analysis of information systems, there is a need for external assistance in the following areas:

- Institutional capacity building and staff training in information systems' development through TCP projects.
- External support in mobilization of financial and human resources to support building a comprehensive agricultural information system.
- Technical support in the development of sustainable links with regional and international agencies related to ICT support and development.
- Encouraging advocacy activities and exchange of ICT successful stories between member countries.

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