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Australian Centre for International Agricultural Research

Final report

project

Egypt-Australia on-farm water use efficiency and water management workshops

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prepared by	Dr Fawzi Karajeh, Nile Valley and sub-Saharan Africa Regional Program (NVSSARP), ICARDA
co-authors/ contributors/ collaborators	Dr Theib Oweis, Director of the ICARDA's Integrated Water and Land Management Program, ICARDA
approved by	Dr Evan Christen, Research Program Manager for Land and Water Resources, ACIAR
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1 List of acronyms

ACIAR	Australian Centre for International Agricultural Research
BCWUA	Branch Canal Water User Association
BOD	Bio Oxygen Dissolved
CA	Conservation Agriculture
CGIAR	Consultative Group on International Agricultural Research
Egypt ARC	Egypt Agriculture Research Center
Egypt NWRC	Egypt National Water Research Center
ET	Evapotranspiration
EWUP	Efficient Water Use Project
GAIN	Global Agricultural Information Network
GDP	Gross Domestic Production
GHG	Greenhouse Gas
ICARDA	International Center for Agricultural Research in the Dry Areas
IIIMP	Integrated Irrigation Improvement and Management Project
IIP	Irrigation Improvement Project
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
MWRI	Ministry of Water Resources and Irrigation
NARS	National Agricultural Research Systems
NVSSARP	Nile Valley and sub-Saharan Africa Regional Program
RBP	Raised Bed Planting
SIWARE	Simulation of Water Management in Arid Regions
USAID	United States Agency for international Development
USDA	United States Department of Agriculture
WBM	Water Benchmark Project of ICARDA
WLI	ICARDA's Water Livelihoods Initiative
WP	Water Productivity
WUA	Water User Association
WUE	Water Use Efficiency

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2 Acknowledgments

This project would not have been possible without the support of many people. ICARDA wishes to express its gratitude to ACIAR for its financial and technical support that helped to facilitate the participation of 5 Australian scientists. Dr Ian Willett was very helpful and offered invaluable assistance, support and guidance to the development of the project document and its implementation. Deepest gratitude is also due to Drs John Dixon Andrew Noble as well as Mr Brendan Brown of ACIAR for their invaluable assistance to execute the terms. Many thanks to the Egypt-ICARDA- Australia on-farm water use efficiency and water management workshop on their direction, knowledge contribution, and assistance throughout the preparation and the implantation of the workshop.

ICARDA would also like to convey thanks special thanks to our Egypt partners including the staff of the Agriculture Research Center of the Egypt Ministry of Agriculture and Land Reclamation and National Water Research Center Ministry of Water Ministry of Water Resources and Irrigation for their invaluable contributions throughout the project implementation.

3 Executive summary

Ninety-seven precent of Egypt's population occupies only five precent of the country's land in the Nile Valley and Delta, which are among the world's most densely populated areas. Creating viable livelihoods for a rapidly growing population in an arid climate is one of Egypt's major challenges. The Nile Delta covers an agricultural area of approximately 2.5 million ha irrigated from a dense network of waterways, including 40,000 km of canals that branch off the Nile River and convey water to over 2 million farmers across several nested geographic scales and institutional levels. Conventional irrigation efficiency is low: conveyance and distribution efficiencies do not exceed 70% and farm-level efficiencies average a mere 50% with applications levels often exceeding crop and leaching requirements. However, the intensity of water reuse in the delta drastically increases macro-level efficiency.

Food security has become an issue of prime political importance, and agricultural expansion is increasing the pressure on the country's limited water resources. Almost all agricultural production in Egypt depends on irrigation from the Nile, and a major limitation to production is the limited and occasionally irregular supply of irrigation water of sufficient quantity and quality to all farmers sharing one irrigation branch. Agriculture remains a significant driver of Egypt's economy and accounts for 15% of GDP and employs a third of the total workforce. It is the dominant user of water, consuming approximately 85% of total demand. With a current population growth rate of 2.1%, concern over a growing dependency on food imports and the need to compensate for the loss of highly productive agricultural land associated with urbanization, the Egyptian Government has pursued a strategy of *vertical expansion*, (i.e. intensification in existing cultivated lands) and *horizontal expansion* into the desert ('New Lands'), which is predicated upon better management and water savings in the 'Old Lands'.

The government's water sector strategy focuses on increasing irrigation water availability primarily through increasing the efficiency of water use, minimizing water loss by upgrading and rehabilitating water delivery and drainage systems and improved drainage water reuse programs. ICARDA's scientists are working hand-in-hand with Egypt Scientists on several food security related projects.

Although the Egyptian irrigation sector has strong policy, educational, and business links with North America and Europe, the experience of ICARDA scientists for over 30 years in Egypt and elsewhere with similar agroecologies of irrigated agriculture, and Australian scientists in water and salinity management at a range of scales, including the management of the Murray-Darling Basin (MDB), are also considered to be particularly relevant to water management and quality issues in Egypt. Following initial high-level consultations between ACIAR and Egyptian research managers, it was decided further interactions are necessary to develop a better understanding of the priorities concerning farm-level water management and to familiarize selected Egyptian officials on the reforms and management of water in the MDB. The proposed project aimed to build on relevant on-going activities of the Egypt's Agricultural Research Centre and ICARDA, and identify areas where Australian scientists have a comparative advantage and can contribute needs to be highlighted, particularly in relation to the follow up research project concepts.

With an overall objective "to increase on-farm water use efficiency" two major activities were proposed:

a. A knowledge exchange workshop on the technical aspects of on-farm water use efficiency to be convened in Egypt (Appendix 11.4). The purpose will be to identify key areas for irrigated agricultural research in the medium and longer term. We know that there are a variety of water measurement techniques and on-farm level management practices which complement the irrigation, soil, and agronomic best management practices which lead to greater water use efficiency. The workshop focused on improving the on-farm water-use efficiency under the three main farming production systems: old lands, new lands and reclaimed/salt-impacted lands. It identified major challenges and potential opportunities for Egyptian irrigated agriculture. Over sixty key scientists from ACIAR, Egyptian NARS and ICARDA, along with other specialists representing key stakeholders participated in the

workshop. The duration of the proposed workshop was 4 days (including a one-day field trip). The workshop succeeded to exchange knowledge on on-farm water management among the Australia, ICARDA and Egyptian scientists and identify ways in which Australia and ICARDA expertise could be of benefit to improving these practices with consideration to SADS-2030.

Four whitepapers were prepared in order to facilitate the discussions during the technical workshop 26-29 July 2011; these are:

- Farm-level water management: Opportunities and challenges in the oldlands of Egypt.
- Farm-level water management: Opportunities and challenges in the reclaimed/salt-affected lands.
- Farm-level water management: Opportunities and challenges in the new lands.
- Water resources of Egypt – technical, institutional, and policy aspects: Availability and allocation.

The workshop and after three days of deliberation produced three concept notes for potential collaborative work in Egypt in the coming few years.

b. A learn-by-seeing travelling workshop (Appendix 11.2). The importance of a variety of non-technical drivers of on-farm water use efficiency producer incentives/disincentives for water use efficiency is recognized. Institutional, water practitioners and water policy specialists from Egypt to get familiarize with water districts' technical and policy related to water planning, allocation, and policies. The delegation consisted with high end water managers and policy makers representing the Government of Egypt: Ministry of Agriculture and Land Reclamation and the Ministry of Water Resources and Irrigation accompanied by the ICARDA's Regional Coordination for the Nile Valley and sub-Saharan Africa Region. The travelling workshop was implemented in close coordination and collaboration with ACIAR on 3-15 October 2011.

Land and water management practices are closely linked to the way people work and interact together and to institutions in general, including sets of formal/informal rules and practices. These practices, in turn, determine the patterns of water use both in quantity and quality and governs which sources of water are tapped; the efficiency of water use at different scales; the spatial distribution of shortages in supply; the magnitude of the different return flows; the amount of salts applied and removed from fields; the spatial and temporal variation in salt contents; and the suitability of drainage water for reuse. The most salient characteristic of the Delta, and the source of much complexity in managing land and water resources, is the **interconnectedness** between users and managers across a maze of waterways.

There are several constraints that need to be addressed in order to achieve sustainable increases in water productivity and water use efficiency at different scales in the Delta. These include identifying appropriate and sustainable technical options for optimizing water use that are acceptable to Egyptian farmers with small-to-medium sized holdings. However, farm-level or secondary/tertiary level improved practices that reduce water abstraction and/or modify the dynamics of salts must be designed and assessed taking into account their implications upon other scales. The integrated understanding of water and salt movements along a cross-section linking rice cropping areas, aquaculture, and finally the lagoon, and of how water quantity and quality are interlinked, is necessary to ultimately assess both 1) whether/how water can be potentially saved and redistributed to New Lands; and 2) the level of outflow to the sea that is necessary to flush out salts and sustain productivity in the rice areas, the fish ponds, and the lagoon.

Based on the above major activities through this project, a Project concept note was developed and submitted to ACIAR. The concept note entitled "*Management of water and salinity in the Nile Delta: A cross-scale integrated analysis of efficiency and equity issues*" The objective of the concept note is for a project with objectives to identify, study, and propose sets of improvements and interventions, both physical and institutional, at a range of scales (farm to meso-level), that are

sound, attractive and cost-effective at the scale/actor at which they are adopted, but also consistent with other scales, and do not produce effects that are in contradiction with other policy objectives, or have unforeseen negative externalities that propagate across the multi-level water system.

4 Introduction

97% of Egypt's population occupies only 5% of the country's land in the Nile Valley and Delta, which are among the world's most densely populated areas. Creating viable livelihoods for a rapidly growing population in an arid climate is one of Egypt's major challenges. Food security has become an issue of prime political importance, and agricultural expansion is increasing the pressure on the country's limited water resources. Almost all agricultural production in Egypt depends on irrigation from the Nile River. The three agricultural production systems of Egypt are outlined in table 1.

Table 1: The three main agricultural production systems in Egypt

Classification	Floodplains (Also known as the Nile Delta or the old land)	Rainfed areas	Newly reclaimed and salt affected lands
Location	Along the Nile floodplains	Northern coast and Sinai	Central plains
Information	Produce most of the country's food	Important to stabilize/improve the livelihoods of rural inhabitants	Semi-desert areas are being converted to farmland through large-scale irrigation schemes-horizontal agriculture expansion
Issues	Improving on-farm water management by • lowering water tables • decreasing salinity • improvement and development of irrigation and drainage practices and networks, • introduce, test, and evaluate improved cultivars and agronomic practices	• soil erosion • poor soil fertility • drainage and crop systems management • controlling salinity • introduce an adaptive cropping system • climate variability and change • economic increase of rainwater harvesting	• poor soil fertility, • crust formation, • low water-holding capacity • salinity build-up in some areas • helping farmers and farm women to add value to their products and increase their income

Cross-cutting issues include water valuation, water allocation policy, building and enhancing water user associations and product marketing associations, market chain development and access to credit.

The government's water sector strategy focuses on increasing irrigation water availability primarily through increasing the efficiency of water use, minimizing water loss by the upgrading and rehabilitating the traditional surface irrigation systems, water delivery, and drainage systems and improved drainage water reuse programs. The government's agricultural sector strategy, on the other hand, focuses on land reclamation; crop development and improvements; crop diversity; and export promotion.

Egypt faces several challenges relating to water resource management for irrigation. These are the improvement of inefficient traditional surface irrigation systems in the old land, annual reductions in water availability per capita due to population expansion; soil and water resources degradation related to excessive irrigation; the need for cropping systems that rationalize the use of water; mismanagement and misdistribution of the open canal system; multiple supervision of the water distribution in the old lands by users and beneficiaries associations; and the projected/emerging environmental pressures in terms of natural resources, climate variability, and change.

The government of Egypt is targeting about 2 million hectares of the surface irrigated land for on-farm water management improvement through strategic national projects. This is planned to be done by deploying improved on-farm irrigation systems (laser levelling, gated pipes) and modified practices for better surface irrigation, including raised-bed planting; applying localized irrigation in fruits and vegetables fields; applying water according to crop requirements based on climatic conditions; and improving irrigation management at the on farm level (irrigation schedule based on soil- water relations, deficit irrigation, alternate furrow irrigation, raised bed irrigation, and surge irrigation, etc.)

Egypt through its national agricultural research systems, and in coordination and collaboration with regional and international research institutions such as ICARDA, has over the past two decades conducted work to develop and/or improve agriculture systems. These efforts include crop improvements, better and more efficient irrigation methods and systems, and better soil, crop, and land management practices. Furthermore, on the water delivery front Egypt has come a long way in improving the flexibility of the distribution irrigation water to irrigated land. Nevertheless, there are substantial opportunities to improve the effectiveness of on-farm water management and off-farm water management. Over a similar timeframe Australia has introduced technical and institutional water management reforms and Australian specialists can contribute this expertise to the context of Egyptian agriculture and water management. While Australian agricultural assistance could be done through various means, ACIAR proposes to capitalize on ICARDA's established partnerships with Egyptian agricultural systems and, as a first step, conduct a consultative information exchange workshop. The proposed workshop, in addition to information exchange, would open a dialogue between selected scientists from Egypt, ICARDA and Australia to workshop priority areas for further research that may be suitable for Australian assistance. We will develop concept notes for the top two to four research priorities that could be conducted in the coming few years in defined areas of Egypt. In addition to the technical workshop, a travelling workshop to selected water districts/basins in Australia will be conducted after the technical workshop to familiarize selected Egyptian professionals on the reforms in water management in the Murray-Darling Basin.

ICARDA will capitalize on its extensive experience in Egypt and propose a new research that complements its past and on-going activities. These include ICARDA/ESCWA joint work on empirical estimates to on-farm WUE in Egypt. Testing and evaluation of on-farm level interventions showed irrigation water consumption on farmers' fields fell by about 30%, with correspondingly reduced pumping costs. Labour costs for land preparation, irrigation and weed control fell by 35%. Yields were the same or higher than the conventional system, and farmers' net income increased by 15%. Crop water productivity increased by over 30% and the net return per unit of water was 20% higher than for conventional irrigation. The package was transferred to farmers by national counterparts through field visits, farmers' field schools, workshops, meetings with development technicians, policy makers, and publications. Most farmers in the Benchmark communities and neighbouring communities have already adopted the new package. Other development projects in Egypt have adopted the package including; The East Delta Rural Development Project financed by IFAD and the World Bank, The Crop Intensification Project of Middle Egypt financed by IFAD and the Water Management Improvement Projects in Behaira and Sharkieh Governorates. The national extension system is transferring the package to six additional governorates in Egypt. Thus, project interventions, originally tested at a few pilot sites, are being rapidly scaled out over a large area by a range of partners, leading to substantial impacts on water productivity and farm incomes.

The collective ACIAR, Egypt NARS, ICARDA, and other stakeholders' experiences in the subjects of concern should lead to the identification of two to four potential research projects that are built on the experience, to further improve and advance irrigated agriculture production systems of Egypt. The anticipated research efforts could also benefit other countries elsewhere with similar agroecology conditions and will help advance the biophysical sciences related to intensive agriculture production systems under scare water resources conditions.

5 Egypt-ICARDA- Australia on-farm water use efficiency and water management workshop

Following a high-level Australian delegation mission to Egypt on 24-27 March 2011, representing AusAID and the Australian Centre for International Agriculture Research (ACIAR), and after consultations between the delegation mission members, Egyptian scientists, research managers, and decision makers, as well as a discussion with ICARDA's scientist and Management, it was decided that further interactions are necessary to develop a better understanding of the research for sustainable agricultural development priorities processes in comfortable with the Sustainable Agricultural Development Strategy towards 2030 (SADS-2030) of Egypt . The focus was on farm-level water use efficiency improvements to the main irrigated agriculture in old and newly reclaimed areas of Egypt, an area identified during preliminary discussions. The discussions took into consideration the Egypt Sustainable Agriculture Development Strategy towards 2030 published in 2009. The workshop started with a field trip on 26 July to the newlands and followed with two days deliberation , 27-28 July, and then with a focused outcome review and concept notes development session on 29 July 2011 .

Objectives of the workshop

1. Exchange knowledge of water and land management at the farm level between Australia, Egypt, and ICARDA and identify ways in which Australian and ICARDA expertise can be of benefit to further improve the on-farm irrigation practices in Egypt.
2. Identify subjects that may form the basis for collaborative research program in Egypt for the coming few years.

Field visit to West Noubaria, 26 July 2011

This area, 50 km southwest of Alexandria, was selected to show the Australian participants examples of "newlands". The area is sandy, very gently undulating to flat, agricultural land developed by extending irrigation canals westward from the main Nile Delta, referred to as "horizontal expansion". Water is pumped from main supply canals to raise it by as much as 60 m. Water is supplied to a group (usually of 8) of small farms (about 20 acres in total) by an electric pump. At Mahmoud Refat Village the main crops were drip irrigated young orange trees intercropped with impulse sprinkler irrigated peanuts. Other crops included vegetables and fruits, and judging by the passing trucks, tomatoes and cucumbers are significant crops. These small (1 to 2.5 feddan (feddan: An Egyptian unit of land area equal to about 0.42 hectare or 1.038 acre) farms were allocated to graduates as part of a government job security scheme. Larger farms (50 to 300 feddan) are cultivated by "investors", and there were some very large companies with cold storage and QC processes for export of fruit and veg to Europe. Mango and other tree crops are common. Fertigation is practised in larger farms. A local farmer nominated reliability of water supply was his biggest problem, though he was not too badly affected as his farm is the nearest to the supply. In general the nutritional status of the crops looked quite good, though poor nodulation of peanuts was apparent.

It was clear that small land holdings are a serious impediment to improving irrigation development, and land fragmentation will continue because of traditional inheritance practices. From observations and discussions produced the following ideas: improvement of irrigation/fertigation in reclaimed sandy areas for intensive horticultural crops, the application of conservation tillage concepts to new lands, and to wide-spaced narrow-furrow (wide raisedbed) systems already showing promises in field crops on heavier land (Appendix 11.1).

Workshop sessions 27 and 28 July 2011

The workshop (Agenda in Appendix 11.5) was attended by 59 participants comprising Egyptian scientists and other professionals, as well as media, 6 Australian scientists, several ICARDA scientists and management team members, and invited guests representing regional international agencies (i.e. FAO and IDRC) (Appendix 11.5). Strong official support was evidenced by the presence of Dr Salah Abdel-Momaen, the new President of Egypt ARC, Ms Stephanie Shwabsky, the Australian Ambassador to Egypt, Dr Mahmoud Solh, ICARDA's Director General, and Salah Yousef Farag, Minister, Ministry of Agriculture and Land Reclamation. The opening of the workshop was one of the first duties of the new Minister. His speech emphasized food security.

In his inaugural address Adel El-Beltagy emphasized the Delta's vulnerability to climate change, sea level rise as well regional projections for drier climates, biofuel production at the expense of food production, the development of aquaculture for protein production in the Red Sea coast area, rationalization of water and land use to improve water productivity, and hydroponic production technologies. He also mentioned the unacceptability of water pricing and suggested that taxes on crop types may be an acceptable alternative. He questioned the wisdom of (and by implication the direction of research) using water in the upstream Toshka development as the area has shallow soils and extreme summers, so that returns to water would be more valuable elsewhere. This paper, and the four "whitepapers" presented during the first sessions are:

- *Farm-level water management- opportunities and challenges in the Egypt Delta's Oldland (Drs Abdel Ghany El-Gindy and Said Abed El-Hafez)*
- *Farm-level water management- opportunities and challenges in the Egypt Delta's reclaimed/salt-affected land (Drs Samir Abou Suleiman and Mahmoud El-Kohly)*
- *Farm-level water management- opportunities and challenges in the Egypt Newland (Drs Abdel Aziz Sheta and Hamdy Khleifa)*
- *Water resources of Egypt– Technical, Institutional, and Policy Aspects: availability and allocation (Dr Dia El Quosy)*

It was decided to avoid repetition of information and have the whitepapers complementing each other in terms of the information presented; the above whitepapers were used in developing a standalone comprehensive technical paper focusing on water use efficiency (Appendix 11.7).

In his talk Dr Abdel Ghany El-Gindy on 'Farm-level water management in the Delta's Oldlands' he described recent development activities. Its first phase included pilot farms and the development of extension services. UC Davis trained 75 Egyptian extension staff. A second phase includes refurbishment of tertiary (mesqa) and field channels (marwa) and subsidies for irrigation and farm equipment, including laser leveling. He mentioned USD 100m support from the World Bank, and discussions for USD 250m from the African Development Bank. A possible project to support these development projects is one that updates natural resource information with GIS and satellite imagery.

Dr Samir Abou Suleiman of the Executive Authority for Land Improvement (EALIP) presented on soil salininisation. EALIP has been equipped with heavy machinery to address salinity problems. He identified the northern delta areas as those most affected by salt and waterlogging. Implementation activities include application of gypsum, sub-soiling, and clearing of water courses. GIZ is supporting work on measurements of water flows and CIDA is supporting lining of marwas (50% subsidies are provided to farmers). Dr Mahmoud El-Kohly is responsible for development work in the north eastern delta, and this was later promoted as the priority area for research.

Abdel Aziz Sheta presented on the newlands emphasizing the need for expansion of irrigated land to keep pace with the increasing population. As noted during the field visit the area is

characterized by sandy soils in the area of the Noubaria Canal extension, and the introduction of new farming practices by new graduates and small and large investors.

Dr Dia El Quosy made a presentation on the water resources of Egypt noting that there are 9 countries in the Nile Basin, including South Sudan, and the consequent uncertainties of long term supplies, as well as those arising from climate change. Water pricing was said to be unacceptable in agriculture, and discussing it was even discouraged before the 25 January "revolution". One potential research area is the re-use of waste waters including agricultural drainage and urban sewage.

During the panel session two farmers (one female) called for improved seeds, improved fertilizer use, improved extension services, and improved linkages of farmers to markets. A research idea emerging during the panel session included improved tools for planning purposes (GIS based). The subject of consolidation of fragmented land did not emerge but I suggest that some work could be done to demonstrate the costs and benefits of land consolidation with laser leveling and improved water infrastructure to at least start thinking and policy advice in this direction. Likely downsides are loss of crop diversity and reduced capacity for farmers to respond to market forces for products.

On the second day of the workshop (28 July), the participants were divided into three groups (old-land, new-land and salt-affected land). Each working group comprised scientists from Egypt, Australia, and ICARDA. I joined the salt-affected soils group. Discussions were around the northern Delta where rice and sugar beet are grown in saline areas, with limited irrigation water supply, shallow water tables and heavy soils. Rice is grown after puddling, so switching to dry seeded rice would be an obvious mean of saving water. This would entail land leveling and again invokes the problem of the small size of land holdings. Where there is insufficient water for rice, cotton, maize, seed melon, soybean or sunflower may be grown. Lucerne, Berseem or sugar beet are grown in winter. The hard pan developed by wet cultivation for rice results in shallow rooting of other crops.

Dr El-Kholy is responsible for the East Delta Project near Port Said. He suggested research support for the ongoing development projects there. The project area has around 250,000 feddans (of salt-affected alkaline land and no effective drainage. He suggested the usual amendments of gypsum, fertilizers and manures, but there was a consistent message that farmers' skills need improvement.

John Blackwell promoted the use of serial (or sequential) biological concentration (SBC) for use in the most saline land. SBC units would be about the size of one or two mesqas, and would need coordination of up to about 50 families for real world application. Some of those would be at the end of the SBC unit and would be subject to deliberate salinization, so that would not be acceptable to some landholders. Research that requires cooperation amongst adjacent landholders, leveling with better irrigation and cropping, with some elements of SBC, could be done on government owned land to demonstrate benefits (and estimation of the costs), but would have to explicitly address formation of farmer cooperative action.

The outputs of the three working groups were written up as three concept notes (Appendix 11.6). These were refined on the 29th July and again by iterations between me and Fawzi – current drafts are attached. They remain very broad and in fact ICARDA wanted to combine them all into one huge proposal to ACIAR. There seemed to be resistance to making the proposals more specific and targeted, probably to in an attempt not to restrict funding requests. In my opinion there is scope for research on:

1. Introducing conservation tillage approaches into oldlands area based on the narrow furrow/broad bed work that is already being adopted and promoted in other projects. Such a project could specifically address water use and drainage, salt management, crop rotations, and mechanization and financial aspects. Potential participants: ARC, ICARDA, USQ (McHugh), CSU (Blackwell), NSW DPI (Jackman).

2. One thing not discussed was the assumption that water saved on-farm could be used effectively elsewhere, and it would be instructive to examine water at a meso scale to determine how much of the water that is saved at farm scale can be made available to other crops (i.e. is water saved by reducing delivery to farms used effectively, or more effectively, than water draining from farms at the surface or via groundwater). Potential participants: WMRI, IWMI, CSIRO

3. The costs and benefits of cooperative farming approaches, involving leveling and improved on-farm water distribution and cropping practices, with some elements of SBC, could be demonstrated as a means of motivating farmers and policy makers to introduce some form of cooperation for land and water management. That is, if it is shown to be very attractive then there may be some hope of its introduction by groups of farmers. Potential participants: ARC, ICARDA, UWA (Camkin, Barrett-Lennard), CSU (Blackwell), CSIRO (Griffith).

Focused deliberation session, 29 July 2011

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6 Murray Darling Basin Egyptian Travelling Workshop

The objective of the workshop was to familiarize selected senior Egyptian officials, and Dr Fawzi Karajeh representing ICARDA, with the reforms to water management in the Murray Darling Basin. The learning-by-seeing activities of the workshop were conducted on 3-15 October 2011. The trip to Australia included visits to Canberra, the Snowy Mountains, Griffith, Mildura, Loxton, and Adelaide. The visit allowed the delegation to gain an overview of water and agriculture management and the associated institutions from the basin level to the end user. Visits were organized to farmers and statutory water R&D organizations. The latter included the ACIAR office, the National Water Commission, the Australian National University, CSIRO Water for a Healthy Country Flagship, a commercial water association, Mallee Catchment Management Authority, Rural Solutions, South Australia Research and Development Institute, and the University of Adelaide. The Egyptian participants in the travelling workshop were:

No.	Name	E-mail	Field of work	Affiliation
1	Essam Eldin Abdelmonem	Ewasif@hot mail.com	Senior Machinery and Water Specialist	Egypt ARC
2	Hamdy Khalifa	hekhalifa@yahoo.com	Senior Soil and water management Specialist	SWERI-Egypt ARC
3	Ahmed Gamal Eldeen	resext_arc@yahoo.com	Senior Extensionist	Vice President of Egypt ARC
4	Hany Mohamed Ramadan	h_m_ramadan@hmail.com	Soil and Water Management Specialist	Director, SWERI-Egypt ARC
5	Salah Eldin Helal	shm744@yahoo.com	Farm Management	Director, ARC
6	Abdel Aziz Abdelnaby	abdelaziz.abdelaziz56@yahoo.com	Field crop researcher	Director, Field Crop Research Institute-Egypt ARC
7	Mohamed Samir Abo Soliman	m_abosoliman@yahoo.com	Irrigation Management	Director, Irrigation Management, ARDC
8	Diaa El-Qousy	lmewp@menanet.net	Water Policy Advisor	WMRI
9	Fawzi Karajeh	f.karajeh@cgiar.org	Water Management	ICARDA

7 Achievements against activities and outputs/milestones

Objective 1: Egypt-ICARDA- Australia on-farm water use efficiency and water management workshop

no.	activity	outputs/ milestones	completion date	comments
1.1	Egypt-ICARDA-Australia on-farm water use efficiency and water management workshop	1. Filed visit to Egypt newlands 2. Four draft whitepapers 3. Three draft concept notes	26-29 July 2011	

Objective 2: Murray Darling Basin Egyptian travelling workshop

no.	activity	outputs/ milestones	completion date	comments
2.1	Murray Darling Basin Egyptian travelling workshop	1. Knowledge exchange meetings 2. Filed visits 3. Three draft concept notes	3-15 October 2011	

8 Key results and discussion

The project facilitated the exchange of information between Egyptian, Australian, and ICARDA scientists on on-farm water use efficiency through the two focused activities: a knowledge exchange workshop on the technical aspects of on-farm water use efficiency convened in Egypt during the period 26-29 July 2011; and a learn-by-seeing travelling workshop to Australia that helped to get Egyptian senior officials familiarized with water districts' technical and policy related to water planning, allocation, and policies.

This project succeeded in:

1. Making an assessment of past and current research of on-farm water management and closely allied subjects; and identify research areas that may benefit from Australian support
2. Familiarizing selected senior Egyptian officials with the reforms of water management in the Murray-Darling Basin.
3. Publishing a standalone comprehensive technical publication addressing Egypt's water and agriculture.

9 Impacts

9.1 Scientific impacts – now and in five years

The set of actions detailed above provided an understanding of interconnected processes of the main agriculture production systems in the Egypt's Delta. This understanding will contribute to the interested parties' knowledge and help design a needed research priorities that lead to advancement with regard to the on- and off- farm practices and interventions that optimise the use of land and water resources under the biophysical and policy constraints facing agriculture in the Delta.

The information generated through the two main activities of this project: Egypt-ICARDA- Australia on-farm water use efficiency and water management workshop and Murray Darling Basin Egyptian Travelling Workshop should help to identify subjects that may form the basis for collaborative research program in Egypt for the coming few years. One agreed upon concept research was to study the interactions between water quantity and quality on the supply side and appropriate interventions aim at increasing the efficiency of resource use and the uniformity/equity of distribution, under constraints of multiple reuse/recycling, limited overall supply and degraded water quality.

9.2 Capacity impacts – now and in 5 years

Over 100 individuals benefited technically from this project. Fifty nine participants comprising Egyptian scientists, farmers and other professionals, as well as media, 6 Australian scientists, several ICARDA scientists and management team members, and invited guests representing regional international agencies (i.e. FAO and IDRC) attended the on-farm water use efficiency and water management workshop 26-29 July 2011. Over 40 individuals comprising technical, educators, and 9 Egyptian decision makers benefited from Murray Darling Basin Egyptian Travelling Workshop.

The project provided immediate and potential opportunities for young agricultural professionals to become engaged in the agricultural sector through hands-on training and project-relevant professional development. Farmers and scientists' capacity and knowledge was enhanced through the field visits in Egypt and Australia. The relevant decision-makers were involved in the production of knowledge and travelling workshops.

9.2.1 Community impacts – now and in 5 years

The project provided no immediate impacts on communities. Potentially, however, the project generated as a result of this project is expected to have positive impacts on the community.

9.2.2 Economic impacts

The project provided no immediate economic impacts. Potentially, however, the project generated as a result of this project is expected to have positive impacts on the farmers' income and the national economy.

9.2.3 Social impacts

The project provided no immediate social impacts. Potentially, however, the project generated as a result of this project is expected to have positive impacts on the farmers' income, in turn, positive social impacts.

9.2.4 Environmental impacts

The project provided no immediate impact on the environment. Potentially, however, the project generated as a result of this project is expected to have positive environmental impacts.

9.3 Communication and dissemination activities

The project provided an opportunity to over 100 individuals to learn about the water management issues in the Nile River Delta of Egypt as well as knowledge and understanding on water management advancement achieved on the micro and macro-level in Australia through the visit to Murray Darling Basin.

10 Conclusions and recommendations

The small grant project succeeded to understand the challenges and opportunities of/for agriculture production systems of the Egypt Nile Delta. The grant helps to advance the communication among farmers, extortionists, researchers, scientists, and decision makers from Australia and Egypt. This led to the development of a concept note that helps to answerer important questions. Including:

- What are the cross-scale interactions and the impacts at other levels of water interventions designed at one particular scale?
- What is the importance of collective action and actors' coordination in the degree of correspondence achieved between supply and demand, and associated water-use efficiencies and distributional equity?
- What are the multi-scale, spatial, and temporal patterns of salt mobilisation and transfers in the delta, and what are their key determinants?
- How do varied plot-level interventions modify the salt and water balances and how do these impacts scale up?
- What is the range of conditions under which the combined sustainability of lake fisheries, aquaculture and rice cultivation can be achieved, while maximising overall water-use efficiency?
- How can the minimum environmental flow out of the delta be redefined when considering salt flushing, aquaculture and lake fisheries needs and what is the fraction of water that can be safely diverted to Newlands?
- What are the appropriate on-farm irrigation, crop or land management systems best suited to the farmers' production systems in the Oldlands?
- Is there a community-based approach to ensure sustainable agriculture and overcome the negative effects of salinity build-up?
- What is the potential for conservation agriculture in increasing land and water productivity at the plot level? What are the best crops and rotations that can be used sustainably under irrigated technologies? What are the soil-borne issues that limit the wider use of CA in the Oldlands?

The project therefore was a success in developing a participatory mode of communication and a deliberation mechanism among all stakeholders to better understand the problem facing agriculture production in an area; the Nile Delta of Egypt in this project. Thus, it is recommended to have A knowledge exchange workshop on the technical aspects approximately every five years.

11 Appendixes

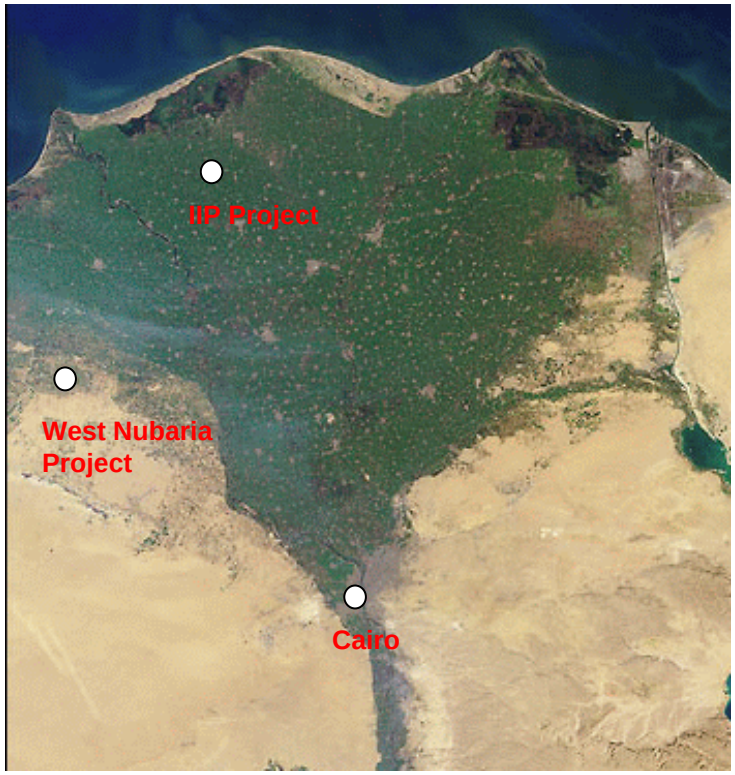
11.1 Appendix 1: Egypt –ICARDA--Australia On-farm Water Use Efficiency Management's Field Trip 26- July 2011

ICARDA
إيكاردا

INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS
المركز الدولي للبحوث الزراعية في المناطق الجافة

Australian Government
Australian Centre for International Agricultural Research

Date of events	26 July 2011: Field trip: Cairo → Noubaria (Alexandria Governorate) → Sidi Salem (IIP Project; Kafr El-Sheikh Governorate) → Cairo



First Stop: West Nubaria Project

West Nubaria Project is selected as a representative site of the new land. Nubaria canal is the main source of irrigation water of West Nubaria project area (which borders the delta on its western side at Behaira Governorate) through several successive elevations by pumping stations and distribution through lined elevated primary and secondary canals: these feed into tertiary open canals (mesqa) in El Bustan district; and into underground pipes in Tiba district.

An electric pump-set then delivers water from mesqa/pipes and serves an area of 20 feddans that is cultivated by either 8 “beneficiaries” (muntafi’in; 2.5 fed each), or 4 graduate (5 fed. each), or one investor. Some of these tertiaries may serve up to 18 pump-sets along the mesqa line.

These collective pumping stations were initially designed to supply movable lines of sprinklers, with one or two out of 4 farmers (in the case of graduates) being able to operate at a given time. With time, many farmers have shifted to fruit trees and increased vegetable production, both being irrigated with drippers. This change includes several benefits: a) a higher income linked to the production of higher value crops; b) easier farm operations and less burden with manipulating the lines of sprinklers; c) a reduced abstraction of water, which has greatly reduced the tension and conflicts at the station and tertiary levels. But such a change is predicated upon 1) a higher availability of capital (both to invest in the system, wait for the trees to reach production stage –although intercropping is often practiced in the meantime, and deal with higher uncertainty in both production and prices, especially for vegetables); 2) a higher availability/ predictability of water supply (optimum irrigation of trees and vegetables in summer requires frequent turns, unlike crops like spring wheat, water melon or groundnut that are quite typical of the areas with poorer farmers and/or water supply).

Therefore, there is a strong linkage between the characteristics of water delivery at the head of the tertiary canal and the ability to diversify and raise water productivity at both the plot and scheme levels. In turn, the cropping pattern within this tertiary, dictates the overall demands (with drip systems limiting ‘demand’).

Facts about West Nubaria Project

The West Nubaria Project, situated some 50 km southwest of Alexandria, covers an area of approximately 208,000 ha representing 40 percent of all the new lands whose reclamation has been made possible by the construction of the Aswan High Dam. At present some 25,000 ha of the area are either being cultivated or are under reclamation.

The Nile water is delivered to the north-western part of the Delta through two large main canals: Rayah El Behera and Nubaria. In connection with the new west Nubaria project, these canals are insufficient. Investigations have indicated the possibility of using the Nubaria, after some modifications, as a carrier for water requirements of the west Nubaria project. Side by side with reclamation processes, the widening of the Nubaria Canal was initiated. It remains only to determine the method of supplying the Nile water from the Rosetta branch to the Nubaria Canal.

The Ministry of Irrigation has conducted several studies to determine the most feasible solution. Four alternatives were considered:

(i) construction of a new barrage on the Rosetta Branch near Kafr El Zayyat;
(ii) widening of the Rayah El Behera to hold the extra water required for reclaimed areas;
(iii) construction of a pumping station at Zawiet El Bahr, to feed Rayah El Behera with the excess water requirements;
(iv) construction of a new canal Rayah El Nasseri parallel to Rayah El Behera.

Each alternative was considered in detail, including studies of side effects and advantages. Among the most important factors studied were:

(i) the effect of the construction of a new barrage on the water table conditions in the Delta, and the cost of the corresponding drainage precautions;
(ii) socio-economic impacts on people living in the area to be occupied by widening of existing canals or constructing new ones;
(iii) improving irrigation conditions in certain parts of the central Delta;
(iv) guaranteeing navigation in the Rosetta Branch.

It was finally decided that the proposal of constructing a new barrage should be rejected due to the impacts of such a barrage on raising the water table levels in a considerable part of the Delta. The proposal of constructing a new big canal parallel to Rayah El Behera was adopted and the construction of this canal was completed in 1971.

The Rayah El Nasseri runs almost parallel to Rayah El Behera for a stretch of 56 km through a newly constructed channel. Then the next 25 km pass through an old canal course followed by a new reach of 2 km, which terminates in the Nubaria Canal.

The Nubaria water level is 4 to 5 m above sea level. Since the project area west of the canal rises gradually to elevations as high as 10 to 60 m above sea level, all the water needed is pumped by a series of electrical pumping stations which are interconnected by the Nasser lined canal. Irrigation water is then distributed by a series of branch canals and some secondary pumping stations.

The Nasser Canal is partially constructed and will have a capacity of 116 m^3/sec. A total of five pumping stations will be built, three of which have already been completed and put into operation. These pumping stations will eventually lift the water from the Nubaria Canal to a maximum elevation of 60 m above sea level. The total length of the canal is 150 km.

The groundwater levels were at a depth of 20 to 60 m when land reclamation in the area started in 1968. It was thought at that time that groundwater problems would not be experienced for a long time. Groundwater studies on a large scale were postponed to a later date after the major reclamation works were to be completed. But very soon after irrigation took place in 1968, a rapid rise in water tables and severe groundwater and salinity problems were reported. The water table gradually rose in some areas to less than 2 m below the ground surface. Over a period of three years, the water table rose 12 m or an average of 4 m per year. High electric conductivity values (as high as 32,000 micro mhos/cm) have been reported in some wells, the major components being Na, Mg, Cl and S04. This saline groundwater started to flow towards the Nubaria main irrigation canal. Outflow of saline groundwater into some of the principal irrigation canals also took place.

The problems were thoroughly investigated and it was found that the main reasons are:

(i) over-irrigation;
(ii) seepage from the main canals and the conveyance system;
(iii) the presence of gypsum layers close to the soil surface in many parts of the area.

An interceptor drain was dug parallel to the canal and a short distance from it to collect some of the salty groundwater. This solution was found to be of very limited value.

A recent inspection of the Nubaria Canal shows that it suffers severely from erosion. The problem is mainly brought about by the high speed of the barges using the canal. The bow waves set up by these craft contribute to the erosion of the banks. The maximum speed of the canal craft considered in the bank design was 8 kph, whereas some craft were recorded as travelling at 20 kph.

There are two proposals to overcome this difficulty: one by reducing the speed of the barges to the point where the bow wave will cause negligible scour (a difficult exercise to implement and wasteful in terms of transport efficiency); the second is to line the banks with a scour prevention apron, thereby increasing the stability of the banks but allowing the present usage of the canal to continue without alteration.

Second Stop: IIP Project

The IIP project was aimed at replacing individual pumping sets by a collective pump at the Mesqa level from single lifting point: this pump would either serve an “elevated mesqa” that would deliver water by gravity to the fields, or a buried pipe, with the initial mesqa filled in both cases. Benefits included gain in arable area, avoidance of pollution of water at the tertiary level, economies of scale in pumping costs (especially after early diesel engines were replaced by electric pumps), reduced diverted volumes which should add up at the branch canal level and reduced diversions. Other changes in the regulation of the parent branch canal, from on/off flows to continuous flow, were also expected to ensure security in supply, and therefore allow for diversification into crops with different water requirements/frequency as well as avoiding having farmers over-irrigating due to expected uncertainty in supply.

Meet Yazied canal command area, in Kafr El-Shiekh district, was one of the first regions considered by the project and has both some areas with more than ten years of functioning of the IIP system, and areas still waiting for the IIP investment.

March 2007--Integrated Irrigation Improvement and Management Project (2006- 2014), for a total value of US$ 303 million with a World Bank loan of US$ 120 million, a contribution of US$ 78 million from foreign donors, and a contribution of US$ 105 million from the Ministry of Water Resources and Irrigation, represents a continuing commitment of the World Bank to projects that focus on natural resources management, raising rural income, poverty alleviation, and environmental sustainability.

The Integrated Irrigation Improvement and Management Project (IIIMP) aims at assisting the Ministry of Water Resources and Irrigation (MWRI) in improving the management of irrigation and drainage in the project area, to increase the efficiency of irrigated agriculture water use and services. The project has the following five components: Component 1) will cover the implementation of irrigation and drainage rehabilitation, improvement and modernization works and programs at all levels of the selected command areas. Component 2) will cover: (i) regional water and land management adaptive research programs; (ii) extensive on-farm water control and irrigated agriculture practice demonstrations; and (iii) irrigation advisory and production support services strengthening.

Component 3) establishment, expansion and scaling up of water user organization functions at the levels of tertiary and secondary system irrigation and drainage hydraulic units throughout the selected command areas. Component 4) will support the management and needed for effective planning, implementation coordination entities, functions and activities and eventual commissioning of irrigation and drainage improvements on the basis of full command areas. Component 5) a project Environmental Management Plan (EMP) will be implemented under this component to demonstrate how improvements in water quality can be achieved.

Source: MoALR

11.2 Appendix 2: Murray Darling Basin Egyptian Travelling Workshop

The objective of the workshop was to familiarize selected senior Egyptian officials, and Dr Fawzi Karajeh representing ICARDA, with the reforms to water management in the Murray Darling Basin. The learning-by-seeing activities of the workshop were conducted 4-14 October 2011. The trip to Australia included visits to Canberra, the Snowy Mountains, Griffith, Mildura, Loxton, and Adelaide. The visit allowed the delegation to gain an overview of water and agriculture management and the associated institutions from the basin level to the end user. Visits were organized to farmers and statutory water R&D organizations. The latter included the ACIAR office, the National Water Commission, the Australian National University, CSIRO Water for a Healthy Country Flagship, a commercial water association, Mallee Catchment Management Authority, Rural Solutions, South Australia Research and Development Institute, and the University of Adelaide. The Egyptians participant in the travelling workshop were:

11.3 Appendix 3: Improving water productivity in Egypt

Improving water productivity in Egypt: Water and Agriculture Policy Travelling Workshop for Egyptian Delegation to Murray Darling Basin, Australia, 4-14 October 2011

Background

Following initial high-level consultations between ACIAR and Egyptian research managers, and ICARDA it was decided further interactions are necessary to develop a better understanding of the priorities concerning farm-level water management and to familiarize selected Egyptian officials on the reforms and management of water in the Murray Darling Basin (MDB). The idea was to build on relevant on-going activities of the Egypt's Agricultural Research Centre and ICARDA, and identify areas where Australian scientists have a comparative advantage and can contribute needs to be highlighted, particularly in relation to the follow up research project concepts. With an overall objective "to increase on-farm water use efficiency" two major activities are proposed:

a. **A knowledge exchange workshop on the technical aspects of on-farm water use efficiency to be convened in Egypt. The purpose will be to identify key areas for irrigated agricultural research in the medium and longer term. We know that there are a variety of water measurement techniques and on-farm level management practices which complement the irrigation, soil, and agronomic best management practices which lead to greater water use efficiency. The proposed workshop is expected to identify major challenges and potential opportunities for Egyptian irrigated agriculture. About forty key scientists from ACIAR, Egyptian NARS and ICARDA, along with other specialists representing key stakeholders are expected to participate in the proposed workshop. The duration of the proposed workshop is 4 days (including a one-day field trip), to take place by July 2011. Key outputs will be two to four project ideas or concept notes.**

b. **A learn-by-seeing travelling workshop. The importance of a variety of non-technical drivers of on-farm water use efficiency producer incentives/disincentives for water use efficiency is recognized. Institutional, water practitioners and water policy specialists from Egypt would visit Australia to learn of agricultural water policy and local institutional and governance arrangements in the Murray Darling Basin of Australia. One of the focuses will be on local institutional arrangements such as water user associations. The group visiting Australia would identify possible research areas on local institutions and governance in Egypt, related to on-farm water efficiency for food crops, for which Australian expertise and experience would be relevant. The visit would be scheduled for approximately 10 institutional experts and agricultural water users and policy makers from Egypt**

accompanied by representative from ICARDA. It is proposed to take place after the technical knowledge exchange workshop.

Participant profile:

High end water managers and policy makers representing the Government of Egypt: Ministry of Agriculture and Land Reclamation and the Ministry of Water Resources and Irrigation accompanied by Fawzi Karajeh, ICARDA's Regional Coordination for the Nile Valley and sub-Saharan Africa Region.

No.	Name	E-mail	Field of work	Affiliation
1	Essam Eldin Abdelmonem	Ewasif@hot mail.com	Senior Machinery and Water Specialist	Egypt ARC
2	Hamdy Khalifa	hekhalifa@yahoo.com	Senior Soil and water management Specialist	SWERI-Egypt ARC
3	Ahmed Gamal Eldeen	resext_arc@yahoo.com	Senior Extensionist	Vice President of Egypt ARC
4	Hany Mohamed Ramadan	h_m_ramadan@hmail.com	Soil and Water Management Specialist	Director, SWERI-Egypt ARC
5	Salah Eldin Helal	shm744@yahoo.com	Farm Management	Director, ARC
6	Abdel Aziz Abdelnaby	abdelaziz.abdelaziz56@yahoo.com	Field crop researcher	Director, Field Crop Research Institute-Egypt ARC
7	Mohamed Samir Abo Soliman	m_abosoliman@yahoo.com	Irrigation Management	Director, Irrigation Management, ARDC
8	Diaa El-Qousy	lmewp@menanet.net	Water Policy Advisor	WMRI
9	Fawzi Karajeh	f.karajeh@cgiar.org	Water Management	ICARDA

ADRC – Agriculture Development and Research Center

FCRI – Field Crop Research Institute

SWERI – Soil, Water and Environment Research Institute

Below is the agenda of the travelling workshop

Day		Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Date		3	4	5	6	7	8	9	10	11	12	13	14	15
Day (Aust)		-	1	2	3	4	5	6	7	8	9	10	11	-
	8					Transport	Drive to Wagga		Transport	Drive to Mildura	DSE (details to follow)	Water user associations	University of Adelaide	
	9			SYD - CBR	Transport	ANU		Transport	CSIRO					
					MDBA			Farm Visit						
	10					Transport	John Blackwell discussion					travel		Arrive Cairo
	11					SEWPAC					travel			
	12			Lunch - ACIAR	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	
	1	Plane		ACIAR	MDBA	Transport	Drive to Leeton	Sights of Griffith/ MIA	CSIRO	CMA	Travel	Travel	Murray darling river board	
	2			Ray Evans	Transport	CSIRO					Rural Solutions	SARDI		
	3			Transport	NWC	Transport	Farm Visit	Transport	MIL				Friday Afternoon off	
	4			Embassy		Friday Afternoon off		Reflection session						
	5			Transport	Transport		Transport						Airport	
Overnight		Plane	Sydney	Canberra	Canberra	Canberra	Griffith	Griffith	Griffith	Mildura	Loxton	Adelaide	Plane	
Comments		Depart Cairo 1pm	Arrive SYD (7pm)										Depart Adelaide 7.05 pm	Arrive Cairo Midday

Below is the detailed visits 5-14 October 2011

Segment 1 – Canberra; 5 October 2011

Organisation: Egyptian Embassy			
Type	Embassy	**Format**	Courtesy Call
Location	1 Darwin Avenue, Yarralumla	**Area**	Canberra
Length of Visit	30 Minutes	**Travel time**	Minimal (10 minutes from City)
Key Contact	TBC	**Phone**	+61-2-6273-4437
		Email	Embassy.canberra@mfa.gov.eg
Rationale	Courtesy Call		
Subject matter	Courtesy Call		
Other Notes	http://www.mfa.gov.eg/english/embassies/egyptian_embassy_canberra/pages/default.aspx		

Organisation: Murray Darling Basin Authority (MDBA)			
Type	Federal Government Agency	**Format**	Lecture
Location	Allara St, Canberra City, ACT 2601	**Area**	Canberra
Length of Visit	Half day	**Travel time**	Minimal (city centre)
Key Contact	Tapas Biswas	**Phone**	TBC
		Email	TBC
Rationale	Responsible for management of the Basin's water resources in the national interest		
Subject matter	Institution arrangements and history of MDBA reforms		
Other Notes	http://www.mdba.gov.au/about		

Organisation: ACIAR			
Type	Funding Agency / Federal Government Agency	**Format**	Courtesy Call, Introductions, Lecture
Location	38 Thynne St, Bruce	**Area**	Canberra
Length of Visit	2 ½ Hours	**Travel time**	Minimal (15 Min from City Centre)
Key Contact	Brendan Brown	**Phone**	6217 0521
		Email	brown@aciar.gov.au

Rationale	Introductions
Subject matter	Introduction to Funding agency, work done at ACIAR in Egypt, Meet Program managers and CEO; Drs John Dixon John.Dixon @aciar.gov.au and Andrew Noble, Andrew.Noble@aciar.gov.au
Other Notes	www.aciar.gov.au

Segment 1 – Canberra; 6 October 2011

Organisation: ACIAR			
Type	Funding Agency / Federal Government Agency	**Format**	Courtesy Call, Introductions, Lecture
Location	38 Thynne St, Bruce	**Area**	Canberra
Length of Visit	2 ½ Hours	**Travel time**	Minimal (15 Min from City Centre)
Key Contact	Brendan Brown	**Phone**	6217 0521
		Email	brown@aciar.gov.au
Rationale	Continue the Introductions		
Subject matter	Introduction to Funding agency, work done at ACIAR in Egypt, Meet Program managers and CEO; Drs John Dixon John.Dixon @aciar.gov.au and Andrew Noble, Andrew.Noble@aciar.gov.au		
Other Notes	www.aciar.gov.au		

Organisation: Evolving Water Management, Collaborative Research Centre; **eWATER CRC**			
Type	CRC	**Format**	Lecture
Location	Innovation Centre, Building 22, University of Canberra, ACT 2601	**Area**	Canberra
Length of Visit	1.5 hours	**Travel time**	Essentially next to ACIAR.
Key Contact	Dr Robert Carr, Robert.Carr@ewater.com.au	**Phone**	6201 5168
		Email	contact@ewater.com.au
Rationale	Research Body involved in knowledge provision on water modelling		
Subject matter	• eWater Source - next-generation enterprise modelling system, eWater Source, will meet the hydrological modelling needs of Australian and international governments, agencies and authorities for at least the next decade. • The eWater Toolkit is your one stop shop for individual utility products to help you with your work in water resources and catchments. Join over 10,000 registered users in 120		

	countries. • eWater Source Catchments enables local knowledge, data and models to be combined with industry best practice to generate effective, transparent scenarios and options Presenters: Dr Robert Carr, Robert.Carr@ewater.com.au and Jeff xxx,
Other Notes	http://www.ewater.com.au/

Organisation: National Water Commission			
Type	independent statutory body within SEEWPAC	**Format**	Lecture
Location	95 Northbourne Avenue,	**Area**	Canberra
Length of Visit	2 hours	**Travel time**	minimal
Key Contact	Ms Browyn.ray ,	**Phone**	Ray to confirm
		Email	Browyn.ray@nwc,gov.au
Rationale	The National Water Commission is responsible for driving progress towards the sustainable management and use of Australia's water resources under our blueprint for water reform - the National Water Initiative		
Subject matter	The National Water Initiative. Discussed water policy and water market to maximize the net social welfare Presenters: Ms Browyn.ray, Browyn.ray@nwc,gov.au (Assessment and Policy Coordination Group) and Will Fargher, Will.Fargher@nwc,gov.au (Water Market and Efficiency)		
Other Notes	http://www.nwc.gov.au/www/html/7-home-page.asp		

Organisation: The Australian National University (ANU)- water initiative			
Type	University	**Format**	Lecture
Location	The Australian National University	**Area**	Canberra
Length of Visit	2 hours	**Travel time**	Minimal
Key Contact	Dr Danial Connell	**Phone**	
		Email	Danial.Connell@AWU.edu.au
Rationale	the ANU Water Initiative will make a significant contribution to the development and		

	successful implementation of sustainable water policies for Australia and the region, for the long term
Subject matter	• Water Resources and the Rural Sector • Water Resources under Climate Variability Presenter: Dr Danial Connell, Danial.Connell@AWU.edu.au
Other Notes	http://www.water.anu.edu.au/

Organisation: CSIRO Water for a Healthy Country Flagship			
Type	Government research Body	**Format**	Lecture
Location	Clunies Ross St Black Mountain ACT 2601	**Area**	Canberra
Length of Visit	2 hours	**Travel time**	minimal
Key Contact	Bill Young	**Phone**	61 2 6246 5745
		Email	Bill.Young@csiro.au
Key Contact	Scott Keyworth	**Phone**	Ray to confirm
		Email	Ray to confirm
Rationale	• largest research partnership focusing on water in Australia		
Subject matter	• The Flagship aims to provide Australia with solutions for water resource management, creating economic gains of A$3 billion per annum by 2030, while protecting or restoring our major water ecosystems • Aim to deliver relevant and effective water management options for government, community and industry Presenters: Dr Scott Keyworth, Scott.Keyworth@csiro.au (Water Healthy Country Flagship- Program Manager); Dr Mobin Ahmad, Mobin.Ahmad@csiro.au ((Stream Leader- Basin Integrated Analysis); Dr Stuart Minchin, Stuart.Minchin@csiro.au (Research director, Environmental Observation and landscape Science)		
Other Notes	http://www.csiro.au/org/WfHC.html		

Organisation: Department of Sustainability, environment, water, population and communities ("SEWPAC")			
Type	Federal Gov Department	**Format**	Lecture
Location	John Gorton Building King Edward Terrace	**Area**	Canberra

	Parkes ACT		
Length of Visit	1.5 hours	**Travel time**	Minimal
Key Contact	Sonia Fedorow	**Phone**	**Information Unit** 1800 803 772
		Email	Sonia.Fedorow@environment.gov.au
Rationale	Key initiatives and water policy unit		
Subject matter	*Water for the Future* initiative (focus on water use efficiency, delivering water to the system, preparing for climate change). Presenters: Ms Sonia Fedorow, Sonia.Fedorow@environment.gov.au (A/g) Director, Water Strategies section- Water Reform Division); Dr Jim Donldoson, Jim.Donldoson@MDBA.gov.au (General Manager- Murray Darling Basin Authority)		
Other Notes	http://www.environment.gov.au/water/index.html		

Segment 2 - Riverina

Organisation: International Centre of Water for Food Security			
Type	University Research body	**Format**	Lecture
Location	Charles Sturt University	**Area**	Wagga Wagga
Length of Visit	2 hours	**Travel time**	3 hours from Canberra
Key Contact	John Blackwell	**Phone**	TBC
		Email	TBC
Rationale	The Centre's research focuses on hydrology of agricultural water systems and the societal responses (socio-economic, technical and governance) to overcome production and environmental issues created by this stress.		
Subject matter	**TBC**		
Other Notes	http://www.csu.edu.au/research/icwater/ may not be appropriate more technology orientated and not policy/high end water management? Would need to be available on a Saturday – perhaps more informal at his vineyard?		

Organisation: Farm Visit, Whitton			
Type	Innovative Farm	**Format**	Farm Visit
Location	Wilga Rd	**Area**	Whitton
Length of Visit	Half day or more	**Travel time**	2 hours from Wagga
Key Contact	George Cummins	**Phone**	TBC
		Email	TBC
Rationale	Visit an innovative farmer, talk to him about water policy from the farmer's perspective and look at his innovations.		
Subject matter	Water from the Farmers perspective		
Other Notes	Much to see and will fill out the weekend.		

Organisation: CSIRO Land and Water			
Type	Government Research Body	**Format**	Lecture, facilities tour
Location	Research Station Road Hanwood NSW 2680	**Area**	Griffith
Length of Visit	Half day	**Travel time**	

Key Contact	Evan Christen	**Phone**	6960 1586
		Email	Evan.Christen@csiro.au
Rationale	The CSIRO research laboratory at Griffith was established in 1924 and is now also the home of Murrumbidgee Irrigation Ltd *[external link]*, the irrigation water supplier for the Murrumbidgee Irrigation Area (MIA). This is a significant partnership that allows a close interaction between research and industry.		
Subject matter	increased irrigation water use productivity through improved irrigation systems and irrigation management tools improved drainage water management through quantity and quality control measures improved soils through innovative management of organic matter including biochars and wastewaters Assessment of greenhouse gases from irrigated cropping.		
Other Notes	http://www.csiro.au/places/Griffith.html		

Organisation: Murrumbidgee irrigation Ltd.			
Type	Commercial Water association	**Format**	Lecture
Location	At CSIRO Griffith Labs	**Area**	Griffith
Length of Visit	1 ½ hours	**Travel time**	minimal
Key Contact	TBC	**Phone**	TBC
		Email	TBC
Rationale	Commercial water company		
Subject matter	Water pricing of Australia		
Other Notes	**http://www.mirrigation.com.au/**		

Segment 3 – Mildura

Organisation: Mallee Catchment Management Authority			
Type	State CMA	**Format**	Lecture
Location	DPI Complex Cnr Koorlong Ave & Eleventh St Irymple, Victoria.	**Area**	Mildura
Length of Visit	2 hours	**Travel time**	Griffith to Mildura – 5 hours
Key Contact	Glen Sutherland	**Phone**	TBC
		Email	TBC
Rationale	The Mallee CMA's primary responsibility is to ensure that natural resources in the region are managed in an integrated and ecologically sustainable way		
Subject matter	The Regional Sustainability Program: • Irrigation incentives and rebates to encourage the adoption of irrigation best management practices • Projects that encourage sustainable irrigation farming practices • Salinity accountability projects • Monitoring & Evaluation of program effectiveness • Research projects predominately investigating hydrogeology and the dynamics of the land-water interface		
Other Notes	http://www.malleecma.vic.gov.au/		

Section 4 – Loxton

Organisation: Rural Solutions			
Type	State Research agency/ Consultants	**Format**	Lecture
Location	Bookpurnong Road,	**Area**	Loxton , SA
Length of Visit	1 day (Inc. WU Associations)	**Travel time**	Mildura to Loxton – 3 hours
Key Contact	Duncan Tullett	**Phone**	TBC
		Email	Duncan.Tullett@sa.gov.au
Rationale	Working with you to enhance primary industries competitiveness, integrate environmental management into your daily business, strengthen regional communities and establish sustainable business practices		
Subject matter	**water management systems for irrigation efficiency, effective recycling and water quality in commercial sense**		
Other Notes	http://solutions.pir.sa.gov.au/markets/water_management		

Segment 5 – Adelaide

Organisation: University of Adelaide			
Type	University	**Format**	Lecture
Location	North Terrace	**Area**	University of Adelaide
Length of Visit	3 hours	**Travel time**	Loxton to Adelaide (3 hours)
Key Contact	Prof. Mike Young	**Phone**	(08) 8303 5155
		Email	Mike.young@adelaide.edu.au
Rationale	Prof. Young is Heavily involved in water policy issues, a member of the Wentworth group and advisor on national policy. He has lots of experience in MDBC related inputs and activities.		
Subject matter	Environmental Policy Water Policy Water Trading		
Other Notes	http://www.sciences.adelaide.edu.au/faculty/schools/		

Organisation: SARDI			
Type	State Government research Body	**Format**	Lecture
Location	Entrance 2b, Hartley Grove Urrbrae	**Area**	Adelaide, SA
Length of Visit	2 hours	**Travel time**	Minimal in adeliade
Key Contact	Jim Cox	**Phone**	61 8 8303 9334
		Email	james.w.cox@adelaide.edu.au
Rationale	Key research Body at end of MDB system		
Subject matter	**Irrigation and drainage science and technologies.** SARDI has developed sustainable agricultural water management practices for irrigated horticulture and has developed strategies to reduce the impact on the quantity and quality of surface and groundwater resources. Innovative soil water monitoring and solute sampling technology has been developed to help growers adapt to sustainable irrigation practices. **Improving soil physical health.** SARDI has developed soil amelioration techniques including organic matter injection to improve the soil infiltration, root penetration, biological activity and water and nutrient uptake of horticultural crops thus leading to increased yields. **Managing soil salinity and other chemical imbalances.** SARDI has developed unique expertise in rootzone salinity management to help counteract the trend in irrigated agriculture, including effective salt-leaching strategies. SARDI research leads the world in understanding the trade-off from applying highly efficient irrigation and the potential for salinity to build up within the root zone.		
Other Notes	http://www.sardi.sa.gov.au/		

Organisation: SA Murray Darling River NRM board			
Type	State Government Board	**Format**	Lecture
Location	pper level, Cnr Mann & Walker Street	**Area**	Mount Barker
Length of Visit	1.5 hours	**Travel time**	30 minutes from Adeliade
Key Contact	TBC	**Phone**	TBC
		Email	TBC
Rationale	Develop state wide water plans		
Subject matter	TBC		
Other Notes	http://www.samdbnrm.sa.gov.au/		

11.4 Appendix 4: List of Participants of Participants of Egypt-Australia-ICARDA On-farm water use efficiency workshop

27-28 July 2011

No	Cum. No	Name	E-mail	Cell	Note
A)	National- Management (Opening)				
1	1	H.E. Salah Yousef Farag			MALR
2	2	Adel El Beltagy	elbeltagy@optomatica.com	35681670	ARDC
3	3	Salah Abdel-Momen	salah1993@yahoo.com	124809957	ARC
4	4	Magdi Anwar	drmagdianwar@hotmail.com	122361508	MALR
5	5	Adel Aboul Naga	adelmaboulnaga@hotmail.com	101497675	ARDC
6	6	Abdel Aziz Abdel Naby	abdelaziz.abdelaziz56@yahoo.com	190016682	ARC
7	7	Mohamad El-Nabrawi (New land)			Farmer
8	8	Khairy Sabry Hamouda (saline land)		101179250	Famer
9	9	Nawal Khames (Old land)		123288543	Farmer/WUA
A.1)	National- Technical				
1	10	Abdel Aziz Sheta	sheta11us@yahoo.com	106019658	Soil
2	11	Abdel-Ghany M. El-Gindy	elgendy@internetegypt.com	123108490	Machinery & Water
3	12	Ahmed Gamal Eldeen Wahba	resext_arc@yahoo.com	127468929	Extension
4	13	Sobhi El Nagar	selnaggar@hotmail.com	107209648	
5	14	Hamdy Khalifa	hekhlifa@yahoo.com	129620976	Soil & Water
6	15	Hassan El-Banna	hassanelbanna551@gmail.com	127365954	Water
7	16	Hany Ramadan	h_m_ramadan@hmail.com	103979347	Soil & Water
8	17	Mahmoud El-Kholy	_dr_mahmoud_elkholy@hotmail.com	108975290	Soil
9	18	Mohmad Abdel-Fatah	m_ibrahim06@yahoo.com	100441655	Soil & Water
10	19	Mosad Kotb	dr_mosaadkotb2003@yahoo.com	119441339	
11	20	Mostafa Azab	m-azab-nwrp@hotmail.com		Wheat
12	21	Samia El-Marsfawy	samiaelmarsafawy797@hotmail.com		Crop & Water
13	22	Mohamed Abd Rabou	abdrabbo@yahoo.com	123675363	

14	23	M.Samir Abou Suleiman	m_abosoliman@yahoo.com	101228124	
15	24	Sayed Abed El-Hafez	sayed.abdelhafez@yahoo.com	105236349	Soil & Water
16	25	Raafat Salah Eldin Zaki	iocd_far@yahoo.com	107702054	
17	26	Salah Abdel Mageed		105782567	
18	27	Mohamed Yacoub	mmyacoub@ahoo.com	101717424	
19	28	Hatem Diab			
20	29	Amr Khairy			
21	30	Mohmed Maghraby			
A.2)	National- WMRI				
1	31	Diaa El-Qousy (WMRI)	lmewp2000@gmail.com	123148215	Water
2	32	Nahla Zaki (WMRI)	n_abouelfotouh@nwrc-eg.org	101990277	Water
3	33	Mohamed El-Baroudy	i_elbararoudy@hotmail.com	161327461	
4	34	Waleed Hassan			Water
A.3)	National- Universities				
1	34	Diaa El-Ansari (AlexU)	diaaagri@hotmail.com	100150804	Crop
2	35	Mohamad El-Ansary (BU)	myans2004@yahoo.com	122236532	Water
3	35	Mohamed Abou Hashim (ZU)	mabuhashim@gmx.de	118261578	Soil
4	36	Yasser Ezzat Arafa(ASU)	arafayeh@yahoo.co.uk	104651800	Water
B)	International/Invited- Opening				
1	37	Aboudou K. Adjibade	kadjibade@idrc.org.eg	33 36-7051	IDRC
2	38	Hammou Laamrani	hlaamrani@idrc.org.eg	163008403	IDRC
3	39	Mohamad El-Ansary	Mohamed.ElAnsary@fao.org	106591818	FAO
4	40	Moujahed Achouri	moujahed.achouri@fao.org	33316000	FAO
C.	Australia				
1	41	HE Stephanie Shwabsky	stephanie.shwabsky@dfat.gov.au		Embassy of Australia-Egypt
2	42	Clemency Oliphant	clemency.l.oliphant@dfat.gov.au		UsAID
3	43	Allen McHugh	Allen.McHugh@usq.edu.au		NCEA, University of Southern Queensland

4	44	Ian Willet	Willett@aciar.gov.au		ACIAR
5	45	James Cox	james.w.cox@adelaide.edu.au		U Adelaide/ SARDI
6	46	Jeffrey Camkin	Jeff.Camkin@uwa.edu.au		UWA, Centre for Ecohydrology
7	47	John Blackwell	jblackwell@csu.edu.au		CSU, IC water
8	48	Rod Jackson	rod.jackson@dpi.nsw.gov.au		NSW DPI
No	**Cum. No**	**Name**	**E-mail**	**Cell**	**Note**
D.	ICARDA				
1	49	Mahmoud Solh	m.solh@cgiar.org		Director General-ICARDA
2	50	Kamel Shideed	k.shideed@cgiar.org		ADG-ICCI, ICARDA
3	51	Theib Oweis	t.oweis@cgiar.org		Director-IWLRM
4	52	Aden Aw-Hassan	a.aw-hassan@cgiar.org		Socio-economy
5	53	Véronique Alary	v.alary@cgiar.org		Socio-economy
6	54	Atef Swelam	a.swelam@cgiar.org		Water
7	55	Adel Hagras	a.hagras@cgiar.org		Agronomy
8	56	Fawzi Karajeh	f.karajeh@cgiar.org		Soil & Water
9	57	Wafa Ghazouani	wafa.ghazouani@yahoo.fr		ICARDA-IWMI
E.	Media				
1	58	Abdel Aziz Gera			Journalist
2	59	Tamer Diab	tamerdiab326@yahoo.com	124474144	Journalist

No.	Name	Affiliation	E-mail
1	Adel Hagras	ARC	a.hagras@cgiar.org
2	Allen McHugh	NCEA	McHugha@usq.edu.au
3	Atef Swelam	ICARDA	a.swelam@cgiar.org
4	Hassan El-Banna	AERI, ARC	hassanelbanna551@gmail.com
5	Kamel Shideed	ICARDA	k.shideed@cgiar.org
6	Mohamad El-Ansary	Banha University	myans2004@yahoo.com
7	Mohamed Abou Hashim	University of Zagazig	mabuhashim@gmx.de
8	Mohmad Abdel-Fatah	ARC	m_ibrahim06@yahoo.com
9	Noha Salah Ibrahim	NWRC	nosa_1234@yahoo.com
10	Rod Jackson	NSWPI	rod.jackson@dpi.nsw.gov.au
11	Sayed Abed El-Hafez	ARC	sayed.abdelhafez@yahoo.com
12	Yasser Ezzat Arafa	Ain Shams University	arafayeh@yahoo.co.uk

11.5 Appendix 5: Egypt-Australia-ICARDA on-farm water use efficiency workshop, 26-28 July 2011; Cairo, Egypt (Agenda)

Program

Tuesday, 26 July 2011: Field visit (all day; departure at 6:30 a.m. from hotel)
Cairo → Noubaria (Alexandria Governorate) →
Sidi Salem (Kafr-El-Sheikh Governorate) → Cairo (return at ~ 18:00)
(Detailed program will be available before departure)
Participants: Australian; ICARDA; and Egyptian scientists

Wednesday, 27 July 2011

08:00-09:00 *Registration at* Semiramis Intercontinental, (Venue: *Babylon room, 3rd floor*)

09:00-10:30 **Opening Ceremony**
(Venue: *Babylon room, 3rd floor*)
Welcome Remarks
Dr Salah Abdel-Momaen, the President of Egypt ARC
H.E. Ms Stephanie Shwabsky, the Australian Ambassador to Egypt
Dr Mahmoud Solh, the ICARDA's Director General
H.E. Salah Yousef Farag, Minister, Ministry of Agriculture and Land Reclamation
Inaugural Address
Prof Dr Adel El-Beltagy,
Chair of International Dryland Development Commission (IDDC)
"Egypt Sustainable Agricultural Development Strategy towards 2030"

10:30-11:00 *Refreshment Break & Group Photo*

11:00-13:30 **Plenary Session 1: Knowledge Sharing**
(Venue: *Babylon room, 3rd floor*)
Chairman: Prof Salah Abdel-Momaen
Co-Chair: Prof Professor Jeff Camkin
[20 minutes presentation and 10 minutes discussion]

- *Farm-level water management- opportunities and challenges in the Egypt Delta's Oldland (Drs Abdel Ghany El-Gindy and Said Abed El-Hafez)*
- *Farm-level water management- opportunities and challenges in the Egypt Delta's reclaimed/salt-affected land (Drs Samir Abou Suleiman and Mahmoud El-Kohly)*
- *Farm-level water management- opportunities and challenges in the Egypt Newland (Drs Abdel Aziz Sheta and Hamdy Khleifa)*
- *Water resources of Egypt– Technical, Institutional, and Policy Aspects: availability and allocation (Dr Dia El Quosy)*
  General Discussion (30 minutes)

13:30-14:30 *Lunch in the Night & Day restaurant at the lobby level*

14:30-15:30 **Plenary Session 2**: **Knowledge Sharing**
(Venue: *Babylon room, 3rd floor*)
Chairman: Prof Mahmoud Solh
Co-Chair: Prof Adel Abou Elnaga

- *ACIAR, what is it?*
  (Dr Ian Willett, ACIAR)
- *Australia experience in on-farm water use efficiency (tbd)*

- *On-farm water management: from efficiency to productivity (Dr Theib Oweis, ICARDA)*

15:30-16:00 *Refreshment break*
16:00-16:30 Discussion

16:30-17:00 **Breakout for working groups- based on farming production systems**
(Venue: *Babylon room, 3rd floor*)
Group 1: Oldland (Chairmanship: Egypt-ACIAR-ICARDA)
Group 2: Newland (Chairmanship: Egypt-ACIAR-ICARDA)
Group 3. Reclaimed/salt impacted land (Chairmanship: Egypt-ACIAR-ICARDA)

Egypt-Australia-ICARDA on-farm water use efficiency concept notes development meeting
29 July 2011 at 9:00 a.m.
Cairo-Egypt

ToR for the Working Groups

- Identify proven and tested technologies/interventions that assist farming communities to enhance on-farm water use efficiency;
- Identify research gap (s) for new research to better respond to water scarcity and food security;
- Identify entry points to link R-4-D to the on-going development projects;
- Developing clear output, activities, timetable, and deliverables;
  Indentify capacity development needs (researchers, extension, and farmers) for each framing production system; and
- Report and present the outcome of the deliberation:
  Draft concept notes (CNs) addressing knowledge and technical gaps in on-Farm water management.

20:00 – 22:00 *Workshop Official Dinner (by invitation)*

Thursday, 28 July 2011

8:30- 9:00 Working groups' Chairpersons and Reporters meeting
9:00-11:00 Deliberation of the working groups, development of CNs

11:00-11:30 Refreshment break
11:30- 13:00 **Continued-** Deliberation of the working groups, advance the development of CNs, and the groups' presentations
13:00-14:00 Lunch in the Night & Day restaurant at the lobby level

14:00-15:30 **Plenary Session 3: Working groups' presentations**
(Venue: *Babylon room, 3rd floor*)
Chairpersons: Drs Abdel Ghany El-Gindy and Ian Willett
Reports from the workgroups: General discussions with focus on the integration of different components and project implementation timeframe and budget.
[20 minutes presentation and 10 minutes discussion]
15:30-16:00 *General Discussion*
Refreshment available on the side
16:00-16:30 **Closing Ceremony**
(Venue: *Babylon room, 3rd floor*)
Prof Dr Salah Abdel-Momaen, President of Egypt ARC
Prof Dr Ian Willett, ACIAR
Prof Dr Mahmoud Solh- ICARDA's Director General
Prof Dr Adel El-Beltagy, Chair, ARDC

16:30 Workshop Adjourn

Focused Follow-up Meeting

Purpose
Focused follow-up meeting to finalize and polish the 1st dart of the concept notes and review the learn-by-seeing travelling workshop to Australia's plan, timetable, and the list of potential participants.

Participants
Australian, ICARDA, and Key Egyptian Scientists.

Venue: (Venue: *Babylon room, 3rd floor*)*;* Semiramis Intercontinental Cairo

11.6 Appendix 6: The outputs of the three working groups- three draft concept notes

Proposed concept notes

1. *Promoting sustainable land use production systems in the old lands of the Nile Delta*
2. *Improving farmers' livelihoods through efficient, productive, and more equitable use of irrigation water in the new lands*
3. *Improving the incomes of farmers through sustainable land and water management in salt-affected soils in the north eastern Delta.*

Concept notes narratives

CN 1. Promotion of sustainable land use production systems in the old lands of the Nile Delta

Justification

Agriculture in Egypt is almost entirely dependent on irrigation from the Nile since the annual rainfall is extremely low. The agricultural lands in the old and newly reclaimed areas total about 8.6 million feddan (1 feddan = 4200 m^2). This land is highly productive (the productivity efficiency – the ratio of output production to input effort – is 177%) and, in combination with widely varied micro-climatic conditions, ideally suited for the intensive cultivation of a large variety of crops. It is a crucial resource for wheat production and is essential for the food security of the country. The sustainability of production is being threatened by excessive pressure on available irrigation resources, forcing farmers to use water of marginal quality. In addition, some of the most productive land is being lost to urbanization. Egypt is expanding its irrigated areas while available water resources remain constant, or are decreasing, as a result of the increased demand from other water consuming sectors.

It is clear that the cheapest, and most technically and economically feasible option, is to improve on-farm water use efficiency (WUE), by changing the practice of applying excess irrigation water. This will free up water supplies for the expansion of the agricultural sector.

Several constraints still exist, but these are considered to be researchable issues under the issues of land fragmentation and extending urbanization. These constraints include the low level of on-farm water management practice, land degradation and desertification, lack of technology transfer for deploying promising techniques for better soil and water conservation, and inequitable water distribution. Over the years, Egyptian National Research Institutes have done a substantial amount of work to develop approaches and practices to improve on-farm irrigation water management and protect ecosystems from the threat of increasing land degradation.

However, in Egyptian agriculture, in the old lands in particular, the use of wide-spaced, narrow irrigation channels and the corresponding broad beds may be promising in terms of both reducing the amount of water applied to field crops (wheat, sugar beet, berseem, cotton, maize, and rice) and in maintaining, or increasing crop production.

The approach of the proposed research is to adapt the principles of conservation agriculture (CA) to the system to further improve on-farm water use, reduce degradation by salinity, and depleted soil nutrient and carbon concentrations. Furthermore, the research will be supported by improved technology transfer methods and approaches.

Research and development strategy and relationship to donor strategies

The proposed research will complement existing research and development (R&D) activities in the old lands of the Nile Delta and Valley, in particular through:

i. A modernization program: links to conveyance efficiency complement efficiency gains. These links will address the inequity problem which has resulted from the use of diesel-driven pumps at the *'mesqa'(tertiary canal)* level. This, combined with other factors such as changes in cropping rotations and patterns and deterioration of the system, has led to problems in water distribution, particularly the inequity between the head and tail areas along the branch canals
ii. Improving on-farm irrigation system efficiencies to maximize water, soil, and fertilizer units use efficiencies and conserve agricultural physical resources for sustainable production
iii. Water and livelihood initiatives and a water benchmarking program (ICARDA, Ministry of Water Resources and Irrigation (MWRI) and Ministry of Agriculture and Land Reclamation (MALR)). Reduction in farm inputs by the application of CA principles. Complement the WUE strategy. Spring board activity
iv. Review to complement the Water and Territories (WAT) project, a cross-border cooperation project in the south west Europe area, developed to work on integrated water resource management issues
v. The WAT project on old lands is funded by the Japan International Cooperation Agency
vi. Adaptations of precision irrigation that might be implemented for each of the current irrigation application systems, including, as appropriate, the sensing, control, and decision support requirements, identification of opportunities for and potential benefits from precision irrigation, identification of current research in precision irrigation, and, more particularly, a clear direction for future research in precision irrigation. However, active research is underway in a number of areas relevant to precision irrigation and many of the component tools and technologies have been, or are being, developed. Examples of these are illustrated in the case studies included throughout the review and include, use of management zones in horticulture, automation of surface irrigation, real-time optimization of surface irrigation, spatially varied applications from centre pivot and lateral move machines, vision sensing of crop attributes, and irrigation scheduling using remotely sensed crop factors.

Objectives

a. Develop and adapt CA principles to grain cropping systems in the old lands
b. Improve the efficiency of on-farm irrigation applications and improve the gross production water use index (GPWUI). The GPWUI is here defined as the yield per total water infiltrating to the root zone, including irrigation and effective rainfall

c. Addressing/enhancing water distribution equity, particularly the head to tail inequities of water distribution. Attention to this issue is important to minimize the negative effects on the long-term sustainability of irrigation resulting from a build-up in the soil of salinity/sodicity and other pollutants, such as heavy metals
d. Reduce salinity build-up, both for downstream users as well as on-farm, and improve soil nutrient and carbon management ('soil health')
e. Capacity building (invigorate extension program).

Activities

a. Broaden the adoption of CA to grain cropping systems, by testing and adaptation

i. Implement a well-designed cropping production system which responds to the agricultural practices of farmers to ensure potential physical and economic benefits ,with consideration for out-scaling, deep rip mole drain tile, drain refurbishment
ii. Import CA machinery for adaption to and development for local conditions
iii. Development of cultivation practices for cotton and grain crops
iv. Rural socioeconomic and extension assessments and recommendation for improvements
v. Capacity development for farmers, extension workers, and researchers through demonstration plots, travelling workshop, framers' field days, and non-degree training.

b. Improve the efficiency of in-field irrigation application (improve GPWUI)

i. Benchmark
ii. Optimize irrigation system (Irrigation tool kit, scheduling)
iii. Increase capacity of extension services
1. Training in Irrigation fundamentals (Irrigation Pump Evaluation and Reporting Tool (IPERT) and Irrigation Performance Audit and Reporting Tool (IPART), benchmarking, Surface Irrigation Performance Evaluation (SIPE), irrigation pumps, scheduling, metering)
2. Irrigation and salinity module
3. Technology transfer (tensiometers, longstop).

c. Reduce Salinity build-up (downstream environmental/farmer benefit)

i. Monitor soil and water quality
ii. Develop irrigation strategy to ensure adequate leaching despite reduced water applications.

d. Capacity building (invigorate extension program)

i. A formal training program, for provincial trainers based on train-the-trainer concepts, on the soil, water, agronomy, irrigation, and farm mechanization system aspects of the CA-based technologies delivered in Egypt
ii. A formal training program in extension, social implications, and irrigation practices given to key researchers and extension staff in Egypt. The courses would be delivered either in Egypt or another country, whichever is the more cost effective and efficient alternative.

Methodology (scale)

a. Demonstration sites (research on key farms)
b. Expand to other demonstrations (3) 1 in each branch canal command area
c. Farmers' field schools, field days, forums
d. Train-the-trainer, training courses (formal and informal), John Allwright Fellowships
e. Extension activities, documentation

Potential Partners (collaborators)

a. Egypt Agricultural Research Center (ARC)
b. Egypt MWRI
c. University of Southern Queensland: agronomy, soil, irrigation technology and training (Dr A.D. McHugh)
d. New South Wales Department of Primary Industry: extension development, irrigation performance (R. Jackson)
e. Charles Sturt University: mechanization (John Blackwell)
f. Zagazig University: upscale modeling (Mohamed Abuhashim)
g. Egypt extension: Head of Agricultural Extension, MALR (Central Administration of Agricultural Extension) and Irrigation Advisory Service, MWRI
h. ICARDA: project development and liaison
i. World Bank, AusAID: irrigation modernization program, Asian Development Bank, International Fund for Agricultural Development (IFAD)

CN2. Improving farmers' livelihoods through efficient, productive, and more equitable use of irrigation water in the new lands

Justification

Despite nearly 40 years of experience, productivity in the new lands is far below its potential and WUE is low. The new lands are less favourable than those of the old Nile Delta; often sandy in texture, of poor inherent fertility, and subject to salinization. Egypt, through its national agricultural research systems, and in coordination and collaboration with regional and international research institutions such as ICARDA, has, over the past two decades, conducted work to develop and/or improve agriculture systems. These efforts include crop improvements, better and more efficient irrigation methods and systems, and better soil, crop, and land management practices. Furthermore, on the water delivery front, Egypt has come a long way in improving the flexibility of distribution of irrigation water to irrigated land. Nevertheless, there are substantial opportunities for improving the effectiveness of on-farm and off-farm water management. Thus, with the new technologies and the production systems management substantial areas of the new lands become highly productive. Over a similar timeframe, Australia has introduced technical and institutional water management reforms and Australian specialists can contribute their expertise within the context of Egyptian agriculture and water management.

ICARDA's and Egyptian research has shown that using improved agronomy and appropriate cultivars in an optimum crop rotation can result in substantial increases in water productivity (WP) in the new lands.

R&D strategy and relationship to other donor activities

Egypt has a reasonable water supply situation, but if water availability is reduced by expansion of the irrigated area, diversion by upstream countries, or climate change, how will it cope? Australian experience will be sought on how to farm with less water. This will focus on Australian technologies and practices under drought conditions, such as partial root zone drying and deficit irrigation, to inform Egypt about future options. This exchange of experience will include understanding the policy contexts in Australia and Egypt to identify what supports adapting to less water, particularly relating to efficiency and equity issues. One aspect of this will be creating opportunities for the marketing of products and improving product quality in anticipation of the potential changes in cropping patterns.

Objectives

a. To optimize water and crop productivity in newly reclaimed areas for the following major crops:
   - Winter crops: wheat, sugar beet, berseem, peas, tomatoes and potato
   - Summer crops: corn/maize, peanuts, tomatoes, watermelon, cantaloupe, other vegetables
   - Orchards trees more than 60% of the new lands (many farmers are switching from filed crops to trees crops due to water shortage issues and uneconomic return)
b. To rationalize the use of water under conditions of a water supply shortage
c. To maintain productive and sustainable farming systems in the new lands
d. To create water savings to allow for the development of additional new lands
e. To inform policy options and institutional arrangements to create a strong link between policy and on-farm practice

Activities

a. Review and collate existing data relating to on-farm water management activities conducted to include improving soil fertility, existing cropping systems and their management, irrigation technologies, WP, environmental impacts of inappropriate irrigation practices and management options for marginal-quality water policies, and institutions in the new lands. These activities shall include the following:
   - Review and utilize data, experiences, and lessons learned from all relevant previous project activities to establish a baseline, e.g. long-term trial project/long-term management project, the Nile Valley projects established by Egypt ARC and ICARDA and West Noubaria Regional Development Project (WNRDP).
   - Review available information on WUE and identify the data gaps and information needed to improve WUE or WP
   - Review the effects of inappropriate irrigation practices and management options for marginal-quality water

- Conduct a rapid research appraisal survey and formal surveys for filling data gaps on water use and productivity

b. Conduct farm surveys and analyses to assess actual WP for multi-cropping systems and to determine the source of inefficiency in water use in the target areas
c. Select experimental sites to be used for calibration and verification to the developed conceptual modelling. Install instrumentation and, after verification of the model, use as tools for various scales of activity, based on field crops, soil types, and irrigation systems, to test different scenarios for optimized water and crop productivity
d. Conduct the field experiments required for the calibration, verification, and application of models and test and verify new options for improving water and crop productivity
e. Analyse Egyptian experiences to identify successful and unsuccessful examples of the uptake of WUE technology and practice
f. Analyse Australian (and potentially other countries) experiences to identify successful and unsuccessful examples of WUE uptake
g. Report on opportunities for increasing the effectiveness of policies that will influence the uptake of WUE technology and practices for farming in the new lands
h. Demonstrate, in farmers' fields, new options for sustainable water use and more productive land use
i. Review Egyptian and Australian experiences of local institutions, particularly water users' associations, in terms of their effectiveness in improving the adequacy of supply, flexibility, efficiency, and equity of water distribution

Methodology

a. Identify the necessary data and databases and their current availability
b. Use or adapt crop production simulation models and schemes; construct water distribution models to suit the Egyptian context
c. On-farm demonstrations to test and verify, under farm conditions, alternative options for improving water and land management and utilization
d. Comparative analyses of Australian and Egyptian experiences through an exchange of visits and desk top reviews
e. Systematic mapping and analysis of existing water, land, agriculture, and other policies and institutional arrangements (particularly water users' associations) that influence the uptake of technology and practice for improved on-farm WUE. From these activities, draw lessons and make recommendations about more enabling policies and institutional options.

Potential partners

a. Egyptian: Agricultural Research Center, National Water Research Center, Ain Shams University, Alexandria University, Egypt Desert Research Center, Deseret Development Center of the American University in Cairo.
b. Australia: Adelaide University, South Australian Research and Development Institute
c. International Center for Agriculture Research in the Dry Areas (ICARDA)
d. Farmer organizations and water users' associations

CN3. Improving the income of farmers through sustainable land and water management in salt-affected soils in the north eastern Delta

Justification: R&D issues, their priority and importance

Soil salinization is extensive in Egypt, encompassing about 30% of the irrigated land. The most severely salinized area is that of the north east Delta. The region is delimited on the east by the Suez Canal, to the north by the Mediterranean Sea, on the west by Sharkia governorate, and to the south by Ismaelia governorate. This agricultural region covers 130,000 ha and has about 30,000 rural households. Half of the irrigation water of this region is drainage water mixed 1:1 with irrigation water from the Salam canal. The region has inefficient drainage systems, is influenced by sea water intrusion, and has a shallow water table. The soils are mainly heavy clay. There are technical problems, including an uneven land surface, puddling of rice fields that requires extra water, soil compaction, sodicity, and farmers plugging the drainage pipes to raise the water table for rice production. There are also social problems, in the sense that the majority of the farmers are agricultural graduates who were given the land by the state and who do not have the years of experience of farming that other, traditional Egyptian farmers have. However, these farmers are educated and have the potential to quickly adopt new technologies if they get proper technical and extension support. Managing these salt-affected soils requires the integrated approach of applying known agronomic and water management knowledge. This suggests that only limited experimental work is needed to fill knowledge gaps. However, there is a need for well-planned and scientifically sound demonstration and pilot fields, managed with the active participation of farmers, to test and evaluate promising technologies and cultivation practices. Such activities will help achieve the needed technology transfer and build farmers' and practitioners' capacities and awareness. These activities are also expected to speed the uptake of improved and sustainable management measures on salt- affected lands.

R&D strategy and its relationship with other donor activity

The target area for this proposal has been chosen so that it will contribute to the Egyptian government's agricultural graduate settlement program, which is aimed at reducing youth unemployment. This settlement program is still underway. An IFAD and the World Bank supported program has just been completed which developed irrigation and rural infrastructure. However, this region still remains underdeveloped and it is a priority region for the Egyptian government for further development and improvements. The potential of these marginal lands is, however, not fully exploited as available land and water management practices have not been widely adopted. Participatory approaches in developing small-scale farmers' skills, understanding the constraints to technology adoption, and developing an impact pathway can then demonstrably improve the performance of these salt-affected soils. This impact pathway shall contribute to the Egyptian government's development strategy in the area under consideration. This, in turn, will provide a successful pilot demonstrations leading to improvements in farmers' income and a sustainable agricultural production system.

Objectives of the research

a. Determine cropping patterns that optimize land and water use in salt-affected soils
b. Develop and test an effective impact pathway that accelerates the adoption of available land and water management technologies in salt-affected soils
c. Identify policies that support more sustainable land and water management and improve the incomes of farmers in salt affected soils
d. Assess why available technologies are not adopted on a large scale and identify solutions
e. Manage the saline drainage from a *mesqa* while maximizing the production capacity of the *mesqa* through the use of tested technologies, such as serial biological concentration (SBC)
f. Build the capacity of farmers and graduates for the management of salt-affected soils.

Activities

a. Review the saline land and water management technologies available in Egypt and develop extension packages
b. Conduct surveys to identify constraints to the adoption of technologies for saline soils and develop plausible solution options
c. Develop and apply participatory capacity development approaches for farmers, practitioners, and graduates to accelerate technology uptake
d. Further test/introduce and evaluate salt tolerant crops and varieties
e. Evaluate the economics of different cropping patterns
f. Review existing agricultural policies and recommend needed changes or new policies to facilitate the adoption of appropriate technologies by farmers
g. Evaluate before and after, and with and without, scenarios of the participatory capacity development on farmers behaviour, rate of adoption of technologies and system performance, and on-farm income
h. Develop a focused awareness program for farmers to help them sustain a profitable production system under saline impacted soil and water conditions
i. Develop, through demonstration, the optimal amount of water to be applied to rice fields and help reduce water logging in adjacent fields through the lateral flow of a shallow groundwater management scheme
j. Evaluate ways to improve fertilizer efficiency under saline condition
g. Test and evaluate the SBC options as a means of managing drainage and to increase land and WP; achieving the following plausible benefits in addition:

   1-No saline drainage downstream

   2-Reclamation of salinized land

   3-Improved farm income

   4-Overcome problems associated with land fragmentation

   5-Creat jobs within the mesqa management and administration

   6-Increase the range of crops

   7-Diversify the income stream

k. Develop a human capacity program to accelerate knowledge and technology uptake for best management practices.

Methodology (scale and content)

The basic idea of this proposal is to identify constraints to the adoption of existing knowledge, and demonstrate that a participatory extension and capacity development approach will develop a model for accelerating the adoption of existing technologies and best management practices. This impact pathway model will address all factors that influence technology adoption and is expected to make a significant contribution to development projects and government programs in Egypt. The proposal uses an integrated approach with a focus on developing farmers' skills and awareness and promoting farmer–to-farmer information exchange. Another aspect of this approach is that it addresses the institutional and policy constraints to the technology adoption and improvements needed to mitigate identified constraints. This adaptive research is conducted at the community level and the indicators are the measurable changes in farmer behaviour and practice using before and after, and with and without, scenario evaluations of the performance of the system in terms of practices, productivity, and farm income. There will be limited agronomic experiments on key information gaps, but the bulk of the work will focus on evaluating how capacity development can change system performance and identifying constraints and ways of alleviating them. There will be a strong connection with decision makers who can affect the identified constraints in order to demonstrate that these issues can be solved with available knowledge and policy instruments.

This proposed program will be implemented in the eastern Nile Delta within four governorates (Port Said, El-Sharkia, El-Ismailia, and El-Dakahlia) and it should directly benefit about 29,000 low income families utilizing about 13,000 feddan. The spill over benefits may influence up to 125,000 inhabitants in the recently developed lands which are irrigated from the El-Salam canal. This area is considered a priority one by the Egypt government.

Organizations involved

a. Egyptian ARC, Ministry of Agriculture and Land Reclamation
b. Egyptian MWRI
c. Universities in Egypt(Zagazig University, Ismailia University, Mansoura University
d. Universities in Australia: Charles Sturt University, University of Western Australia
e. International Center for Agriculture Research in the Dry Areas (ICARDA)

11.7 Appendix 7: Background Paper on Water and Agriculture in Egypt

International Center for Agricultural Research in the Dry Areas

ICARDA

Australian Government

Australian Centre for International Agricultural Research

BACKGROUND PAPER ON

WATER AND AGRICULTURE IN EGYPT

Based on the Egypt-Australia-ICARDA Workshop

on

On-farm Water-use Efficiency

July 2011

Cairo-Egypt

For submission to

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Nile Valley and sub-Saharan Africa Regional Program

International Center for Agricultural Research in the Dry Areas

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