



Australian Government
Australian Centre for
International Agricultural Research

Project annual report

project

Development of conservation cropping systems in the drylands of northern Iraq

project no.

CIM/2008/027

period of report

1 June 2008 – 31 May 2009

date due

31 May 2009

date submitted

3 June 2009

prepared by

Dr Colin Piggin

Project leader, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria

collaborators Dr Kadambot Siddique
Professor, Chair in Agriculture and Director, Institute of Agriculture, The University of Western Australia

Dr Wal Anderson
Principal Research Scientist, Department of Agriculture and Food, Western Australia

Dr David Coventry
Professor, Sustainable Agricultural Production, School of Agriculture, Food and Wine, The University of Adelaide, Australia

Dr Saleh Mohsen Bader, Director General and Project Coordinator, State Board for Agricultural Research, Ministry of Agriculture, Baghdad, Iraq

Dr Abdul Sattar AlRijabu, Assistant Professor and Project Leader, Field Crop Department, College of Agriculture, University of Mosul, Ninevah, Iraq

Mr. Jaafar Sedeeq Saeed
Director, Ninevah Directorate of Agriculture, Mosul, Ninevah, Iraq

Dr. Kasim Khalil Kasim
Director, State Board for Agriculture Research, Al Rashidiya Research Station, Mosul, Ninevah, Iraq

approved by Dr Paul Fox

Contents

1	Progress summary	4
2	Achievement against activities and outputs/milestones	6
3	Impacts	21
3.1	Scientific impacts	21
3.2	Capacity impacts.....	21
3.3	Community impacts	22
3.4	Communication and dissemination activities	24
4	Training activities	25
5	Intellectual property	29
6	Variations to future activities.....	30
7	Variations to personnel.....	31
8	Problems and opportunities	32
9	Budget	33

1 Progress summary

The project aims to increase crop productivity, profitability and sustainability in the drylands of northern Iraq through development, evaluation and promotion of conservation cropping technologies involving zero-tillage, stubble mulching, improved crop cultivars and better crop management. Project activity is focussed in Ninevah Governorate.

The objectives are:

1. To demonstrate and promote uptake of “best-bet” improved varieties and crop management systems for wheat, barley and pulse and forage legumes
2. To evaluate and select new, improved germplasm of wheat, barley and pulse and forage legumes for promotion in demonstration programs
3. To evaluate and select new, improved crop management technologies for promotion in demonstration programs
4. To facilitate agricultural planning and development through utilisation of GIS and crop modelling
5. To develop, evaluate and promote efficient and sustainable local seed production and supply systems
6. To monitor and evaluate adoption and impacts of project technologies, and identify enabling policy options to enhance uptake by farmers
7. To enhance capacity of Iraqi research and extension programs to develop and promote improved conservation cropping technologies.

The project commenced with the first reporting/planning meeting at ICARDA in September 2008, with 17 participants from Iraq, 7 from Australia and 20 from ICARDA. Activities and achievements from the previous project (CIM/2004/024) were presented and the 2008-09 workplan for the new project developed and circulated.

Under the demonstration objective, on-farm demonstrations were established as planned at 12 locations in Iraq evaluating wheat, barley, chickpea, and lentil lines under zero-tillage (ZT), chisel cultivation and conventional cultivation (CC). ZT area in the demonstrations covered 52ha. Six collaborating farmers independently sowed 440ha of ZT crops using a Rama seeder modified for ZT. The year was very dry with <150mm of rainfall at half the locations. Inspections in April-May 2009 confirmed that harvests were possible in only 4 sites, with crops failing because of low rainfall in the other 8 sites. Field days were held at Alqush on 7 January (12 farmers and staff); Telkief on 24 May (18 farmers and staff); and Alqush on 25 May (16 farmers and staff).

In linked demonstrations in Syria, 2070ha of ZT crops were established by 41 farmers in on-farm comparisons of ZT vs CC using locally-made ZT seeders. These farmer crops were inspected and discussed to promote understanding of ZT/stubble mulching with 12 farmers and 12 scientists from Iraq and 7 scientists and 10 farmers from Syria during training-study visits on ZT research, development and seeders in the spring of 2009.

Under the germplasm and crop management research objectives, the project conducted a total of 66 research trials. The University of Mosul and State Board of Agricultural Research Ninevah established 50 trials: 31 on evaluation of elite lines of wheat, barley, chickpea and lentil and varieties of vetch, lathyrus, saltbush, safflower, oats and peas; 19 on crop management and agronomy involving mixtures, rotations, polymer gel, hardpan amelioration and IPM. Trials were regularly inspected and evaluated. Unfortunately, crop growth was poor in many sites due to the very dry year, with reasonable growth and harvests expected from only 12 trials in 4 locations. Harvesting commenced in May/June.

At ICARDA, 16 trials for technology refinement/verification and Iraqi scientist and farmer training were conducted on crop growth under ZT and CC, local seeder performance under ZT and evaluation of alternative crops (oilseeds, oats, peas). All trials established and grew well with 280mm of rain. Growth was consistently better from ZT than CC and early than late sowing. Locally-made ZT seeders performed well. Trials were harvested in May/June.

Under the capacity enhancement objective, there were 91 Iraqi scientist and technician training visits to ICARDA with 74 participating in 10 formal training courses and 17 participating in the reporting-planning meeting where Australian collaborators gave 3 seminars on ZT machinery development, participatory extension and germplasm evaluation under ZT. The formal training focused on specific areas related to project implementation: adoption and impact analysis; seed multiplication and marketing; experimental methods and statistics; ZT seeder principles and operation; variety description and maintenance; GIS/remote sensing; germplasm improvement and breeding; and participatory extension methodology/practice. Australian collaborators delivered 3 of these courses, with the others delivered by ICARDA scientists.

In a May 2009 study visit, 11 farmers from Iraq and 8 from Syria spent a week inspecting and discussing ZT research and local farmer demonstrations in northern Syria. This was a very significant visit which enhanced farmer knowledge of conservation cropping systems and encouraged farmer involvement in development and evaluation of ZT/stubble mulching systems in Ninevah and Syria.

Six Iraqi project scientists attended several other significant capacity enhancement opportunities closely related to project activities:

- a) one Iraqi economist undertook impact and adoption analysis training at an ACIAR-sponsored Crawford Fund Master Class in India in March 2009.
- b) three Iraqi cereal breeders undertook crop breeding and seed production training at an AusAID sponsored course followed by a conservation cropping study tour in Australia in June-July 2009.
- c) two Iraqi scientists/project leaders participated in, and presented a project poster at, the 4th World Congress on Conservation Agriculture and undertook a study tour of ACIAR-supported conservation cropping projects in India in February 2009.

During the year, project findings and research and demonstration trials were shown to and discussed with 50 farmers at field days and 21 agricultural engineering students in Iraq and over 500 visitors at ICARDA, which exposed the project and technology widely.

Detailed project information including project documents, reports and presentations is available through the ICARDA web site (<http://www.icarda.cgiar.org/ACIAR/Index.htm>). The website averaged 150 hits/month during July 2008 - April 2009.

Since ZT technology was first exposed and introduced into Iraq by the previous project in 2006-07, the known area of ZT crops has increased to 489ha in 2008-09. In project-related development in Syria where the technology was similarly unknown and untested, total ZT area from project interactions was about 2126ha in 2008-09. A further 160ha of ZT crops is being grown in research and development projects involving Syrian research and extension groups. The recent increase in awareness, research and development on the technology, the keen involvement of farmers and seeder manufacturers in testing and taking up ZT sowing and seeder fabrication, and the higher yields and lower costs being experienced with the technology, provide a good foundation and confidence for wider adoption and impact. However, it has been difficult and disheartening for researchers, extension officers and farmers to develop, promote and evaluate better varieties and conservation cropping technologies during two successive severe droughts. We will hope for a wetter year in Iraq and Syria in 2009-10.

2 Achievement against activities and outputs/milestones

Background

In discussing achievements against activities and outputs/milestones, it is important to emphasise that project activity commenced in late August 2008.

In the 5 months before this, from April to August 2008, the project proposal was developed, finalized and approved. Briefly, the sequence and events were as follows. The draft proposal developed by all project partners during the April review/planning meeting of CIM/2004/024 was modified extensively in ICARDA and ACIAR in May-July. Revisions were based on many interactions including an ACIAR external review of the initial May draft by Dr David Connor, an AusAID external review of a July draft by Dr David Swete Kelly, visits and discussions with all Australian collaborators, comments from all project partners, and interactions with ACIAR and AusAID. Dr Piggin was contracted by ACIAR for a month during this time to coordinate proposal finalization. Following this extensive and participatory development and review, which gave all partners strong ownership, the final proposal with a budget of A\$4.7 million was submitted by ACIAR to AusAID on 1 August 2008. AusAID advised on 8 August 2008 that the project would be funded. The AusAID-ACIAR Record of Understanding was signed in early August 2008 and the ACIAR-ICARDA agreement signed on 21/25 August 2008.

The Iraqi Minister of Agriculture, Dr Ali Husein Kazem Al Bahadly, signed the ICARDA-MOA agreement on 1 November 2008. Australian collaborating institution agreements with ICARDA were signed by the University of Western Australia on 5 December 2008, University of Adelaide on 25 February 2009, and Department of Agriculture WA on 11 March 2009.

Inception

Dr Piggin commenced duties as the Project Leader at ICARDA on 21 August 2008. The Inaugural Reporting-Planning Meeting was held at ICARDA on 7-11 September 2008 followed by the Project Coordinating Committee Meeting on 11 September 2008.

The Iraqi Minister of Agriculture, Dr Ali Husein Kazem Al Bahadly, issued a Ministerial Order on 27 November 2008 to DOA, SBAR and UniMosul nominating staff and roles:

- Central committee - SBAR-Baghdad (3), SBAR-Ninevah (3), UniMosul (8), DOA (8)
- Sub committees
 - Demonstration activities - DOA (10)
 - Research activities - SBAR-B (4), SBAR-N (9), UniMosul (6), DOA (5)
 - GIS and IT activities - DOA (3)
 - Auditing activities - DOA (4)

The project appointed an ICARDA-based research assistant (12 October 2008) and secretary (4 December 2008) to assist with project implementation.

Management

The Ninevah Central Committee met in DOA Mosul on 24 July 2008 to review participation, reporting and workplanning at the September 2008 annual meeting, 9 October 2008 to plan implementation of the workplan, and 11 March 2009 to review progress and management of the demonstration program.

The DOA Sub Committee (DOA Director, 3 Sector Heads of rainfall zones, 15 location managers) coordinated implementation of the demonstration program through five meetings on 5 October and 27 November in 2008 and 11 January, 8 March and 10 May in 2009, where preparations, planting, monitoring, measuring, harvesting, data analysis and evaluation of demonstrations were discussed and organised.

Overall project coordination was enhanced by regular visits to ICARDA by the Project Coordinator Dr Saleh Bader (15/16 October 2008, 29/30 January and 2-7 May 2009) and Project Leader Dr Abdulsattar AlRajibo (29/30 January and 17 February 2009) to discuss and resolve various issues on workplan implementation, training, fund transfers, capital purchases and reporting.

High-level visits to ICARDA were made by: Dr Paul Fox, ACIAR Crop Program Manager, on 7-11 September 2008; Dr Mahdi T Al-Kaisey, Iraqi Deputy Minister of Agriculture, and Dr Saleh Bader on 1-5 May 2009; ACIAR Chief Executive Officer Peter Core on 3 May 2009; and Jonathan Ball, First Secretary (Development), Australian Embassy Baghdad, on 13-16 June 2008, to take part in meetings and to discuss and inspect the project.

Implementation

Outputs/milestones with completion dates and comments are tabled below for all activities under each objective:

Objective 1: To demonstrate and promote uptake of “best-bet” improved varieties and crop management systems for wheat, barley and pulse and forage legumes

no.	activity	outputs/ milestones	completion date	comments
1.1	Compile, review and analyse existing information on potential available technology options, (options already tested in the original project and more broadly within and outside Iraq, including registered Iraqi varieties of target crops and crop management options) in all agro-climatic zones of Ninevah governorate (All)	Annual Project meeting of project partners to discuss and determine work plan Constraints/limitations in rainfed crop production identified through evaluation of Phase 1 results/ experiences and on-going diagnostic study of farmers' existing practices Available “best bet” technologies identified and prioritized based on Phase 1 results/ experiences in farmer demonstrations and research trials	Sept-Oct 08 Sept-Oct 08 Sept-Oct 08	Reporting/planning meeting held at ICARDA on 7-11 Sept08. 44 scientists attended, with 3 from SBAR Baghdad, 3 from SBAR Mosul, 7 from DOA Ninevah, 4 from University of Mosul, 7 from Australia and 20 from ICARDA. Four ZT seeder manufacturers from Syria joined part of the field visits and demonstrations. Four scientists from the Syrian General Council for Scientific and Agricultural Research (GCSAR) joined for agronomy presentations and discussions and field demonstrations of ZT seeders. The 2008-09 demonstration workplan incorporating “best bet” technologies was developed after considering constraints and Phase 1 results; this was circulated on 8Oct08. Minutes of the meeting were circulated on 8Nov08.

1.2	Demonstrate and evaluate alternative conservation tillage management in Ninevah governorate, including zero-tillage, chisel plough, and deep tillage, compared with conventional tillage (PC)	<p>Annual Project meeting of all project partners to discuss and determine work plan</p> <p>Demonstration trials established</p> <p>Field days and visits to promote farmer awareness/adoption</p> <p>Evaluation of results and reporting</p>	<p>Sept 08</p> <p>Sept 0 -May 09</p> <p>Yr 1, 2, 3 on-going</p> <p>Yr 2, 3 m3</p>	<p>Workplan developed (see 1.1). Iraq</p> <p>It was very dry until 28-29 November, when effective rain fell and planting of trials and demonstrations commenced.</p> <p>All planned farmer demonstrations evaluating establishment and growth of several lines of the major crops (wheat, barley, chickpea, lentil) under ZT, chisel cultivation and CC (farmer practice) were established in 12 locations. ZT demos covered about 52ha. Six farmers independently sowed 437ha of ZT crops using a Rama seeder modified for ZT.</p> <p>Most sowing was undertaken in Dec-Jan. Although transfer of project funds to Iraq is still awaiting bank transfer procedure advice from MOA, demonstration and research programs proceeded using Phase 1 savings from the very dry 2007-08 to fund required seed, fertilizer and transport.</p> <p>Rainfall to 30April09 was very poor in LRA (Tel Abta - 87mm, Al Hatra - 28 mm, Al Mahlabia - 148mm) and two MRA sites (Al Namrod - 179mm, Bashyka - 146mm) with 0-10% germination of crops. The SI sites at Tel Abta and Al Namrod were unable to access irrigation water. Rainfall was higher in other sites under MRA (Tel Kief - 201mm, Al Hamdania - 235mm) with 65-80% germination and HRA (Al Shykhan - 335mm, Rabia - 236mm, Alqush - 212mm) with 60-95% germination. Inspections in April-May09 confirmed that harvests were possible in only 4 sites (Alqush HRA, Alshykhan HRA, Alshykhan+SI and Telkief MRA), with crops failing in the other 8 sites: LRA (Al Hatra, Tel Abta, Tel Abta+SI, Al Mahlabia), MRA (Hamdania, Bashyka, Al Namroud+SI) and HRA (Rabia).</p> <p>ICARDA</p> <p>In linked farmer demonstrations in Syria, 2073ha of zero-till crops were established in on-farm comparisons of ZT vs CC using locally-made ZT seeders with 41 farmers in northern Syria, many around Kamishley on the Iraqi border. These have assisted greatly in training/discussion visits by Iraqi scientists and farmers.</p>
-----	---	---	---	--

1.3	Identify, promote and widely disseminate among farmers in the rainfed cropping regions of Ninevah 'best bet' improved crop varieties (and management) identified in Phase 1 of the project (PC)	Annual meeting of all project partners to discuss and determine work plan Demonstration trials established Field days and visits to promote farmer awareness/adoption Evaluation of results and reporting	Sept 08 Sept 08-May09 April-May09 Yr 2, 3 on-going Yr 2, 3 m3	See 1.2 comments In Iraq, field days were held at Alqush 7 January (12 farmers and staff); Telkief 24 May (18 farmers and staff); Alqush 25 May (16 farmers and staff) In Syria, two large Iraqi groups inspected ICARDA research trials and Syrian farmer demonstrations: a) 12 scientists and 1 farmer from Iraq and 7 GCSAR scientists, 1 private company scientist and 1 farmer from Syria during ZT seeder training on 19-23 April 09 b) 11 Iraqi and 8 Syrian farmers during a visit on 23-28May09.
-----	---	--	---	---

PC = partner country, A = Australia

Objective 2: To evaluate and select new, improved germplasm of wheat, barley and pulse and forage legumes for promotion in demonstration programs

no.	activity	outputs/ milestones	completion date	comments
2.1	Identify potential lines from the original project experience, other Iraq information, ICARDA's international testing program, Australian experience, and other sources (All)	ICARDA activity: identifying 10-12 elite lines of drought, disease and salinity tolerance ICARDA activity: incorporating abiotic/biotic stress tolerance/resistance into adapted lines	Nov08 On-going	Reporting/planning meeting held and germplasm research workplan determined as outlined under 1.1. Elite lines of bread wheat (10), durum wheat (13), barley (14), chickpea (12) and lentil (10), with a range of tolerances to drought, salinity and pest/disease were identified, along with oats (10), peas (5), vetch (22), lathyrus (2), saltbush (2) and safflower (23) which perform well at ICARDA. Seed for 3-5 trials sent in Nov 09

2.2	Screening, evaluation and selection of improved germplasm in Ninevah (PC)	<p>Screening trials established</p> <p>Evaluation of results and reporting</p> <p>Field days and visits to promote farmer awareness/adoption</p> <p>Selected improved lines moved into activity 1.3 in demonstration program</p>	<p>Nov08-Jan09</p> <p>Yr 2, 3 m 3</p> <p>Yr 1, 2, 3 on-going</p> <p>Yr 2,3 m4</p>	<p>Replicated trials established by University of Mosul and SBAR-Ninevah testing elite lines:</p> <p>a) bread wheat (7 lines) at Telafar Research Station (LRA); Mosul University (LRA)</p> <p>b) bread wheat (5 lines) at Rasheediya Research Station (MRA-SI); Mosul University (MRA+SI)</p> <p>c) bread wheat (12 lines) at Mosul University (MRA)</p> <p>d) durum wheat (13 lines) at Tel Kief (MRA)</p> <p>e) barley (15 lines) at Telafar RS (LRA); Bashiqa (MRA); Mosul University (MRA)</p> <p>f) lentil (11 lines) at Rasheediya Research Station (MRA); Bashiqa (MRA); Al Kosh (HRA)</p> <p>g) chickpea (13 lines) at Rasheediya Research Station (MRA); Bashiqa (MRA); Al Kosh (HRA)</p> <p>h) vetch (23 lines) and lathyrus (2 lines) at Rasheediya Research Station (MRA)</p> <p>i) salt bush (3 lines) at Mosul University (MRA); Al Hatra (LRA)</p> <p>j) safflower (3 lines) at Alnamroud (MRA), Tel Kief (MRA), Tel Abta (LRA); Mosul University (MRA)</p> <p>The year was very dry, with 140mm at Telafar (LRA), 193mm at Rasheedia (MRA), 128mm at Bashiqa (MRA) and 217mm at AlKosh (HRA) (see 1.2 for other rainfall and irrigation possibilities).</p> <p>Trials regularly inspected and evaluated. In rainfed areas, growth was reasonable and harvests expected only for wheat, lentil, chickpea, vetch and lathyrus at Rasheedia, barley at Mosul University, saltbush at AlHatra and lentil, chickpea, safflower, oats and peas at Alqush. Harvesting commenced in May.</p>
2.3	Screening, evaluation and selection of improved germplasm of wheat, barley, and forage legumes and grasses for adaptation to salinity in Iraq (PC)	<p>Screening trials established</p> <p>Evaluation of results and reporting</p> <p>Field days and visits to promote farmer awareness/adoption</p>	<p>Nov08-May09</p> <p>Yr 2, 3 m 5</p> <p>Yr 2, 3 m 3</p> <p>Yr 2, 3 on-going</p>	<p>Two trials implemented as planned at irrigated sites at Wahda in Baghdad Governorate and Sawaria in Wassit Governorate. Trials harvested in May09 and results under analysis.</p>

Objective 3: To evaluate and select new, improved crop management technologies for promotion in demonstration programs

no.	activity	outputs/ milestones	completion date	comments
-----	----------	------------------------	-----------------	----------

3.1	Conduct research on conservation cropping technologies including ZT, stubble mulching, time of sowing, ± stubble, improved fertilizer practices, crop rotation, improved weed, pest and disease management in Iraq and ICARDA (PC and ICARDA)	<p>Annual meeting to discuss and determine work plan</p> <p>Trials established</p> <p>Field days and visits to promote farmer awareness/adoption</p> <p>Evaluation and reporting at annual meetings</p> <p>Selected improved technologies moved into activity 1.2 in demonstration program</p>	<p>Sept08</p> <p>Jan09</p> <p>Yr 1, 2, 3 on-going</p> <p>Yr 2, 3 m3</p> <p>Yr 2,3 m4</p>	<p>Reporting/planning meeting held and crop management research workplan determined (see 1.1). Iraq</p> <p>The University of Mosul established trials as follows:</p> <p>a) mixed safflower + barley at Alnamroud, Tel Kief and Tel Abta b) polymer gel use to mitigate moisture stress for wheat (Alnamroud) and barley (Tel Abta) c) crop rotation with annual medic and wheat at Tel Kief and Mosul University d) crop rotation with nigella and wheat at Tel Kief and Alqush e) mixed cropping with flax and wheat at Alqush f) subsoiler to break hardpans with wheat and barley at Alnamroud, TelKief, Alqush and Tel Abta g) IPM - efficacy of Cruiser and Devedent to control wheat leaf miner and covered smut at Telkief and Alqush h) IPM - efficacy of Cruiser350 FS and Celest 100 FS to control chickpea lesser army worm and root rot diseases at Telkief and Alqush i) IPM - evaluation of biological control of covered smut and root rot on wheat under ZT at Alqush</p> <p>Due to limited rainfall, harvests were expected only for subsoiler and IPM experiments at Alqush.</p> <p>ICARDA</p> <p>Nine crop management trials were established for technology verification/refinement and Iraqi training:</p> <p>i) three long-term trials on effects of CC vs ZT on cereals and food legumes with early/late planting and +/- stubble treatments</p> <p>ii) five trials on effects of CC vs ZT on 10-12 bread wheat, durum wheat, barley, lentil and chickpea lines</p> <p>ii) one trial on effects of sulfonylurea residues on chickpea and coriander under ZT and CC</p> <p>There was 280mm of well-spaced rainfall commencing in mid-Sept. All trials established and grew well. Growth from early Sept/Oct sowing was better than late Nov/Dec sowing and ZT was generally better than CC.</p> <p>In one trial, Ascochyta blight (<i>Ascochyta rabiei</i>) on chickpea was higher under ZT than CC, especially with early sowing. Cyst nematode (<i>Heterodera ciceri</i>) was observed in all chickpea and lentil, with incidence lower under ZT than CC. In chickpea, incidence was higher with early sowing under CC and with late sowing under ZT.</p>
-----	---	--	--	--

3.2	Cross-evaluation of alternative cropping systems by crop-soil-simulation modelling (PC and ICARDA)	Small experiments conducted for later crop model calibration Selected trials analysed by crop simulation modelling to evaluate benefits of conservation cropping	Yr 1, 2, 3 m5 Yr 3 m3	The small optimal growth side-experiments were not established. With the appointment of a soil scientist at ICARDA, this is now planned for the 2009-10 season. Soil and crop parameters (soil water, Nmin, microbial biomass, aggregate stability, biomass, LAI) were collected from 3 long-term trials in Oct08, Mar09 and May09. Crop modelling will start after full-season data are available in June.
3.3	In conjunction with local manufacturers, modify and adapt locally produced seeders and evaluate their performance under ZT (PC and ICARDA)	Annual Project Reporting and Planning meeting to discuss and determine work plan Prototype ZT seeders produced, evaluated and promoted Evaluation of results and reporting at annual meetings	Sept08 On-going Yr 2, 3 m3	Reporting/planning meeting agreed on ZT seeder fabrication workplan (see 1.1). ICARDA-Syria The project collaborated with four local seeder manufacturers to fabricate affordable ZT seeders. Four excellent tyne machines costing around US\$1500-2000 were produced. Kamishley manufacturers fabricated a disc seeder for Iraq. Four trials conducted comparing performance of ZT seeders (2 imported and 3 local) for early/late sowing with wheat, barley, lentil and chickpea. The 3 local seeders performed comparably well for all crops. Iraq No activity because budget/funds unavailable
3.4	Conduct research on adaptation and seed production of alternative crops including oats, peas and oilseeds in ICARDA and, when seed is available, in Iraq (PC and ICARDA)	Annual Reporting and Planning meeting to discuss and determine work plan Trials established Evaluation and reporting at annual meetings Field days and visits to promote farmer awareness/adoption Selected crops/ lines moved into activity 1.3 in demonstration program	Sept08 Nov08-Jan09 Yr 2, 3 m3 Yr 1, 2, 3 on-going Yr 2,3 m4	Reporting/planning meeting held and alternative crops research workplan determined as outlined under 1.1. Lines of oats and peas sent into Iraq (see 2.1). ICARDA Three trials conducted on adaptation of lines of oats, peas, brassicas. All grew well and were harvested in May09. Iraq Adaptation trials conducted on: a) oats (5 lines) at Alnamroud, TelKief, Tel Abta, Alqush and Mosul University b) peas (5 lines) at TelKief, Alqush and Mosul University. The year was very dry (see 1.2). Trials were regularly inspected and evaluated, with field days in Telkief and Alkush on 24/25 May. Growth was reasonable; oat and pea harvests expected only in Alqush.
3.5	Evaluate systems for the integration of crops, forages and livestock (All)	Evaluation of literature and trials Reports and recommendations to annual meetings	Yr 2, 3 m3	Stubble retention/removal treatments imposed in 2008-09 barley crop in one long term trial at ICARDA. This will simulate effects of grazing on crops and soils.

3.6	Undertake initial demonstrations with farmers in Iraq and ICARDA/Syria and identify options for wider promotion under Objective 1 (PC and ICARDA)	Establishment of demonstrations with farmers in Iraq and around ICARDA	Nov08-Jan09	ZT demonstrations established with 20 farmers in Iraq and 41 farmers in northern Syria (see 1.2 and 1.3 for details).
-----	---	--	-------------	---

Objective 4: To facilitate agricultural planning and development through utilisation of GIS and crop modelling

no.	activity	outputs/ milestones	completion date	comments
4.1	Conduct annual training session on advanced GIS skills (ICARDA)	2-3 trained GIS scientists	May09	3 scientists from the GIS laboratory at DOA Ninevah undertook 3 weeks GIS/RS training at ICARDA. Training will continue in October 2009.
4.2	Develop land suitability maps using locally compiled and globally available data (PC and ICARDA)	Land suitability maps developed and used in planning and technology dissemination	Yr 3, m12	Targeted for 2011
4.3	Integrate GIS into project development activities and develop and utilize geospatial services to assist with the interpretation and promotion of project technologies (PC)	New GIS skills being applied in DOA Ninevah GIS Unit	On-going	Trainees returning from initial GIS course in May09 using better understanding and skills
4.4	Initiate training sessions in crop-soil simulation modelling using either the CropSyst, APSIM or DSSAT crop modelling suite (ICARDA)	2-3 scientists trained in modelling Crop models increasingly used in evaluation of conservation cropping	Jan 09 Yr 2 m12 On-going	3 scientists participated in CropSyst Simulation Modelling training at ICARDA, 11-15Jan09 Levels of available experience and expertise insufficient to enable independent use of modelling

Objective 5: To develop, evaluate and promote efficient and sustainable local seed production and supply systems

no.	activity	outputs/ milestones	completion date	comments
5.1	Multiply and provide seed of new crop germplasm and crop varieties for research and demonstration in Iraq (ICARDA)	1-2 tonnes of seed of new germplasm and varieties of cereals, legumes and forages produced at ICARDA and made available for research and demonstration in Iraq	Sept - Nov 08	Four tonnes (4t) of seed from ICARDA and WA to support trials and demonstrations in Iraq assembled/sent from ICARDA to Mosul on 24 Nov 08. Possibly salt-tolerant lines of durum and bread wheat and barley included for testing at 2 sites near Baghdad. University of Mosul established seed production plots for bread wheat (2 lines) at Tel Kief (MRA).

5.2	Develop a functional seed unit for breeder and foundation seed production at Rabiaa research station in Ninevah using the seed cleaners purchased in the original project (PC)	Appropriate procedures and facilities for breeder and basic seed production reviewed during first year and established during the second year At least 10 participants trained each year in variety maintenance and breeder/foundation seed production	May09 Yr 2 m12 Apr-May09 Yr 2 m12	SBAR planned at the 20May09 meeting to undertake line/spike selection of private grower areas in 2009-10. No information available on review Two Iraqi participants from Baghdad (Francis Janno, SBAR; Farhan Fayyadh, SBSTC) attended training on variety description and maintenance in seed production on 26Apr-7May09. It is not clear how Baghdad scientists will assist implementation of seed activity. It was a missed opportunity Ninevah scientists did not participate
5.3	Establish sustainable farm/village-based seed production enterprises (VBSEs) (PC)	Four VBSEs operational during Yr1 each producing 100 t seed An additional 4/5 VBSEs operational during Yr2 each producing 100 t seed Group training for farmers, extension services and other stakeholders organized each yr on technical and management aspects Seed demand survey conducted and business plans developed each yr Analysis of profitability of VBSEs conducted each yr to ensure sustainability and options for diversification A network/association of local seed production and marketing enterprises established at provincial level during Yr3	All Yr1 targets not achieved Yr 2 m12 Yr 1,2,3 m12 Yr 1,2,3 m12 Yr 1,2,3 m12 Yr 3 m12	Detailed plans and responsibilities for VBSE developed with 11 Iraqi participants at seed multiplication and marketing workshop, held at ICARDA on 15-19Feb09. A 2nd meeting in Mosul on 20May09: 1. confirmed responsibilities of DOA, SBAR, SBSTC, UniMosul, Mesopotamia Seed Company and private growers 2. planned for 6 regions in HRA/SI to produce a total of 100t of seed on 83ha in 2009-10 3. identified 2 durum and 4 bread wheat and 3 barley varieties for multiplication 4. selected 6 growers and nominated target varieties/areas

Objective 6: To monitor and evaluate adoption and impacts of project technologies, and identify enabling policy options to enhance uptake by farmers

no.	activity	outputs/ milestones	completion date	comments
-----	----------	------------------------	--------------------	----------

6.1	Characterization of improved technology options in terms of their performance, profitability, risk reduction, and acceptance by farmers (PC)	Yields and agronomic performance estimates, budgets and results of sensitivity analysis, farmer perceptions documented and used in evaluation and planning	Yr 2 m12	<p>Main activities, especially in view of the 2007-08 drought, were preparing tools, methodologies and capacities for gathering and analyzing primary data, which will be available after harvest.</p> <p>Dr Emad Abdullah and Mr Watheq Abdullah undertook training in poverty, livelihoods, adoption and impact analysis at ICARDA in Nov08. Dr. Saad Mohammed undertook training in adoption and impact analysis in India in Mar09. Questionnaire designed to capture required farmer's data to support the 8 activities in Objective 6.</p> <p>Data will be gathered after harvest in May, with 500 farmer interviews distributed equally amongst rainfall zones/locations.</p>
6.2	Analysis of water productivity and factors explaining low WUE in SI areas and farmer's demand for water (PC)	Water-related productivity and demand indicators	Yr 2 m12	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah
6.3	Identify sources of inefficiency and assess the impacts of improved options on increasing efficiency (PC)	Options for improving production inefficiency identified	Yr 2 m12	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah
6.4	Assess the effectiveness of improved management options on the adaptive capacity of local communities to climatic variability and change (PC)	Best-bet technology options for adaptation to climatic risk identified	Yr 3 m6	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah
6.5	Monitoring rate of adoption of improved technologies and identifying constraints to provide feedback to technical, socio-economic and policy research (PC)	Adoption indicators, constraints identified and shared with others	Yr 2 m12	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah
6.6	Evaluation of economic and environmental impacts of improved technologies promoted by the project at both farm and community levels (PC)	Estimates of impact documented	Yr 2 m12	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah

6.7	Assess the impact of land tenure, input and output pricing policies (input price subsidy, output price supports) on the uptake of new technologies and their implications on rural livelihoods (PC)	Land tenure and pricing policy options developed	Yr 2 m12	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah
6.8	Identify enabling policy and institutional options (PC and ICARDA)	Enabling institutional arrangements and policy incentives and options identified	Yr 3 m6	To be conducted in 2010-11 provided data from demos/trials collected and security situation allows surveys in Ninevah

Objective 7: To enhance capacity of Iraqi research and extension programs to develop and promote improved conservation cropping technologies

no.	activity	outputs/ milestones	completion date	comments
7.1	Develop and agree on program of training (All)	Annual training program	Sept08	Possible topics/areas nominated for short-term training at ICARDA and medium and post-graduate training in Australia.

7.2	Short term and individual medium-term training and joint data analysis (ICARDA)	Training conducted (25 trainees per year)	Nov08 - June09	<p>Eleven training courses/visits undertaken involving 74 scientists and 11 farmers from Iraq; 12 GCSAR/DOA scientists, 1 private company and 9 farmers from Syria; and 2 ICARDA scientists on:</p> <ol style="list-style-type: none"> 1. Poverty, livelihoods, adoption and impact analysis, 16-27Nov08 - 2 Iraqi participants 2. IPM workplanning, 18-20Nov09 - 3 Iraqi participants 3. CropSyst Simulation Modeling, 11-15Jan09 - 3 Iraqi participants 4. Seed multiplication/marketing in Ninevah, 15-19Feb09 - 11 Iraqi participants 5. Experimental methods and statistics, 19-30April09 - 9 Iraqi + 2 ICARDA participants (Presenter: Dr Jens Berger, CSIRO/UniWA) 6. ZT seeder principles, fabrication and operation, 19-23April09 - 13 Iraqi + 7 GCSAR, 1 commercial company scientist and 1 farmer Syrian participants (Presenter: Dr Jack Desbiolles, UniSA/UniAdel) 7. Variety description and maintenance in seed production, 26Apr-7 May09 - 2 Iraqi participants 8. GIS/Remote sensing, 3-21May09 - 3 Iraqi participants 9. Germplasm improvement - breeding (on-the-job), 3 - 28May09 - 4 Iraqi participants 10. Farmer inspection of ZT R&D at ICARDA and in Syria, 23-28May09 - 11 Iraqi + 8 Syrian farmers 11. Participatory extension methodology/practice, 14-18June09 - 11 Iraqi and 5 DOE Syria participants (Presenter: Dr Jay Cummins, Rural Solutions SA/UniAdel)
-----	---	---	----------------	--

7.3	Thematic workshops (ICARDA)	New research areas identified, or work plans adjusted; new methodologies adopted	Sept09 Yr 2,3 m3	<p>Three seminars presented by Australian collaborators at the reporting-planning meeting in Sept08, each attended by 50 scientists including 17 Iraqis, illustrated and discussed diverse approaches to crop yield improvement, as follows:</p> <ol style="list-style-type: none"> 1. "No-Till Seeding Systems - Technologies & Performance Issues" Dr Jack Desbiolles, Agric Machinery Res and Design Centre, Uni of South Australia 2. "Participatory Approaches to Creating Change On-Farm; Sharing Australian Experiences" Dr Jay Cummins, Rural Solutions SA 3. "Field Trials & Variety Evaluation in Australia - The University of Adelaide Barley Program" Assoc. Prof. Jason Eglinton, Barley Program Leader.
-----	-----------------------------	--	-------------------------	---

7.4	Long term training/joint research and English/MSc/PhD graduate research at Australian partner institutes (A)	10 Iraqi scientists trained over 3 years 4 MSc graduates 2 PhD graduates	Yr 1, 2,3 m12 Yr 3 m12 Yr 5 (2013) m12	<p>There has been much interaction concerning trainees between Iraq, ICARDA and Aust collaborators. AusAID in Baghdad and Canberra is providing support for visas and other arrangements.</p> <p>So far, 13 scientists have been nominated, with 3 MSc and 4 six-month nominees possibly acceptable to Aust institutions. Others provided inadequate data or do not meet agreed criteria. More nominations were requested.</p> <p>In a special training opportunity, project socio-economist (Dr. Saad Hatem Mohammed) attended an ACIAR-sponsored Crawford Fund Master Class on "Impact assessment: concepts and tools for agricultural research evaluation and impact assessment" provided by ACIAR and ICRISAT in India on 18-27Mar09. This was valuable to expose Dr Saad to the latest methodologies and experiences to enhance adoption and impact assessment.</p> <p>In a second special training opportunity, three breeders from the project (Dr Maan Mohammed Salih SBAR - chickpea/lentil; Jamal Abdulfattah Yousif Al-Hazza MSc SBAR - bread wheat; Dr Mohammed Yousif Hammed UniMosul - barley) travelled to Australia on 28May09 to participate in AusAID-supported training (8 weeks) on plant breeding, seed production and seed quality by SARDI, Adelaide University and Rural Solutions SA followed by a project study tour (4 weeks) on conservation cropping R&D arranged by UniAdelaide.</p>
-----	--	--	--	---

7.5	Support participation of Iraqi personnel in regional or international workshops and conferences of relevance to the project (All)	Conference attendance and report	Feb09	<p>Six project collaborators (Iraq - Drs Bader, AlRijabo; ICARDA - Dr Piggin, Mr Haddad; Adelaide Uni - Drs Coventry, Cummins) attended and presented a project poster at the 4th World Congress on Conservation Agriculture, India, 4-7 Feb 09. Dr Piggin also co-authored a keynote address paper/presentation.</p> <p>Following the conference, the group undertook a study tour on 7-16 Feb09, under the guidance of the ACIAR wheat quality project leader, Dr Ashok Yadav, Haryana Agricultural University, to inspect-discuss conservation cropping, ZT seeder manufacture and farmer-participatory extension R&D being undertaken around Rewari, Hisar, Kaithal, Kurekshetra, Karnal and Ludhiana in Haryana and Punjab States, including National Agro Industries where initial project ZT seeders were sourced. This opportunity to learn from Indian experience has enhanced efforts to develop ZT systems in Iraq.</p>
-----	---	----------------------------------	-------	--

PC = partner country, A = Australia, ICARDA = International Center for Research in Dry Areas

3 Impacts

This project follows on from an initial 3-year project, with both aimed at introducing, developing and promoting new cropping technologies in a difficult environment, which needs time. In the initial project, as discussed in the final report, adoption and impact prospects were considered promising but had been constrained by the facts that ZT seeders were unavailable in the first year and severe drought caused crop failure in nearly all research and demonstration sites in the third year. In this first year of the new project, rainfall was also very low in Ninevah and crop prospects were bleak in the LRA and most MRA sites. Crops are just being harvested at the end of this first year, so complete information is not yet available on crop performance and farmer experiences with the new technologies being tested. It must be recognised that it is very tough and disheartening to try and develop and promote technologies during (and after) two successive severe droughts.

Cost-benefit and adoption/impact evaluations will be undertaken after crops are harvested each year over the next 3 years. Nevertheless, there were some positive impact-related experiences to date which are discussed below.

3.1 Scientific impacts

The project has continued to develop considerable knowledge and experience of conservation cropping technologies in Iraq and Syria through research and development in Iraq and at ICARDA on zero-tillage, alternative crops and ZT seeder fabrication. Comparisons of barley, bread wheat, durum wheat, chickpea and lentil lines under CC and ZT systems at ICARDA, once analysed, may contribute to a review of germplasm evaluation methodologies in the region.

3.2 Capacity impacts

There were 91 Iraqi scientist training visits to ICARDA with 74 participating in 10 formal training courses and 17 participating in the reporting-planning-scientific exchange meeting, where Australian collaborators delivered 3 seminars on developments in priority project areas of ZT machinery development, participatory extension and germplasm evaluation under ZT.

The ICARDA training for Iraqi scientists was more targeted and longer-term than previously, with Australian partners delivering 3 of the courses, and focused on specific areas related to the project: adoption and impact analysis; seed multiplication/marketing; experimental methods and statistics; ZT seeder principles, fabrication and operation; variety description and maintenance; GIS/remote sensing; germplasm improvement and breeding; and participatory extension methodology/practice.

Capability to plan and implement programs to identify, demonstrate and disseminate new technologies, especially related to conservation cropping, was enhanced for the 17 scientists who attended the annual meeting through involvement in the planning, conducting and reporting of research and demonstration activities. They have received good guidance from ICARDA and Australian scientists but, because of their isolated situation, have been completely responsible along with colleagues for implementation. This has encouraged experience and capacity in planning, organisation, communication and innovation.

In a very significant visit, 11 farmers from Iraq and 8 from Syria inspected and discussed ZT research at ICARDA and the GCSAR Research Station in Kamishley, farmer experiences with testing ZT around Aleppo, El Bab and Kamishley, and ZT seeder fabrication with 4 machinery manufacturers in ElBab, Qabbasin and Kamishley. This

greatly enhanced farmer knowledge of zero-till/stubble retention sowing systems and reinforced commitment to try these on a large scale.

Other significant capacity enhancement events closely related to project activities were:

a) impact/adoption analysis training for Dr. Saad Hatem Mohammed at an ACIAR-sponsored Crawford Fund Master Class in India in March 2009.

b) breeding and seed production training sponsored by AusAID and a project-funded study tour of conservation cropping R&D in South Australia in May-August 2009 for three cereal breeders (Dr Maan Mohammed Salih SBAR; Jamal Abdulfattah Yousif Al-Hazza SBAR; Dr Mohammed Yousif Hamed UniMosul), arranged through Rural Solutions SA and the University of Adelaide

c) Dr Saleh Bader and Dr Abdulsattar AIRijabo, accompanied by Drs Colin Piggin, David Coventry and Jay Cummins, attended and presented a project poster at the 4th World Congress on Conservation Agriculture in February 2009 and undertook a study tour to inspect and discuss conservation cropping, ZT seeder manufacture and farmer-participatory technology promotion R&D being undertaken in northern India.

Capacity of Iraqi institutions to undertake work has been enhanced with the supply in May 2009 of three project vehicles to facilitate the implementation, monitoring and evaluation of project activities.

3.3 Community impacts

Farmers in Iraq and Syria are very interested in ZT to increase yields, reduce costs and improve soil and water conservation. It is very significant that the initial project introduced ZT technology and seeders into Iraq and demonstrated their potential to both scientists and farmers, for the first time according to Iraqi project collaborators. Farmers are also interested in using some of the improved varieties under evaluation. The current project is building on this legacy.

In Iraq, several farmers who visited ICARDA in 2006-07 modified their Rama/John Shearer seeders and grew significant areas of their crop under ZT. These have expanded their areas in 2008-09 and influenced many neighbours to take an interest in ZT.

In Syria, some 20 farmers collaborated with ICARDA in on-farm testing/demonstration of ZT in 2006-07 and 2007-08 and were impressed with the simplicity, good yields and lower costs of the ZT system. These farmers have influenced neighbours and expanded the uptake of ZT in 2008-09.

Four machinery manufacturers involved in local development of ZT seeders see the potential of the technology, as many are farmers, and possibilities to increase business as demand and adoption grow. One manufacturer in Kamishley expects demand from Iraq.

3.3.1 Economic impacts

In Iraq, several machinery manufacturers and farmers collaborated to construct local ZT seeders, and three were produced in the first project. Several farmers sowed large areas (>50ha) using these seeders in 2007-08. This introduced the technology into the private sector domain and stimulated interest amongst other farmers. In 2008-09, ZT crops covered some 52ha in project demonstrations on farmer fields. Six farmers grew a further 437ha of ZT crops seeded with the Rama seeder. Total ZT area we know of was 489ha.

In project-related development in Syria, ZT was tested by 3 farmers in 2006/07 and 6 farmers in 2007-08 using the Indian ZT seeder from ICARDA. Area greatly expanded in 2008-09 with 2073ha being grown by 41 farmers, facilitated by extra availability of ZT seeders. There was also 52ha of ZT research plots and rotation crops at ICARDA. The Syrian ZT area linked to project interactions totalled about 2126ha in 2008-09.

There are several other projects in Syria evaluating and promoting ZT; the project is interacting with them. An Arab Center for Studies of Arid Zones (ACSAD) project supported by GTZ involving the Syrian Directorate of Extension has five 1ha on-farm demonstration plots in each of 5 governorates and a further 60 farmers growing a total of 160ha of ZT crops. The General Commission for scientific Agricultural Research (GCSAR) Himo Research Station in Kamishley in a project supported by the Arab Organisation for Agricultural Development (AOAD) has 3 long term ZT rotation trials and 11 on-farm demonstrations linked with ACSAD covering an area of 60ha. Both these projects use imported ZT seeders.

One Syrian farmer at Kamishley (Ali Mansour Alewi), after visiting ICARDA, modified his broadcast disc seeder for ZT by removing discs and fitting narrow tine points with seed tubes for about \$1000 and sowed 1200ha of ZT wheat, with savings in cultivation and seed costs of US\$20,000. Despite the dry conditions, his wheat looked harvestable in May 2009 and may yield around 1t/ha, whilst surrounding CC farmer crops were very stunted with few ears and little grain and no possibility of harvest.

The four collaborating machinery manufacturers produced their first four ZT seeders in 2008/09, which were loaned to interested farmers and performed very well. Manufacturers see commercial opportunities in marketing ZT seeders at prices around \$1500-2000, which is comparable to conventional seeders.

Economic benefits will come from higher yields and lower costs. 2008-09 crops are just being harvested but, in long-term trials at ICARDA in 2007-08 with 220mm of rainfall, yields with improved management (ZT and early sowing) were higher by 54% for wheat (730kg/ha), 56% for chickpea (600kg/ha), 46-91% for lentil (600kg/ha) and 14% for barley (1620kg/ha), than for farmer practice (2 cultivations and late sowing). ZT eliminated 2 cultivations (\$20/cultivation) and saved about \$40/ha. Other costs seem unlikely to change as the dry Mediterranean summers mean few weeds and no need for pre-sowing knock-down herbicides such as Glyphosate, whilst post-sowing crop management is similar for both systems.

This initial farmer uptake of ZT, involvement of local manufacturers in ZT seeder construction, higher yields and lower costs provide a good foundation for wider adoption and impact.

3.3.2 Social impacts

The reductions in cultivation and quicker, earlier sowing of crops possible with ZT will bring more time and leisure to farmers and more family opportunity for interaction and recreation. Human health may be enhanced with no requirement for stubble burning and consequently less smoke pollution and also with reductions in dust storms, which are common in the region. These are predicted impacts which may be realised if/when ZT is more widely adopted.

3.3.3 Environmental impacts

Environmental benefits to soils and water can be expected in future. From experience elsewhere, ZT brings better soil structure (OM), better soil-water dynamics (porosity), better nutrient recycling (NPK), improved trafficability, less erosion, and opportunity for increased soil OM and C sequestration. Soil testing from the long-term trials at ICARDA suggests that after 3 years the percentage of aggregates with a size >0.5 mm is higher under ZT than conventional cultivation. Pollution will also be less as stubbles are retained on the soil surface and burning is reduced. Dust storms and erosion, which can be severe in the region, should be reduced. These benefits have not been quantified but are well known from other experiences and publications.

3.4 Communication and dissemination activities

Project Website - this allows quick and easy access by all project partners to the latest project documents as well as to all presentations given at meetings by the project partners, for reference and re-use. The website is open to the public and provides information to the wider scientific community and donors on research, development and capacity building by the collaborators in, and AusAID/ACIAR support for, the project in Iraq. The website averaged 150 hits/month during July 08 - April 09.

Project reports and publications produced were:

Project final report, CIM/2004/024 Better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes in Iraq, April 2009. 36pp.

Meeting report: Final reporting meeting 2007-08; ACIAR/AusAID CIM/2004/024 Better crop germplasm and management for improved production of wheat, barley and pulse and forage legumes in Iraq. Iraq-ICARDA-Australia Project; 2007/08 reporting and planning meeting 7-11 September 2008 ICARDA Aleppo, Syria. 24pp.

Workplan 2008-09: Annual reporting/planning meeting, ICARDA, 7-11 September 2008. ACIAR/AusAID CIM/2008/027, Development of conservation cropping systems in the drylands of northern Iraq. 40pp.

Solh, M., Colin Piggin, Akmal Akramkhanov, Aziz Nurbekov, Raj Gupta, Maarten van Ginkel and Christopher Martius (2009). Improving Equity and Livelihood Security through Conservation Agriculture. Invited keynote address and paper to the 4th World Congress on Conservation Agriculture in Delhi, India, 4-7th February 2009.

Piggin, C., Atef Haddad, Abdulsattar Alrijabo, Saleh Bader, Wal Anderson, David Coventry and Kadambote Siddique (2009). Development and Promotion of Zero-tillage for Conservation Cropping in Iraq and Syria. Poster and paper presented at the 4th World Congress on Conservation Agriculture in Delhi, India, 4-7th February 2009.

Ninevah, Iraq

A group of 21 agricultural engineering students from Mosul University visited Telkief with Drs Abdulsattar AlRajibo and Saad Abdul Jabbar Samir on 15 April 2009 to inspect the new seed cleaner and see and discuss the seed cleaner study of an MSc student.

Field days were held in 2009 on demonstration and research locations as follows: Alqush 7 January (12 farmers and staff); Telkief 24 May (18 farmers and staff); Alqush 25 May (16 farmers and staff)

ICARDA, Syria

Many visitors inspected and discussed the conservation cropping research being undertaken at ICARDA in spring (April-May) when crops looked good and displayed treatment differences well. This included over 350 agronomy and agro-machinery undergraduate students from Aleppo, Damascus, Lattakia, Dier Azor, Idlib and Homs Universities in Syria and the American University Beirut in Lebanon and a group of 25 trainees, including 13 from Iraq and 5 from Syria, attending a JICA-sponsored course on integrated crop and livestock production. This was a first exposure to ZT/stubble mulching for all students and trainees, with many expressing disbelief that crops can be grown without tillage but some indicating interest in pursuing further studies which may help promote more awareness, understanding and adoption of ZT technology in the long-term.

Other visitors in April-May included 60 scientists/guests attending at the time of the ICARDA Presentation Day (including the Syrian Prime Minister Eng. Naji Otri, the Syrian Minister of Agriculture and Agrarian Reform Dr Adel Safar, the Syrian Head of the State Planning Commission, Dr. Taysir Raddawi, and the Iraqi Deputy Minister of Agriculture, Dr Mahdi T. Al-Kaisey), 3 program managers from GRDC, 6 wheat breeders from Australia,

the Director of the CGIAR Secretariate, 30 wheat scientists attending the CWANA wheat strategy meeting, and the President of the Islamic Development Bank.

Visiting project trainees (62 from Iraq; 20 from Syria; 2 from ICARDA) inspected and discussed conservation cropping R&D at ICARDA whilst participating in the following courses: Seed multiplication/marketing in Ninevah, 15-19Feb09 - 11 Iraqi participants; Experimental methods and statistics, 19-30April09 - 9 Iraqi + 2 ICARDA participants; ZT seeder principles, fabrication and operation, 19-23April09 - 13 Iraqi + 7 GCSAR Syria participants; GIS/Remote sensing, 3-21May09 - 3 Iraqi participants; Germplasm improvement - breeding, 3-28May09 - 4 Iraqi participants; farmer study tour of ZT R&D in ICARDA/Syria, 23-28May09 - 11 Iraqi + 8 Syrian farmers; Participatory extension methodology/practice, 14-18June09 - 11 Iraqi and 5 DOE Syria participants.

As well as visiting ICARDA research trials, the trainees in the ZT machinery course and farmers in the ZT inspection tour also visited and inspected the fields/crops of many Syrian farmers undertaking ZT-CC demonstrations and local ZT seeder manufacturers, and discussed farmer and manufacturer perceptions and experiences with ZT technology and machinery. These visits exposed and explained ZT technology at both the scientific and basic farmer level and were significant in turning initial farmer doubts about growing crops without cultivation to enthusiasm to test and adopt ZT more widely.

The recent increase in awareness, research and development on the technology, the keen involvement of farmers and seeder manufacturers in testing and taking up ZT sowing and fabricating ZT seeders, and the higher yields and lower costs being experienced with the technology, provide a good foundation and confidence for wider adoption and impact. However, it has been difficult and disheartening for researchers, extension officers and farmers to develop, promote and evaluate better varieties and conservation cropping technologies during two successive severe droughts. We will hope for a wetter year in Iraq and Syria in 2009-10.

4 Training activities

Eleven training courses/study visits were held at ICARDA involving 74 scientist/technical officers and 11 farmers from Iraq; 12 GCSAR/DOA scientists, 1 private company representative and 7 farmers from Syria; and 2 ICARDA scientists on:

1. Poverty, livelihoods, adoption and impact analysis, 16-27Nov08 - 2 Iraqi participants

Dr Emad Yousif Ismael Abdullah, Economics Department, University of Mosul
Mr Watheq Abdulkahar Abdullah, Economics Section, SBAR, Baghdad

2. IPM workplanning, 18-20Nov09 - 3 Iraqi participants

Dr Khalid Hasan Taha, College of Agriculture & Forestry, University of Mosul
Dr. Suaad Irdeny Abdullah, College of Agriculture & Forestry, University of Mosul
Mr Dheyab Ahmed Qasim, PhD student (Weed Control), University of Mosul

3. CropSyst Simulation Modeling, 11-15Jan09 - 3 Iraqi participants

Cielo Cito Murad, Ninevah Directorate of Agriculture, Mosul
Qahtan Saied Ibrahim, State Board for Seed Legislation and Certification, Mosul
Mehana Jarro Abdul-Rahman, SBAR, Mosul

4. Seed multiplication/marketing in Ninevah, 15-19Feb09 - 11 Iraqi participants

Mr. Younus Dhanoon Mahmood Ninevah Directorate of Agriculture, Mosul
Mr. Younis Hamdoon Kasim, State Board for Agriculture Research, Ninevah
Dr Daham N Azoo, Extension Services, Ninevah
Dr Yasar S Khasim, Extension Services, Ninevah
Dr. Qahtan S. Ibrahim, State Board for Seed testing and Certification, Ninevah
Mr. Eesam Y Saeed, State Board for Seed testing and Certification, Ninevah
Mr. Haidar Hassan El-Jaddouh, Ma Baina Nahraini Seed Company
Mr. Ghazi Fathi, Private grower, Ninevah
Mr. Sinan Amin Jalili, Private grower, Ninevah
Mr. Ayman Taher, Ninevah Directorate of Agriculture, Mosul
Mr. Anmar Tarek Ahmed, Ninevah Directorate of Agriculture, Mosul

5. Experimental methods and statistics, 19-30April09 - 9 Iraqi + 2 ICARDA participants (Presenter: Dr Jens Berger, CSIRO/UniWA)

Abdullah Mohamad Ahmed Hammo, SBAR Ninevah, Mosul
Zyad Abdul Alraza Majeed, SBAR Ninevah, Mosul
Salim Himmade Anter, College of Agriculture & Forestry, University of Mosul
Ahmed Mohammed Taher Dhannoon, Ninevah Directorate of Agriculture, Mosul
Haitham Saadoon Yousif, Ninevah Directorate of Agriculture, Mosul
Mohammed A. Kasem, Ninevah Directorate of Agriculture, Mosul
Rihaab T Ahmed, Ninevah Directorate of Agriculture, Mosul
Ahmed H Kassim, Ninevah Directorate of Agriculture, Mosul
Yaser S Sahry, Ninevah Directorate of Agriculture, Mosul
Yaseen Khalil, Research Assistant, ACIAR Iraq Project, ICARDA
Adnan Omran, PhD student, Southern Cross University/GRDC, GRS, ICARDA

6. ZT seeder principles, fabrication and operation, 19-23April09 - 13 Iraqi + 7 GCSAR, 1 private company and 1 farmer Syrian participants (Presenter: Dr Jack Desbiolles, UniSA/UniAdelaide)

Dr Saad Abdul Jabbar Samir, College of Agriculture and Forestry, University of Mosul
Moyassar Mahammed, College of Agriculture and Forestry, University of Mosul
Rasool Mustafa Qahraman, Ninevah Directorate of Agriculture, Mosul
Sabah Jamaa Hamou, Ninevah Directorate of Agriculture, Mosul
Sliman Assad Mohammed, Ninevah Directorate of Agriculture, Mosul
Farok Kh Qasim, Ninevah Directorate of Agriculture, Mosul
Salim Salih Huseen Abdallah, Ninevah Directorate of Agriculture, Mosul

Ammar Yousif Waddeea, Ninevah Directorate of Agriculture, Mosul
Adel Abdulwahab Izalden, Ninevah Directorate of Agriculture, Mosul
Mhana Jaroo Abdulrahman Al Lahib, State Board of Agricultural Research Ninevah, Mosul
Ali Jassim Mohammed Allayla, State Board of Agricultural Research Ninevah, Mosul
Younus Hamdoon Qasim, State Board of Agricultural Research Ninevah, Mosul
Mr Sinan A A AlJalili, Farmer (demo and ZT collaborator), Al Namroud, Ninevah
Dr. Omran Abbas Youssef, Director, Himo Research Station, GCSAR, Kamishley
Mohammed Kheir Saadoon, Himo Research Station, GCSAR, Kamishley
Ms. Manal Othman, Himo Research Station, GCSAR, Kamishley
Khaled Sali, Himo Research Station, GCSAR, Kamishley
Husain Sheikho, Hassake Research Station, GCSAR, Hassake
Fahed El Omar, Hassake Research Station, GCSAR, Hassake
Mohamed Kheir Shanady, Hassake Research Station, GCSAR, Hassake
Al Muthanna Al Rahabi, Agricultural Materials Company, Hassake
Abdul Aziz Khalil, Farmer, Kamishley, Hassake

7. Variety description and maintenance in seed production, 26Apr-7 May09 - 2 Iraqi participants

Mr. Francis Oraha Janno, State Board of Agricultural Research, Baghdad
Mr. Farhan Hameed Fayyadh, State Board for Seeds Testing and Certification, Baghdad

8. GIS/Remote sensing, 3-21May09 - 3 Iraqi participants

Amjad Khalil Mahmoud, Ninevah Directorate of Agriculture, Mosul
Abdul Albasat Muhamed Ali, Ninevah Directorate of Agriculture, Mosul
Mahmood Ahmed Hassan, Ninevah Directorate of Agriculture, Mosul

9. Germplasm improvement - breeding (on-the-job), 3 - 28May09 - 4 Iraqi participants

Dr. Maan Mohammed Salih, State Board for Agricultural Research Ninevah, Mosul
Jamal Abdulfattah Yousif Alhazae, State Board for Agricultural Research Ninevah, Mosul
Dr. Mohammed Yousif Hamed, College of Agriculture and Forestry, University of Mosul
Mouhammed Subhi Mostafa Al-Tawel, College of Agriculture and Forestry, University of Mosul

10. Farmer inspection of ZT R&D at ICARDA and in Syria, 23-28May09 - 11 Iraqi + 8 Syrian farmers

Gazee H. Fateh, Ninevah, Iraq
Mohand A. Mohamed, Ninevah, Iraq
Yasir Abdullah Fathi, Ninevah, Iraq
Ali A. Hassan, Ninevah, Iraq
Mahmod Abd Allah A., Ninevah, Iraq
Salim Saaid Hamo, Ninevah, Iraq
Abdulhafedh Mohammed Salmoo Al- Zooroo, Ninevah, Iraq
Ali M. Ali, Ninevah, Iraq
Mahmood Hasan Mahmood, Ninevah, Iraq
Abdullah Sulaiman Ismaeel, Ninevah, Iraq
Masar Safar Elias, Ninevah, Iraq
Abdulatif Elkhalad, Aleppo, Syria
Abdul Fatah Khalifeh, Hama, Syria
Abdul Aziz Khalil, Kamishley, Syria
Ali Alewi, Kamishley, Syria
Ibrahim Al Arwad, SYLICO, Kamishley, Syria
Ahmed Khalil, SYLICO, Kamishley, Syria
2 farmers

11. Participatory extension methodology/practice, 14-18June09 - 11 Iraqi and 5 DOE Syria participants (Presenter: Dr Jay Cummins, Rural Solutions SA/UniAdelaide)

Yaodhan Abdullah Yousif , Ninevah Directorate of Agriculture, Mosul
Asaad Hirmiz Maho Naisan, Ninevah Directorate of Agriculture, Mosul
Bassam Yahya Qasim, Ninevah Directorate of Agriculture, Mosul

Abd Al Monem M Mahmood, Ninevah Directorate of Agriculture, Mosul
Manhal M Yousif, Ninevah Directorate of Agriculture, Mosul
Hazim Azeez Salih, Ninevah Directorate of Agriculture, Mosul
Najam Aldeen A Azize, State Board for Agricultural Research Ninevah, Mosul
Mutism M Taher, State Board for Agricultural Research Ninevah, Mosul
Moafak M Ahmad Hammashi, College of Agriculture and Forestry, University of Mosul
Ahmed Mohammed Sultan Ahmed Al-Marood, College of Agriculture and Forestry, University of Mosul
Ihasan Farhan Khudhair Al-Jassani, State Board for Agricultural Research Ninevah, Wassit

Drs Saleh Bader, SBAR Baghdad, and Abdulsattar Al Rijabo, University of Mosul, together with Drs Colin Piggan, David Coventry and Jay Cummins and Mr Afef Haddad, attended and presented a project poster at the 4th World Congress on Conservation Agriculture, India, 4-7 Feb 09. Following the conference, the group undertook a study tour on 7-16 Feb09 to inspect and discuss conservation cropping, ZT seeder manufacture and farmer-participatory extension R&D being undertaken in Haryana and Punjab States, including National Agro Industries where the first project ZT seeders were sourced.

Dr. Saad Hatem Mohammed SBAR Baghdad attended an ACIAR-sponsored Crawford Fund Master Class on "Impact assessment: concepts and tools for agricultural research evaluation and impact assessment" provided by ACIAR-ICRISAT in India on 18-27Mar09.

Dr Maan Mohammed Salih SBAR Ninevah, Jamal Abdulfattah Yousif Al-Hazza SBAR Ninevah and Dr Mohammed Yousif Hammed University of Mosul participated in AusAID-supported training (1 June - 24 Jul 09) on plant breeding, seed production and seed quality by SARDI, Adelaide University and Rural Solutions SA followed by a study tour (27 July - 21 Aug 09) on conservation cropping R&D arranged by the University of Adelaide.

5 Intellectual property

None

6 Variations to future activities

None

7 Variations to personnel

None

8 Problems and opportunities

Outstanding issues constraining the implementation of the project in Iraq, discussed most recently in early May with Deputy Minister Dr Mahdi Al-Kaisey, Dr Saleh Bader and Dr Kassim Khalil Kassim, who agreed to solve these issues:

1. Fund transfer

It has not been possible since the project started (and for much of the Phase 1 project) to transfer funds from ICARDA to Iraq because MOA is yet to identify and advise a workable transfer system. This difficulty needs to be solved urgently so funds are available to support the work in Iraq.

2. Seed Production Objective/Component

The Village Based Seed Enterprise (VBSE) component has made slow progress with implementation of planned seed production/VBSE activities for 2008-09. The widespread drought and the unavailability of supplementary irrigation water in many locations have also hindered seed production. To ensure that seed availability does not limit research, seed distribution and uptake of new varieties by farmers, the project needs to ensure good progress, if the season is favourable, of the well planned 2009-10 activities to develop local seed production capabilities.

3. Nominees for training in Australia

There has been difficulty in getting adequate nominees and support data for Australian training. This was an initiative strongly recommended by MOA to AusAID and it needs close attention to ensure that good trainees are selected, visas and travel are organized, and the trainees can commence study in Australia soon.

There is funding for 2 PhD, 4 MSc and 10 study-research visits (6 months). So far, there have been nominations for 2 PhD, 3 MSc and 9 study visits, with many of these having incomplete information provided. More nominees and full support data are required to enable the Australian partners to select appropriate candidates fulfilling the selection criteria agreed at the planning meeting, the research priorities of the project and availability of appropriate supervisors and facilities at the Australian institutions.

9 Budget

Transfers from Australia were A\$1,345,864 in August 2008 and \$423,935 in April 2009. Expenditure from July 2008 to May 2009 was \$933,574. The cash balance as of 31 May 2009 was \$836,225. Much of this balance is funds for Iraq (\$490,468) and AgWA (\$35,847). No fund transfers to Iraq have been possible because the Ministry of Agriculture has been unable advise on transfer procedures. The Deputy Minister of Agriculture and Project Coordinator are working to solve this problem.

In a budget variation approved by ACIAR, ICARDA is transferring some funds from Supplies and Services for the purchase of three vehicles in Iraq (about US\$36,000) and one vehicle in Syria (about US\$25,000) to facilitate implementation, monitoring and evaluation of project activities.