

# Third Steering Committee Meeting of “ACIAR-ICARDA Adapting conservation agriculture for rapid adoption by small holder farmers in North Africa” (CANA Project)

**9.00 – 12.30, 10th October 2014**

**Hotel Jardinsd’Agdal**

**MARRAKECH, Morocco**

## **Minutes**

Executive summary

The Third RCPM meeting was followed by the Third CANA Project Steering Committee Meeting on 10 October 2014.

## **Participants**

Dr. Mohamed El Mourid ICARDA/ NARP Regional Coordinator on behalf of ICARDA (Chairman)

Dr. RachidDahan INRA, Morocco (representing DG INRA)

Dr. Patrick Wall, for ACIAR, Australia

Dr. Jim Fortune, Rural Solutions SA, Australia

The National Agricultural Research Services (NARS) were represented by;

MrAbdelmalekLaouar representing ITGC ALGERIA

Dr. Oussama El Gharras representing INRA MOROCCO

Dr. HatemCheikhM'hamed representing IRESA TUNISIA

## **Apologies**

Apologies were received by participating countries but all were represented.

Dr. KamelShideed, ADG-ICC, ICARDA

Prof. Mohamed Badraoui, DG INRA Morocco

Prof. Aziz Darghout, President IRESA, Tunisia

Dr. Omar Zaghoulane, DG ITGC, Algeria

Dr John Dixon, ACIAR, was an apology due to health reasons. The SC wished him a strong recovery.

## **Detailed minutes**

Dr El Mourid presented the agenda of the meeting which was approved. The agenda includes the following:

- Opening: statements of ICARDA, Host Country, ACIAR, and RSSA
- Follow up action on the Minutes of the 2<sup>nd</sup> SCM and follow-up actions
- Presentation of Project achievements 2013-14
- Presentation of the POWB 2013-2014 and budget
- Financial report and budget utilization

- Discussion and approval of POWB 2014-15
- Project continuity and exit strategy
- Any other business
- Close

## **1. Welcome and Opening statements**

Dr El Mourid outlined the processes resulting from the early termination (June 2015; notified by ACIAR in May 2014) of the project by the Australian Government and ACIAR. A meeting was held in Amman (1-2 June 2014) between ACIAR, ICARDA and RSSA (Dixon, El Mourid, Fortune) to discuss and develop a project variation to reflect changes in time and budget. This was then completed and approved by ACIAR in Sept 2014. All parties to the project demonstrated a strong commitment to the project and acknowledged ICARDA's leadership in the Mahgreb.

Dr Rachid Dahan (INRA) welcomed the Steering Committee and the project team to Morocco. He reflected on the need for continued efforts during the project exit process to maintain and build on what has been achieved to date, and to identify and seek opportunities to outscale the project to other areas. The need to jointly identify alternative funding sources to support regional developments was also reinforced.

Dr Dahan thanked the project for its web-site ([www.cana-project.org](http://www.cana-project.org)) which he had used prior to the meeting, and encouraged its continued development as part of an active communications strategy.

Dr Pat Wall will continue to support project activities as he has done for ACIAR since the beginning of the project. His continued inputs were discussed and approved during variation planning and will be supported by project funds. Dr Wall remains an important link for all partners and ACIAR, and his inputs will be managed by Dr El Mourid. Dr Wall expressed his appreciation for the opportunities to date of working closely with the project and its people across all locations and the value of the presentations and discussion at the Regional Coordination and Planning Meeting.

Dr Jim Fortune and the Australian team have been working with Rural Solutions SA since the project development stage. Due to changes in RSSA policy, they have terminated their agreement with ICARDA with effect from the 30<sup>th</sup> September 2014. Dr Fortune has worked closely with Dr El Mourid to ensure the Australian team inputs and Australian activities can be managed effectively until the conclusion of the project. This will involve direct contracting with ICARDA for the team of Fortune, Mayfield, Mudge and Desbiolles. ACIAR will be kept fully informed of these changes and we are positive that the Australian partnership in the project will continue to deliver strongly.

## **2. Approval of the Second SCM minutes**

The Minutes of the Second SCM had been approved on-line after being shared with participants shortly after the meeting in October 2014.

### **3. Highlights of major project achievements**

Highlights of major achievements of the project during 2013-14 season were prepared and integrated by across the three platforms and presented by Abdelmalek Laouaron behalf of the three platforms (Appendix 1). In addition it should also be noted that the CANA team, assisted by Prof. Boubaker Thabet, had to meet the additional requirement of preparing a Final Interim Report for ACIAR by 30 Sept 2014 as part of the contractual changes. This was achieved and once ACIAR has responded to the Draft this document will also provide a record of project achievements and impacts.

### **4. Plan of Work**

Dr. Oussama El Gharras presented on behalf of the team the plan of work for 2014-15 season (see Appendix 2).

Discussion focus by the SC on both the Highlights and Plan of Work was on the following:

- There was a strong emphasis on the need to make decisions about zero-tillage equipment recommendations with a focus on;
  - o Continuing to actively build relationships with equipment suppliers – either local or international
  - o Relative costs for each country (direct purchase by farmers and the possibility of a service provider/contractor business model; differential tax/subsidy systems in individual countries need to take into account)
  - o The need for efficiency in maintenance and spare parts inventory
  - o Consideration for developing spray equipment needs is also essential (this needs to also form part of any economic analysis for machinery purchase and use)

This information and decision process is essential if the very promising data arising from the CANA project is to be used to drive adoption of zero-tillage as part of the conservation agriculture strategy of for the Maghreb.

- The use of glyphosate as a pre-sowing strategy needs to:
  - o have some clear guidelines for farmer use
  - o be supported by further development and access to appropriate spray equipment and its calibration
  - o may need some policy consideration if generic forms of the chemical are to be accessed to improve price competitiveness
- Farmers are displaying a very positive attitude to the replacement of traditional clean or weedy fallows and the integration of forage crops. This has highlighted the need to consider a more systematic seed production and supply system for forage seeds.
- A number of activities (economic analyses, similarity mapping and monitoring and evaluation) all highlight the need for further confirmation of national statistical data within the project. Some of this

information would also have value as part of the CANA web-site (it was noted that the site would be supported by ICARDA beyond the end date of the current project).

- Continuing work with farmers should have a strong emphasis on rapid appraisal approaches such as focus groups rather than necessarily conducting more formal surveys
- There is still a need to analyse existing policies that enhance or inhibit CA adoption in the Maghreb
- For each of the platforms it remains important to articulate the current agronomic practices and recommendations so that any CA communications strategy can take these into account
- The project team needs to share and integrate data and develop material for journal publication, and a “position paper” on CA in North Africa. This may involve linkages with others such as FAO.

## **5. Financial Report and Budget Utilization**

Dr El Mourid outlined that with changes to the project, including the Variation arrangements, that resources have been reduced from the original plan for the period 2014-15.

1. There are resources for activities discussed in the Regional Workshop and presented as the 2014-15 Plan (Appendix 1) to this SCM.
2. Given the scale of the project and the changes, Dr El Mourid confirmed that a detailed financial report will be generated by ICARDA by 15 November 2014.
3. Surplus funds from Rural Solutions SA up to 30<sup>th</sup> Sept 2014 will be returned to ICARDA and the sum allocated to RSSA for the 2014-15 period (as per variation) will be retained by ICARDA.

## **6. Other businesses:**

### **6.1. APSIM**

Planning for an APSIM workshop had been shared and strongly supported by the whole project team. A maximum of 12 people will be supported for a proposed date in early January 2015 in Rabat (to be confirmed). The key trainers (Dr John Dimes and Mr John Hargreaves, Australia) both have extensive experience with APSIM and training. They will be supported by Mr Barry Mudge (CANA project) who has particular interests in Water Use Efficiency and risk management. Dr El Mourid will coordinate the nomination process for the participants, and Dr Fortune will coordinate the arrangements for training between the Australian team and ICARDA.

### **6.2. Monitoring and evaluation**

ICARDA continues to take the lead on M&E activities but as in the Planning Meeting, Dr El Mourid stressed the need for active participation in this process, especially from those who were part of M&E and Results Based Management Workshop in Rabat in February 2014. A consultant, Dr. Malki who has conducted the M&E training and framework will be hired for one week to ten days in early 2015 to finalize the M&E action plan.

### **6.3. Australian visits**

Australian visits are still planned for early 2015 but the nominations are still required from Algeria and visa matters finalized for everyone. The preferred window is in February 2015 when there are a number of well-coordinated industry updates.

The Australian team will continue to work directly with ICARDA to ensure that all planned inputs and contributions to the CANA project are met.

## **7. Closing remarks**

All participants in the meeting expressed their thanks and recognition to the Moroccan team and INRA for hosting this meeting, and to ICARDA for its management of logistics. The support of INRA for ICARDA relocation and development activities in Morocco was also acknowledged.

It was noted that Algeria, Morocco and Tunisia, through their national organisations, have continued to actively support the project and indicated their ongoing commitment to CA objectives in the region. All participants in CANA will be seeking funding opportunities to support further activities.

It was obvious in both the Planning Meeting and the Steering Team meeting that the CANA project has made significant gains in developing national and international relationships and capacity that will endure into the future.

The Steering Committee acknowledged the efforts of ACIAR and Dr John Dixon for managing change within the constraints of Australian government policy.

In closing the meeting Dr El Mourid thanked all participants for their support for the CANA project and continued commitment to deliver project outcomes of value for farmers, and for regional sustainability and prosperity.

## Appendix 1:

Slide 1



**Adapting Conservation Agriculture for Rapid Adoption by Smallholder Farmers in North Africa (CSE-2011-025)**

***Achievements 2013-14***



**3<sup>rd</sup> Steering Committee Meeting  
Marrakech, Morocco 10<sup>th</sup> October 2014**

Slide 2

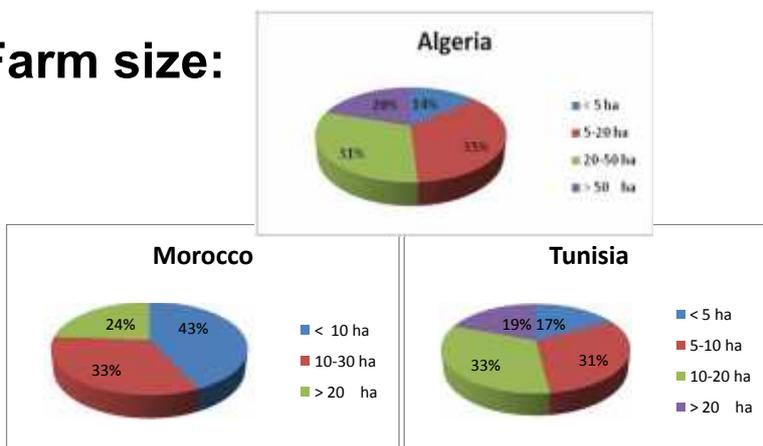
### **Objectives/expected results**

1. *To identify constraints to adoption of CA* by small holder farmers and ways of enhancing adoption, most importantly identifying and testing socio-economic options.
2. To identify and test improvements in seeding machinery, and in weed and biomass management of CA systems :
  1. 2.1. *Develop and test affordable ZT seeding machinery* and crop establishment systems for small to medium-sized farms;
  2. 2.2. *Fine-tune weed and disease management and crop sequences* for sustainable land and water management;
  3. 2.3. *Optimize crop residue management* and test alternative livestock feeding systems under CA.
3. *To enhance the capacity of NARES staff and other stakeholders* to practice and promote CA.

**Objective 1. To identify constraints to adoption of CA by small holder farmers and ways of enhancing adoption, most importantly identifying and testing socio-economic options**

. 340 surveys to characterize the 3 platforms.

**Farm size:**



A. 1.1. 140 surveys to characterize the 3 platforms.

**Land use:**

	<i>Algeria</i>	<i>Morocco</i>	<i>Tunisia</i>
<i>Cereals</i>	<b>57</b>	<b>61</b>	<b>59</b>
<i>Legumes</i>	<b>3</b>	<b>0</b>	<b>19</b>
<i>Forages</i>	<b>3</b>	<b>16</b>	<b>6</b>
<i>Vegetables</i>	<b>6</b>	<b>0</b>	<b>5</b>
<i>Weedy fallow (pasture)</i>	<b>5</b>	<b>22</b>	<b>9</b>
<i>Tilled fallow</i>	<b>25</b>	<b>0</b>	<b>0</b>

<i>Countries</i>	<i>Durum</i>	<i>Soft wheat</i>	<i>Barley</i>	<i>Oat</i>	<i>Tilled falow</i>	<i>Weedy fallow</i>	<i>Others</i>
<i>Algeria</i>	<b>41</b>	<b>6</b>	<b>10</b>	<b>2</b>	<b>25</b>	<b>5</b>	<b>11</b>
<i>Morocco</i>	<b>11</b>	<b>28</b>	<b>22</b>	<b>9</b>	<b>0</b>	<b>22</b>	<b>8</b>

### Average land use (in Mha):

<i>Countries</i>	<i>Durum wheat</i>	<i>Bread wheat</i>	<i>Barley</i>
<i>Algeria</i>	<b>1.9</b>	<b>1.8</b>	<b>1.8</b>
<i>Morocco</i>	<b>1.5</b>	<b>1.6</b>	<b>2.3</b>
<i>Tunisia</i>	<b>0.8</b>	<b>0.2</b>	<b>0.5</b>

### Mechanization ownership (in %)

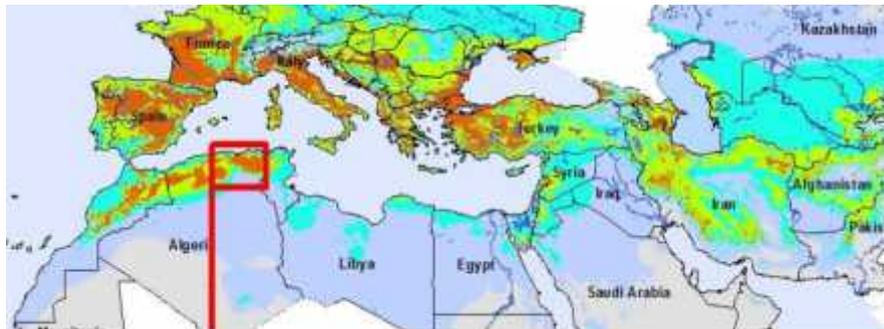
<i>Countries</i>	<i>Tractor</i>	<i>Conventional seeder</i>	<i>Sprayer</i>	<i>Combine harvester</i>
<i>Algeria</i>	<b>55</b>	<b>29</b>	<b>24</b>	<b>16</b>
<i>Morocco</i>	<b>34</b>	<b>11</b>	<b>3</b>	<b>8</b>
<i>Tunisia</i>	<b>29</b>	<b>5</b>	<b>12</b>	<b>5</b>

## Livestock (average herd size)

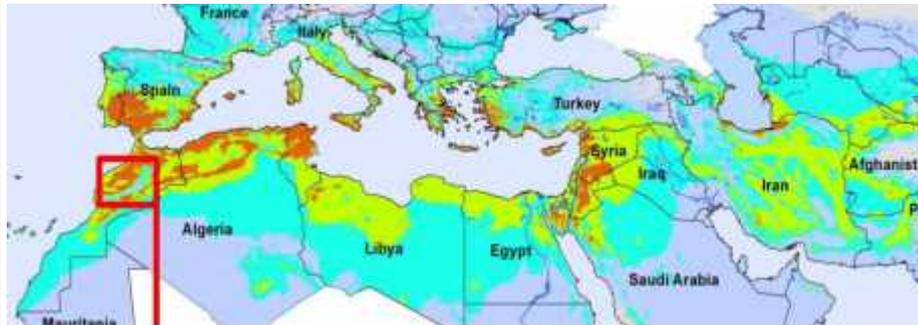
<i>Countries</i>	<i>Sheep</i>	<i>Cattle</i>
<i>Algeria</i>	<b>23</b>	<b>6</b>
<i>Morocco</i>	<b>30</b>	<b>7</b>
<i>Tunisia</i>	<b>9</b>	<b>4</b>

*For Morocco platform we have 2.3 sheep heads per ha for small farms category, 1.6 sheep heads per ha for medium size farms And 0.8 sheep heads per ha for large farms*

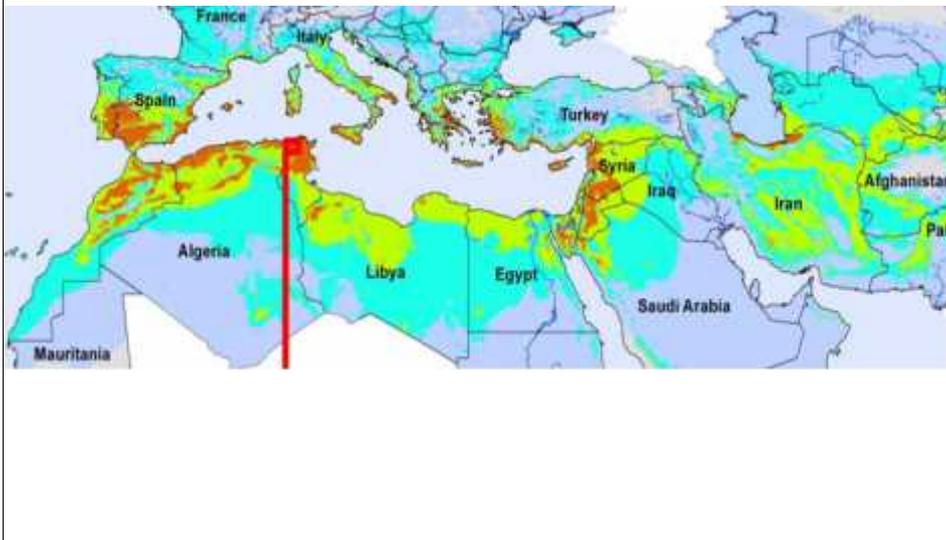
## Similarity studies within countries and across the region.



Similarity studies within countries and across the region.



Similarity studies within countries and across the region.





## Economic evaluation of proposed technologies

### Wheat gross margin in Algeria

CV system 2013		NT system 2013	
Income	\$/ha	Income	\$/ha
Grain	675	Grain	900
Straw	300	Straw	300
Livestock Grazing	10	Livestock Grazing	0
<b>Total Income</b>	<b>985</b>	<b>Total Income</b>	<b>\$1.200</b>
<b>Variable Costs</b>		<b>Variable Costs</b>	
Seed	58	Seed	48
Fertiliser	97	Fertiliser	97
Sprays	43	Sprays	80
Contract Work	85	Contract Work	68
Contract Harvest/Freight	114	Contract Harvest/Freight	122
Machinery operating	0	Machinery operating	0
Insurance	26	Insurance	26
Other	20	Other	24
<b>Total Variable Costs</b>	<b>\$ 442</b>	<b>Total Variable Costs</b>	<b>\$ 464</b>
<b>Gross Margin</b>	<b>\$ 543</b>	<b>Gross Margin</b>	<b>\$ 736</b>

### Wheat gross margin in Morocco

CV system 2013		NT system 2013	
<b>Income</b>	\$/ha	<b>Income</b>	\$/ha
Grain	504	Grain	483
Straw	190	Straw	116
Livestock Grazing	15	Livestock Grazing	15,00
<b>Total Income</b>	<b>\$709</b>	<b>Total Income</b>	<b>615</b>
<b>Variable Costs</b>		<b>Variable Costs</b>	
Seed	65	Seed	54
Fertiliser	48	Fertiliser	37
Sprays	11	Sprays	24
Contract Work	97	Contract Work	41
Contract Harvest	125	Contract Harvest	92
Machinery operating	0	Machinery operating	0
Insurance	0	Insurance	0
Other	0	Other	0
<b>Total Variable Costs</b>	<b>\$ 344</b>	<b>Total Variable Costs</b>	<b>\$ 248</b>
<b>Gross Margin</b>	<b>\$ 365</b>	<b>Gross Margin</b>	<b>\$ 367</b>

### Wheat gross margin in Tunisia

**Example1: Farm of Mr hmid Ghazwani (Oued grib)**

Nomination	NT	CV	NT - CV	%
<b>Total mechanization</b>	325	387	-62	-16
<b>Total inputs</b>	443	246	197	80
<b>Total fees labor</b>	90	90	0	0
<b>total others</b>	63	59	4	7
<b>Total variable cost</b>	922	782	140	18
<b>Yield (qx / ha)</b>	<b>23</b>	<b>18</b>	<b>5</b>	<b>28</b>
<b>Total receipts</b>	<b>1697</b>	<b>1407</b>	<b>290</b>	<b>21</b>
<b>Gross Margin</b>	<b>775</b>	<b>625</b>	<b>150</b>	<b>24</b>

## Summary results for Algeria

<b>For D. Wheat</b>	<b>Total income</b>	<b>Total variable costs</b>	<b>Gross margin</b>	<b>Break Even Yield</b>
High rainfall stage CV	\$1.754	\$532	\$1.222	11,82 q/ha
High rainfall stage NT	\$1.965	\$552	\$1.413	12,26 q/ha
Medium rainfall stage CV	\$985	\$442	\$543	9,83 q/ha
Medium rainfall stage NT	\$1.200	\$464	\$736	10,32 q/ha
Low rainfall stage CV	\$550	\$394	\$156	8,76 q/ha
Low rainfall stage NT	\$765	\$416	\$349	9,25 q/ha

## Summary results for Morocco

<b>For S. Wheat</b>	<b>Total income</b>	<b>Total variable costs</b>	<b>Gross margin</b>	<b>Break Even Yield</b>
Wheat CV 2013	\$709	\$344	\$365	11,11 q/ha
Wheat NT 2013	\$615	\$248	\$367	7,99 q/ha
Wheat CV 2014	\$442	\$290	\$152	9,37 q/ha
Wheat NT 2014	\$542	\$313	\$229	10,10 q/ha



**Objective 2. Identify and test improvement in seeding machinery, weed, disease and biomass management of CA system.**

- **Sub-objective 2.1 Develop and test affordable ZT seeding machinery and crop establishment systems for small to medium sized farms.**

### 2.1.1. Conduct ZT seeder inventory

- The objective is to select suitable low cost options for available and potential power sources in the selected platforms.
- Results are detailed in Dr J. Desbiolles report.
  1. Nine specification cards were prepared from the international available information.
  2. Comparative analysis was conducted.
  3. Two main commercial seeders were selected.

## International seeders

- 5 Australian seed drills (John Shearer)

With different options and hoe points

in order to test and evaluate the performances of these components under different conditions.

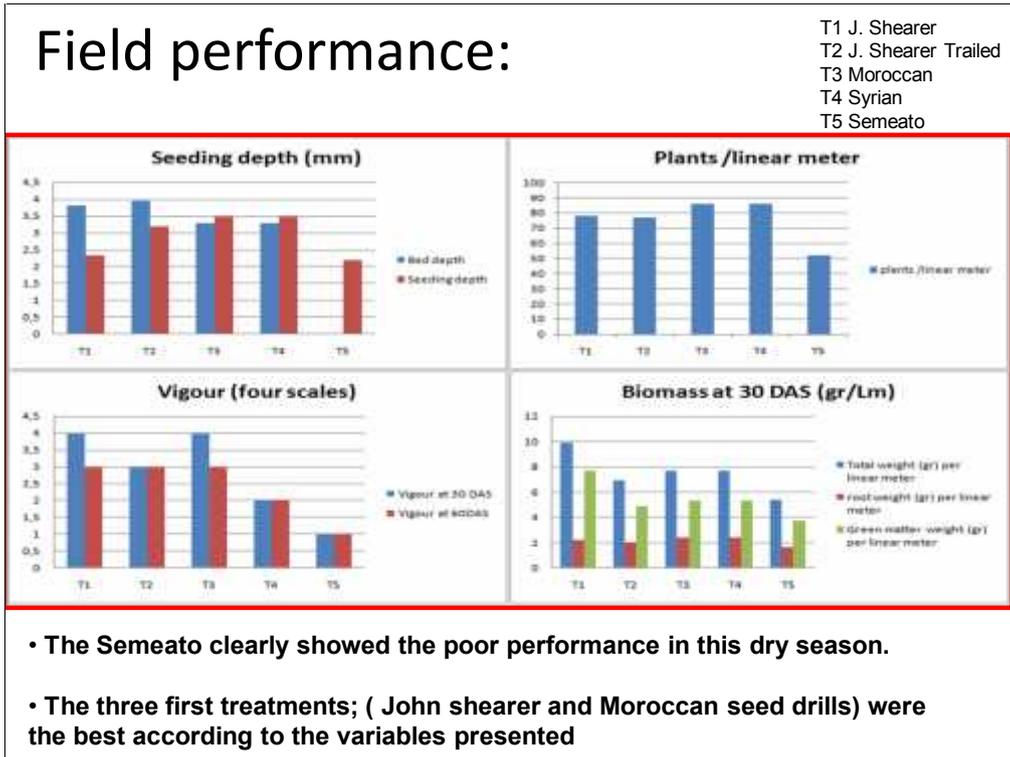


- 1 Spanish seed drill (Gill) that is sold in the Tunisian platform.



## Design new ZT drills

- In Algeria, PMAT has agreed to develop a low cost ZT seed drill based on the Syrian model.
- In Morocco, ATMAR has built last year 10 INRA ZT seed drills that are sold to different projects and is developing a new design of lower cost that will be more efficient at the farm level.
- In Tunisia, a seed drill prototype is built in a private shop in Beja that can be used as ZT machine or for bed planting.



## Objective 2. Identify and test improvement in seeding machinery, weed, disease and biomass management of CA system.

- **Sub-objective2.2. Fine tune weed and disease management and crop sequences for sustainable land and water management.**

## Fine tune weed management.

- Weed seed bank is monitored under CA in the three platforms under different crop rotations.
- Weed management of Small Faba bean is mastered.
- Weed management under CA should consider crop rotations for a sustainable production system.

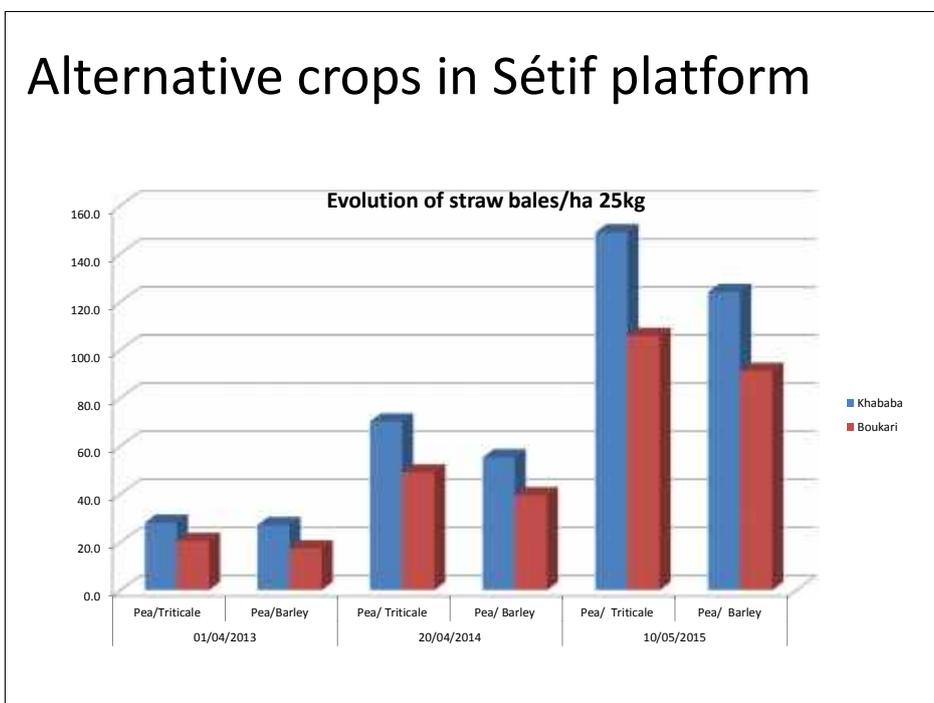
## Fine tune disease management.

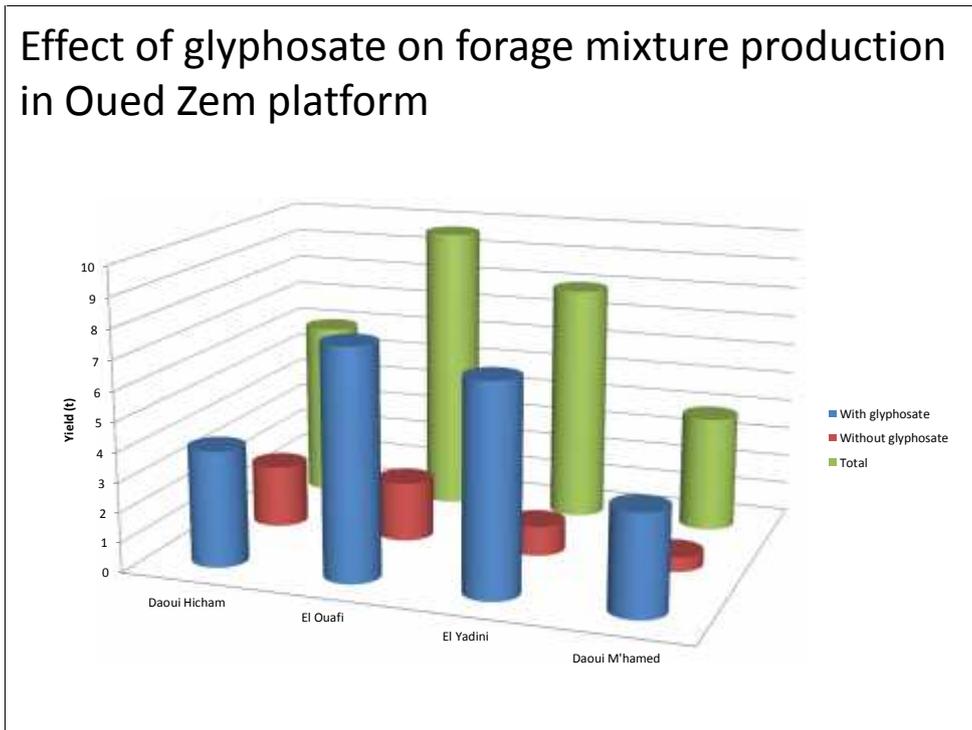
- Soil born disease is monitored in Morocco and Tunisia.
- Crop rotation including food legumes, and mainly Canola should be benefic to crop production under conservation agriculture, because it helps seed germination, seed establishment and reduced cereal root rot diseases.
- Rotation should be either 3 to 4 years long to maintain sustainability of the conservation cropping system with canola as a break in the sequence.



**Objective 2. Identify and test improvement in seeding machinery, weed, disease and biomass management of CA system.**

- **Sub-objective2.3. Optimize crop residue management and livestock feeding under CA systems.**





### Alternative crops in Fernana platform

- Spring triticale harvested as forage at soft dough stage by one farmer yielded 31 T Fresh Matter ha<sup>-1</sup> corresponding to 10 T DM ha<sup>-1</sup> with a CP content of 7.5%.
- Spring triticale harvested as grain yielded 2.2 T ha<sup>-1</sup> of grain and 4.6 T ha<sup>-1</sup> of straw.
- Farmers noticed a significant increase of their cow milk production when they fed them the green mixture.

## Alternative crops in Fernana platform

Forage crop dry matter yields and crude protein (CP) for three farms (2013-2014)

	Forage yield T DM ha <sup>-1</sup>	CP content (%)
Mixture 1. winter-triticale (20%)- hairy vetch (80%)	4.2	12.5
Mixture 2. Spring triticale (40%) – common vetch (60%)	5.85	11.36

The production of the two feed mixtures was very important and with good quality



**Objective 3. Enhance the capacity of NARES staff and other stakeholders to practice and promote CA.**

Workshops	Achievements	
	Tunisia	14/11/2013, 70, Regional & provincial engineer of agriculture Extension services, Farmers , NGO's, CANA project team
<p data-bbox="328 640 628 672">National Inception workshop</p>	Algeria	ITMA– Setif, 05/11/2013, 52 farmers and stakeholders Agriculture direction services, agriculture chamber, extensionists, forestry; service providers, local and private medias and University of Setif Students, Teachers and Farmers
	Morocco	INRA – Settat, 27/11/2013, 315 Policy makers, Regional & provincial directorate of agriculture, Extension services, Service & inputs providers, Farmers & farmers organizations

## Use Australian experience; NARES visits to Australia

- 10 scientists and 1 NGO representative visited South and West Australia in different fields related to CA.
- 1 decision maker is to visit Australia in February.

## Use Australian experience

- 1 Australian Agricultural Engineer has visited the region 5 times to help NARES to implement the related activities.
- 1 Agronomist and 1 plant protection from Australia visited the region 3 times.
- Dr John Dixon visited Tunisia during this cropping season.
- Dr Patric Wall visited the region 5 times.

## Field days and trainings

- 13 Field days were organized during the cropping season.
- 7 regional courses were organized: (principles and concepts of CA, pesticide application, Harvest and storage, sustainability analysis, test of seeders, monitoring and evaluation and innovation platforms)



## Networking in the region

- Project website where information on activities and events are described, updated and disseminated

- [www.cana-project.org](http://www.cana-project.org)

- Travelling workshop.



## Farmers' managed trials

- 20 farmers using ZT seed drills in each platform, Farm Managed Trials.
- 200 ha of ZT implemented per platform.
- Implement CA options in comparison with farmers' practices.
- Yields data are collected on the Farm Managed Trials.

# THANK YOU FOR YOUR ATTENTION



## Appendix 2: 2014-15 Plan of Work

### Project Objectives/expected results

1. **To identify constraints to adoption of CA by small holder farmers and ways of enhancing adoption, most importantly identifying and testing socio-economic options.**
2. To identify and test improvements in seeding machinery, and in weed and biomass management of CA systems:
  - 2.1. *Develop and test affordable ZT seeding machinery* and crop establishment systems for small to medium-sized farms;
  - 2.2. *Fine-tune weed and disease management and crop sequences* for sustainable land and water management;
  - 2.3. *Optimize crop residue management* and test alternative livestock feeding systems under CA.
3. *To enhance the capacity of NARES staff and other stakeholders to practice and promote CA.*

### **Objective 1: Principal Activities to Date:**

1. Characterize the 3 platforms and conduct similarity studies within country and across the region for efficient project implementation and result out-scaling ;
2. Study farmers behavioural change and analyse constraints to adoption of CA systems in the three platforms (including mechanisation aspects and machinery supply industry;
3. Undertake a household survey to assess economic, environmental and social project impact through ex-ante analysis;
4. *Investigate enabling policy and institutional options to promote CA adoption;*
5. *Analyse and quantify the degree and rate of CA adoption at the three platforms at the end of the project;*
6. *Conduct farmers perception study on CA system by end of project at the three platforms*

### **Objective 1: Year 3 Plan of Work**

**Task 1:** Complete, finalize and homogenize a narrative report on the characterization of each platform including the biophysical team;

**Task 2:** Deepen analyses on farmer behavior towards CA adoption via focus group and using short questionnaires.

**Task 3:** Complete, finalize and homogenize the economic evaluation framework and adoption of no till System using cost benefit analyses between farmer managed technical options with their conventional ways (the groups of 30 farmers);

**Task 4:** Economic assessment of the different technology options – trials (provided by the technical teams) using the Partial Budget Analysis tool.

**Task 5:** Complete the analysis on financial feasibility of investing in no-till drill and sprayers for farmers and service providers;

**Task 6:** Mapping and diagnosis of the exiting policy and institutional options to promote CA adoption;

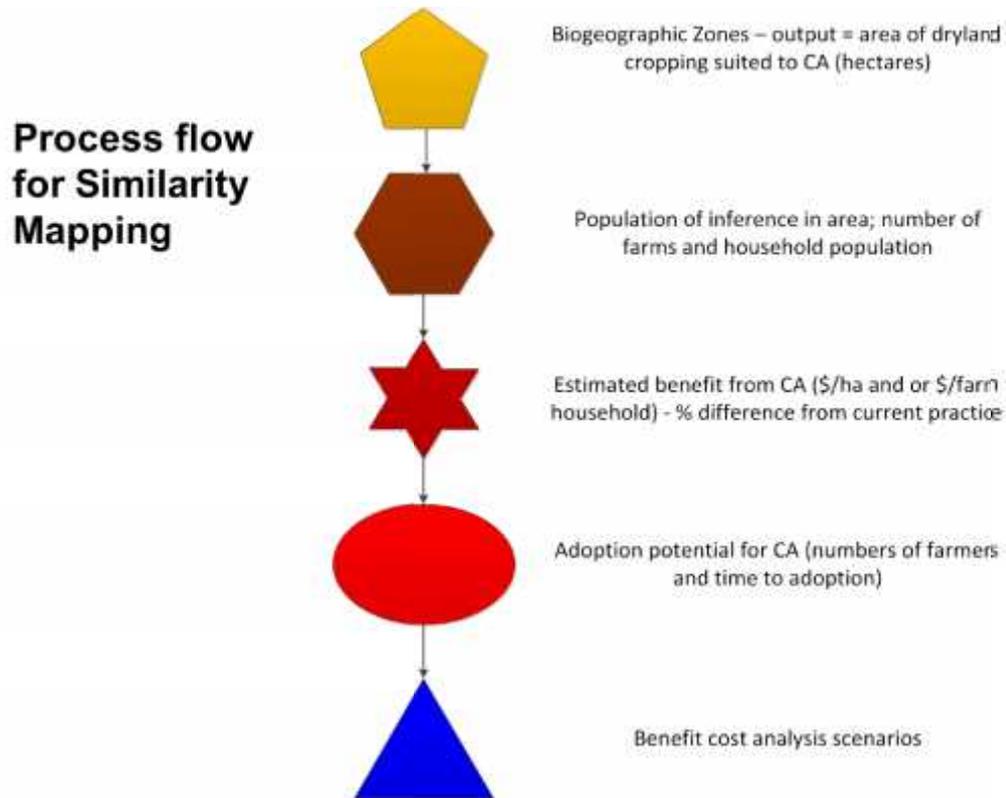
**Task 7:** Journal articles will be prepared and submitted for publication;

**Task 8:** A position paper on CA in North Africa (in collaboration with CANA team and ICARDA staff).

## Similarity Mapping

As part of objective one and broader Monitoring and Evaluation work, similarity mapping being undertaken by DrChandrashekharaBiradar (ICARDA) was presented in the Regional Planning Workshop. Further team discussions considered his data needs to enable the process (Fig 1) to deliver for the CANA project.

Fig 1. Similarity mapping and use and integration of data



## **Objective 2 /expected results**

1. *To identify constraints to adoption of CA by small holder farmers and ways of enhancing adoption, most importantly identifying and testing socio-economic options.*
2. **To identify and test improvements in seeding machinery, and in weed and biomass management of CA systems:**
  - 2.1. ***Develop and test affordable ZT seeding machinery and crop establishment systems for small to medium-sized farms;***
  - 2.2. ***Fine-tune weed and disease management and crop sequences for sustainable land and water management;***
  - 2.3. ***Optimize crop residue management and test alternative livestock feeding systems under CA.***
3. *To enhance the capacity of NARES staff and other stakeholders to practice and promote CA.*

## **Objective 2: Year 3 Plan of Work**

### **Engage local manufacturers to manufacture ZT seed drills.**

- Three manufacturers are identified and engaged to develop and manufacture appropriate low cost seed drills each in a platform.
- Farmers and extension services are engaged to develop and suggest improvements of the seed drills and their promotion in different regions.

### **Conduct economic assessment and investment opportunities**

- Conduct economic assessment and investment opportunities of the new ZT drills in the relevant CA systems. (using the same methodology developed and used by Moroccan team)
- Conduct Cost Benefit Analysis to convince mechanization service providers to switch to ZT services.

### **Weed and disease dynamics**

Weed seed bank under ZT fine-tuned and finalized.

Soil born disease fine-tuned and finalized under CA system.

Dissemination of results (chemical weed control in small faba bean).

Production of weed management guide.

### **Test crop sequence options to enhance diversification and sustainable productivity**

- Same crop sequences for data validation continued.
- WUE of wheat crop determined.
- Synthesis report on agronomy recommendations produced for each platform.
- Tilled or weedy follow replaced by forage mixture or food legume along with weed control in **Algeria**.
- Lentil management with a cropping and harvesting system developed.
- Weed management in early or late sowing mastered in **Algeria**.

### **Assess soil quality/health and water productivity under CA**

- Chemical, physical and biological properties in crop rotation monitored under.
- Soil borne fungi monitored under CA system using (Predicta B test).

#### **Test and validate decision tools/models for crop monitoring and risk management**

- 12 Scientists from NARES that are willing to dedicate their time and effort to APSIM are trained.
- Needed data base collected from the neighboring stations and validated.
- Proposed date is 12 to 15 January 2015 in Morocco.

#### **Objectives 2.3/expected results**

Develop and test alternative integrated feeding options

- Forage mixture crops (vetch & triticale, peas & barley, etc.) validated and disseminated in the 3 platforms.
- Cost - benefit evaluation of the alternative feeding sources conducted.

#### **Objective 3/expected results**

##### **Raise awareness on CA system potential**

- Manufacturers of Agricultural equipment involved in the development and dissemination of ZT technologies.
- Input dealers; (seeds, fertilizer, agro-chemical, etc.) trained on CA systems.
- Extension services and decision makers informed and trained on CA benefits and production systems.

#### **Use Australian experience**

##### **From North Africa to Australia:**

- 3 Scientists and 1 decision maker to visit Australia.

##### **From Australia to North Africa:**

- 3 experts on APSIM to train NARES on APSIM modeling.
- 1 Ag mechanization scientist to fine tune the ZT machines development.
- Participation in M&E and other concluding activities of project.

#### **Enhance knowledge Sharing**

- CANA website is operational and need to be finalized with the team contribution.
- Weed and disease guides produced.
- Spraying technology guide developed.

#### **Promote networking**

- Third travelling Workshop organized if funds are available.
- Organize a workshop for the NGO's from the three platforms to coordinate their programs and actions.

## **Monitoring and Evaluation**

- One consultant hired for Monitoring & Evaluation to help national NARES finalizing their M&E report
- Similarity mapping work completed

## **Farmermanaged trials**

It remains important to the project that interactions and activities with farmers continue for each platform area.

- 20 farmers using ZT seed drills in each platform.
- 200 ha of ZT implemented.
- Implement CA options in comparison with farmers' practices.
- Minimum data to be collected is yields.

