

MINUTES OF THE PLENARY MEETING HELD IN DJERBA, TUNISIA

APRIL 17-19, 2013

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This report was written in the framework of the WAHARA project – www.wahara.eu

List of attendants

AC Arthur Chomba (GART)
BI Brian Irvine (UNIVLEEDS)
CR Coen Ritsema (WU)
FS Francesco Sambolino (MetaMeta)
HS Hamado Sawadogo (INERA)
KD Kaushali Dave (UNIVLEEDS)
KW Kifle Woldearegay (MU)
LF Luuk Fleskens (UNIVLEEDS)
MA Mohamed Arbi (IRA)
MO Mohamed Ouessar (IRA)
MS Mongi Sghaier (IRA)
RH Rudi Hessel (ALTERRA)
SB Stan van den Bosch (internship ALTERRA)
SL Sarah Lebel (UNIVLEEDS)
VG Violette Geissen (WU)

Annexes

1. Programme of the meeting
2. List of agreements
3. Presentations (hosted on website)
4. Draft table monitoring

Wednesday April 17th

A field excursion was held together with the Afromaison project team. Both projects share the same study site. Several stops were made. Figures 1-4 give an overview of the Excursion.

Gabion check dam and stilling well

A number of gabion check dams have been built across wadis in the study site. These dams result in temporary lakes when there is runoff. In 10 of these lakes, recharge wells have been installed with the aim to facilitate that runoff infiltrates and recharges the aquifer. If the recharge wells work well, the temporary lakes are drained much faster than in the case without recharge well.

Viewpoint at Hachana

At this viewpoint an overview of the Dahar plateau can be obtained. The plateau is sparsely vegetated and is bordered by the Sahara desert, but it does provide groundwater to areas further downstream.

Oasis

An oasis at Ksar Hallouf was visited. Numerous palm trees indicate that ground water in this location is close to the surface. One well showed that the water level was about 3 meters below the surface.

Storage

A visit was made to ruins of ancient storage facilities for food.

Viewpoint at Ain El Anba

At this viewpoint an overview of the Piedmont area could be obtained. In addition, numerous Jessour and Tabia could be observed.

IRA offices

At the IRA offices, we were welcomed, after which MO gave a presentation in which he presented an overview of IRA and its activities. A visit was also paid to a museum belonging to IRA that showed the traditional way of life in the area.



Fig 1. Gabion check dam with recharge well



Fig 2. View at Dahar plateau



Fig 3. Oasis at Ksar Hallouf



Fig 4. Jessour at Ain El Anba

Thursday April 18th

Joined Afromaison-WAHARA session

RH provided an overview of WAHARA, after which Tom d'Haeyer presented Afromaison and MS gave a presentation in which he showed the complementarity of the WAHARA and Afromaison projects for the Tunisian study site. This presentation indicated that within the Tunisian study site both projects are already collaborating closely. Both projects are furthermore also involved in the Africa Cluster. Some further possibilities for collaboration were discussed, e.g. input that WAHARA could provide to Afromaison and vice versa. For example, the Quick scan tool developed in WAHARA was shared with Afromaison.

Wahara meeting

Welcome

MO welcomes everybody and apologises that Abraham Abishek could not make it due to visa problems. MO is also happy that everybody was able to come and was happy to organize the meeting despite rumours of security issues in southern Tunisia. RH adds that the kick-off meeting would already have been organized in Tunisia in 2011 and that this is a delayed visit of the team to the Tunisian site. Piet Stevens (ACA) could not make it but has sent a presentation and planning document.

RH presented the current state of the project and the programme for the meeting.

Study site Tunisia

MO presented the study site progress for Tunisia. The socio-economic survey revisited a sample of households that were interviewed in the Jeffara project (2003). 133 interviews were conducted. In stakeholder selection workshops, attention is paid to both local methods of interest for farmers (traditional and private), and of interest from a watershed level (with Ministry of Agriculture staff). An intervention site was selected (Chabeat Anez site) and implementation costs discussed between the WAHARA project and local CRDA. Downstream the same was done (Oued Moussa site).

AC: How many farmers were sampled? MA: 140 farmers, representing different sections of the watershed.

VG: What are other activities of farmers working on olive fields? What motivation do part-time farmers have to invest in water harvesting? MO: They are mainly working on the field in the harvest (and ploughing) period. Agricultural income is not so important for the local people, it is one of their livelihood strategies. They are nevertheless attached to their land and trees and willing to invest in the land. MA: the current year is very dry and that has reduced the activities on the land. The survey will add details about the importance of agriculture for livelihoods.

KD: What were the factors that influenced the selection of different WHT? They firstly selected the WHTs they know. Government agencies have an interest in other methods such as recharge wells.

VG: Can we envision a future for the Oum Zessar catchment area? What is the future for agriculture, and do we need to invest in WHT for agriculture, or other activities such as tourism? MO: Agriculture is already seen as an additional income; with climate change the risk is large. Tourism development in the area should also value traditional heritage and preservation of landscapes, which includes water harvesting. FS: the case in southern Europe is that young people are returning to rural areas due to the crisis. MO: 2/3 of village is migrated out of the village.

Study site Burkina Faso

HS gave a presentation on progress made in the Burkina Faso study site. 60 household questionnaires were conducted, 30 in Ziga and 30 in Somyaga. The WHTs selected related to two levels: field level and basin level. WOCAT files were prepared for 5 technologies, but 2 technologies did not appear (RH: we can ask the WOCAT secretariat to assist, **action 1**). As the French version of the WOCAT database did not work, the English version was used, but with French text. Banka (farm pond) exists in two forms: traditional and improved. In selection workshops, the technologies were presented in PowerPoint presentations. The selection was done at two levels, at village level and a meeting in the town of Ouahigouya with national level actors (policymakers, representatives of farmer organizations). As there was no electricity in the villages, WHTs at village meetings were presented in paper format and a technology from Ethiopia was presented on a laptop by video. A field experiment was conducted with 40 farmers in the two sites. RH: zai with sorghum experiment has no control with fertilizer to separate the effects of WHT and fertilizer. CR: What is the difference between recommended fertilization and microdoses? HS: recommended is 100 kg/ha, microdose equates to 60 kg/ha. Technologies selected are: zai, stones lines, Mango Ripper, to combine with use of compost manure. HS attended a meeting in USA, where he presented WAHARA. He also organised field days for dissemination and had a radio interview in Burkina.

KD: Are the WHT selected to be implemented with fertiliser? HS: Yes, this is the only way to get higher production. KD: At what level is the criteria for water availability measured? HS: at the village level.

FS: is there not a risk that pesticides interfere with bacteria to process compost? HS: pesticide is used on the cow pea crop only as an insecticide. No pesticides are used on sorghum.

Study site Ethiopia

KW presented progress during the second year in the Ethiopia study area. A survey was conducted among 300 households (100 households in each subwatershed). In the selection workshops 10 technologies were presented. A report has been produced on this. The project will test hillside cisterns with bench terraces (3), percolation/sedimentation storage ponds with hand dug wells (2) and two other technologies (see presentation in Annex 3). The project team has teamed up with a NGO (affiliated to Catholic Church) to benefit mutually on scale of activity and knowledge generation. An implementation site has already been identified.

VG: What options are there to line percolation ponds if soils are sandy? KW: Depends on the purpose, for storing water you need lining, but for infiltration ponds the purpose is to benefit groundwater availability downstream.

MA: How can you ensure adoption of technologies from outside? KW: The government has led the way in trying different technologies without testing, and farmers took up the WHTs that performed well.

MS: What about money? KW: Initially the government provided workers with a productive safety net (food: 3kg grain/day), but this is not necessary any more.

Study site Zambia

AC explains that it was the rainy season in Zambia. Did not do the household economic survey yet as it should be done in the lean season. Need more information to conduct the choice experiment. Stakeholder workshop was conducted, and technologies selected but not ranked. Structural measures were not well received as they do not fit into the rainfed production systems. They are going to test 4 technologies, 2 of which are new to the area. Stakeholders did not have an opinion on these. As criteria that are important can be regarded: initial costs and maintenance costs, labour, yield, timeliness of operation.

KD: Can you implement the choice experiment soon? AC: Yes, in October [note RH: this deadline was changed to June later]. LF suggested to merge the implementation of the choice experiment with the household survey. RH/VG pointed out that for implementing technologies it is crucial to undertake the activities before the rainy season, also from the point of project planning, despite the fact that this means that no demonstration can take place in the dry season.

MS: What were the potential WHT that were selected in Zambia? AC: Different in-situ measures.

WP6 training

FS presented on training and dissemination of knowledge in WP6. Explained how MetaMeta came to develop a '3R' Training of trainers method. LF/KW suggested some complications may occur when people or communities are defending their own interests when talking about watershed management plans. FS continued to show some useful tools in knowledge exchange, including online mapping tools, use of videos and real simulation tools using plastic bottles, the FlashCards developed by MetaMeta, the of images and drawings, and the 'Happy strategies game'.

KD: Perhaps good to show before/after WHT implementation sites.

Choice experiment training

KD presented the Choice Experiment training. There were many questions surrounding the implementation. MO requested a clearly defined purpose; KD and LF replied that the purpose is to validate the choices made in the stakeholder workshop. MA then asked about the consequence of the validation. RH responded that the selection process as currently defined will not be altered, but that it clarifies the criteria that influenced stakeholder choice. Regarding criteria, the question was posed what to do in case of overriding importance of a single criterion. E.g. AC mentioned the case of Zambia where labour requirements for weeding were the sole reason not to choose the Magoye ripper. LF: in such cases this criterion should be one of the central criteria in the workshop and also in the choice experiment. KD added that a criterion that does not differentiate can be left out of the choice experiment.

On the question where to meet respondents, different opinions were aired. Bringing people together at a venue was preferable in Zambia (AC), but meeting people at markets was not a good idea in Ethiopia (KW), as people may be drunk.

Practical issues were discussed, such as financial constraints (KW) and risk of 'stakeholder fatigue' (KW, MO). MA asked why 100 surveys were required. AC inquired if it would be ok if farmers were not part of the original workshop. KW suggested whether the choice experiment could not be postponed until after the implementation of the WHT experimental measures. Questions also concentrated on clarifying the operational feedback from the survey, i.e. what contribution it makes to the project (MO). RH suggested that a practical solution is needed, for example by not interviewing the same people again. KD continued and presented data input. After the final discussions, it was agreed that KD and LF think of a practical solution to implement the choice experiment. This will be done by 26 April (**action 2**), when KD and the Tunisian team (and LF remotely) have had the chance to communicate a clear plan.

Friday April 19th

PhD presentations

PhD SL

SL presented her PhD research on the ability to bridge water deficits under changed climatic conditions in Africa.

CR: Which time period do you consider in modelling? SL: 20-30 years

MO: At what level will you model, the whole continent? SL: Only the study sites, which depends on data availability

KW: we have all the data except those on climate, we will have these in a few weeks

VG: Should you not also study the socio-economic context. This determines whether livelihoods can be sustained by growing crops or whether other options are needed. Also take into account that it is difficult to change from growing crops to raising cattle. LF: Yes, it is important to also look at how many people can be supported.

PhD MA

MA presented his PhD research on on-site and off-site effects. Climate models indicate that the Tunisian site will become both hotter and dryer. Ground water extraction is increasing over time and now exceeds sustainable levels, resulting in a decrease in ground water level. Tourism (on Djerba) uses around 60% of the extracted water.

LF: We need to look at how WHT fits in the future. What is the relevance of WHT if other changes are very large? Models are also not good at modelling sudden events. MA: Watershed management is based on WHT. We need to compare to see which method is best to improve livelihoods

LF: Is the money invested significant compared to other events?

KW: If 100% conservation would be applied, what is the maximum change that could occur?

MA: Water harvesting provides water for agriculture; hence more water from the aquifer could be used for other purposes. WHT are also relevant on-site; money spent at the local scale has relevance.

VG: Another interesting aspect could be to compare climate change impact with tourism change impact. Tourism might well have a larger impact. Can this be included in the model?

LF: This can be included in a model scenario

KD: Can you explain how you developed different strategies? MA: This is based on the household survey, and the stakeholder workshops. It reflects what stakeholders expect.

Progress WPs

WP1

MO presents current status of WP1 and remaining activities. Data (including GIS data) need to be shared between partners. Deliverable 1.4 needs to be completed; draft is available.

RH: to complete deliverable 1.4 the results of the household survey are needed

VG: Zambia study site should hold the survey ASAP; is delaying WP1.

RH: Zambian team appears to consist of 1 person, while other teams have multiple persons.

Deadlines for Zambia is discussed and it is agreed that both household questionnaire and choice experiment will be completed before the end of June (**action 3**).

To facilitate data exchange between partner, dropbox will be used because the existing ftp site does not work well in the experience of partners. Erik van den Elsen will provide information on dropbox, and also on the possibilities to send large amounts of data with Sendit (**action 4**).

LF: EU will want the dataset too

BI: For modelling the most urgent data are now the rainfall data; we need daily data for 20-30 years.

It is agreed that study sites will provide rainfall data by the end of May (**action 5**).

It is also agreed that WP4 will update their table of data requirements (**action 6**). The updated table will be provided by April 26th, and will include a division of data into those that are absolutely needed and those that would be nice to have (but for which alternatives exist). WP4 will also specify which data are still missing from which study site. The deadline for providing the data will be end of May (**action 7**).

KD: to design the choice experiment in time for Zambia, I need to have their data within 2 weeks. This is agreed (**action 8**), and KD will then provide the design to the Zambian team by the end of May (**action 9**).

LF: I would like to have the raw data of the household survey. It is agreed that study sites will provide these (**action 10**)

WP2

HS present status and remaining activities of WP2

RH: Study sites please provide a list of which WHT will be actually implemented in your site [note: list was made later during the meeting]

AC: GART will send WOCAT questionnaires by 26 April (**action 11**)

RH: I will send the workshop report from Zambia to HS (**action 12**)

LF: I will go back to the original project document to clearly describe what input the choice experiment (CE) provides to the modelling. We need a clear focus on what is needed in the project. There are 2 basic options: to make a site-specific CE or a general one applicable to all sites. The plan will be ready by April 26th (**action 2**). Data from the study sites should be provided by the end of September (**action 13**).

MO: Going back to the same stakeholders will be difficult; they want action, not more questionnaires.

RH: Can't you ask different stakeholders? All study sites have 25000 or more inhabitants, so it should not be that difficult to find 100 stakeholders who were not involved before?

VG: Why do we need 100?

It is agreed that LF & KD will take the comments into account to develop the plan (ready 26th April, see above, **action 2**).

WP3

WP3 is just starting. A monitoring plan will be developed.

It is agreed to discuss WP3 planning in the afternoon during the planning session

WP4

LF present status and plan for WP4. The Choice experiment provides information on the decision making process that stakeholders use to decide on which WHT to use.

RH: Is there a final version of the Quick Scan tool? BI: Yes, is available, and was shared with Afromaison project. A report will be provided for this deliverable (**action 14**). In fact, reports need to be made for all deliverables, also when the deliverable is e.g. software. It is agreed to discuss WP4 data needs during the planning session in the afternoon.

WP5

As Piet Stevens could not attend the meeting, RH explains that WP5 has not started yet, but that it will start in month 31. A draft planning for tasks 5.1 and 5.2 has been made by Piet

Stevens, and is shown by RH. There are no comments on this. It is agreed that Piet Stevens and RH will first develop the WP5 planning further, and that the planning will then be send around for comments (**action 15**).

WP6

FS present status and plans of WP6

VG: I liked the theatre that was used in Burkina Faso, and have discussed this too with the Afromaison team (who were planning something similar for their final meeting). A theatre provides a lively presentation that is more likely to reach stakeholders than e.g. a powerpoint. An option (to be discussed with Afromaison, **action 16**) is that some WAHARA people would attend the final meeting of Afromaison to obtain ideas on the theatre

FS: good plan

KD: Also make a video of the theatre

LF: Do we need some kind of celebration on the actual implementation in the field?

VG: Is it important to involve religious leaders? Study sites indicate that this is not necessary.

FS: Would like to have information on how knowledge has been spread in the past in the different study sites. Which path is followed in dissemination? How does it work in the different countries? (**action 17**)

KW: We are writing a paper on how this happened in Ethiopia over the past 30 years. The main driver has been the government; they implemented anything that was suggested. Later it was considered more how to reach the people. In our experience people need to see the measures in the field, and farmer to farmer interaction is crucial.

FS: Part of our project results will be hardcore science. We need to translate these results for the stakeholders. For example, how do we translate model results into messages that are useful to stakeholders? We might use a kind of game for that? See the presentation of yesterday.

LF: There are also 2 DESIRE publications upcoming that deal with this subject

Planning

RH provides an introduction to the planning session

WP3 planning

A draft table is made that is meant to show which data should be monitored for the different WHTs that have been selected. This draft table was partially filled with data that serve as example, and is given in Annex 4.

It is agreed that expert on the different types of information will send to WP3 suggestions of which data should be collected, and how these could be monitored (**action 18**). The deadline is April 26th. The table below indicates who will provide information on which kind of data.

Type of data	Who will provide advice to WP3
Plant data	HS
Social data	MA
Economic data	LF, MS
Modelling data	BI, LF
Soil data	ALTERRA

Based on this information, WP3 will then make a draft monitoring plan (**action 19**), which will be sent to the study sites. Study sites will select those parameters and methods that are appropriate in their case (**action 20**), and WP3 will then finalise the monitoring protocol (**action 21**).

RH stresses the need to implement the WHT that have been selected before the next rainy season. This is needed to allow for 2 years of monitoring. As the rainy season is at different times of the year in the different study sites, the consequence is that some study sites need to execute the WP3 work quicker than others. The Table below shows when the rainy season starts in the different study sites.

Study Site	Start Rainy Season
Burkina Faso	June
Ethiopia	June/July
Tunisia	September (though hardly a 'rainy season')
Zambia	October

VG: the book about the Tana basin, that was provided by MetaMeta, might also be useful to develop the monitoring protocol.

RH: Another document that might be useful is the Site Implementation Plan that was developed in the DESIRE project. RH will send this doc to KW by April 26th (**action 22**). The WP3 planning is briefly discussed, and agreed on.

WP4 planning

WP4 will look at the household survey data & at the WOCAT data and will, based on that, assess if there are any gaps in data that should be addressed by the study sites (**action 23**).

Overall planning

RH proposes that all WPs (especially 4-6 as 1-3 where discussed during the meeting) send their updated plannings to Alterra within 2 weeks (**action 24**). Alterra will then compile these and will send the new overall planning around (**action 25**).

Other issues

Copyright

VG raises the point of copyright issues; this because of the data-sharing that is proposed. She proposes that if data are used, co-authorship should be offered

MS: People who provided the data should always be informed about plans to use their data in publications. Nothing should be published without the authorisation of the people who collected the data. However, if they do not contribute to the paper itself it would be sufficient to include these people in the acknowledgements.

Some other points made during the discussion:

- The reverse situation should also be taken into account, namely that someone is planning to use e.g. a model developed by someone else.
- It is also important to consider the position of PhD students; their interests should be protected

- Dropbox has the risk that restriction of access is lost. For example, students are given access and after 1 year many people can access the data.

It is decided that:

- Erik will provide advice on the best way to share data without the risk of losing the restrictions in access (**action 4**)
- Alterra will draft a brief document about data sharing and publishing data in WAHARA. This document will take into account what is written about this subject in the consortium agreement and will be send around for comments (**action 26**)

Interviews

FS would like to record brief interviews with all 4 study site leaders after the meeting. Study site leaders agree to this.

Next meeting

There are no volunteers at present. We will wait a few months to see how the situation develops in the different countries. Alterra will approach a partner to ask if they could host the next meeting (**action 27**). This will be done around October 2013, to have the meeting in March/April 2014.

Closure

RH thanks MO and the rest of the IRA team for organising and hosting the meeting. Meeting was organised very well and RH is happy that we took the decision to have the meeting in Tunisia despite the unrest that was reported in the media; no trace of this unrest was seen during the meeting. MO thanks all participants for attending.

Annex 1 Meeting Programme

Tuesday April 16th: Arrival

Wednesday April 17th: Excursion with Afromaison (full day)

Thursday April 18th

time	what
9:00	Joint session Afromaison
11:00	Coffee break
<i>Chair: Rudi, Notes: Luuk</i>	
11:30	Welcome (IRA)
11:35	Welcome & Intro (Rudi)
11:45	Report study site Tunisia (IRA)
12:10	Report Study site Burkina Faso (INERA)
12:35	Lunch
13:50	Report Study site Ethiopia (MU)
14:15	Report Study site Zambia (GART)
14:40	WP6 training
15:30	Tea break
16:00	Training choice experiment (WP2)
18:00	Closure
	Dinner

Friday April 19th

<i>Chair: Violette, Notes: Rudi</i>	
9:00	PhD presentations (Sara, Mohamed Arbi?)
9:40	Report year 2, plans month 25-42 WP1 (IRA)
10:05	Report year 2, plans month 25-42 WP2 (INERA)
10:35	Coffee break
11:05	Report year 2, plans month 25-42 WP3 (MU)
11:35	Report year 2, plans month 25-42 WP4 (LEEDS)
12:05	Report year 2, plans month 25-42 WP5 (ACA)
12:20	Report year 2, plans month 25-42 WP6 (MetaMeta)
12:50	Lunch
<i>Chair: Coen, Notes: Rudi</i>	
14:00	Intro Planning m 25-42 (Rudi)
14:20	Planning session for WPs most active m25-42 → task list & deadlines
16:00	Tea break
16:30	Management, finances and reporting
17:00	Other issues
17:30	Closure
	Dinner

Saturday April 20th: Departure

Annex 2 Action list

No	Task	Who	When	Remarks
1	Ask WOCAT secretariat for assistance with 2 QTs not shown for Burkina	RH/HS	May 15	
2	Plan for choice experiment	KD/LF	April 26	
3	Household survey & choice experiment completed in Zambia	GART	June 30	
4	Info on dropbox, security and Sendit	Erik van den Elsen	May 15	
5	Rainfall data	SS	May 31	
6	Updated table of requirements WP4, with crucial/desired and with site specific status	WP4	April 26	
7	Provide data requested by WP4	SS	May 31	
8	Data needed for set-up choice experiment Zambia	GART	May 15	
9	Design of Zambian choice experiment provided	KD	May 31	
10	Raw data of household survey to LF	SS	ASAP	
11	Completed WOCAT questionnaires from Zambia to RH & HS	AC	April 26	
12	Workshop report Zambia to HS	RH	April 26	
13	Choice experiments conducted in all sites	SS	Sep 30	
14	Report on Quick scan tool (del 4.1)	WP4	June 30	
15	Develop WP5 planning, send around for comments	Piet Stevens (WP5), RH	June 30	
16	Discuss attendance Afromaison final meeting with Afromaison	Alterra	June 30	
17	Information on knowledge transfer in sites to WP6	SS	June 30	
18	Suggestions for what to monitor & how to KW	HS, MA, LF, MS, BI, ALTERRA	April 26	
19	Draft monitoring protocol	WP3	May 15	
20	Adapt monitoring protocol for study sites	SS	May 30	
21	Final monitoring protocol	WP3	June 15	Earlier for Burkina
22	Send DESIRE SIP to KW	RH	April 26	Done
23	Data gaps for modelling	WP4	May 1	Related to point 6
24	WPs to send updated planning to Alterra	WPs	May 15	
25	Update overall planning	Alterra	May 30	WP5 later (see point 15)
26	Document on data sharing and publication	Alterra	May 30	
27	Contact SS partner for hosting meeting in March/April 2014	Alterra	Oct 31	

Annex 3 Presentations

All presentations will be made available on the WAHARA website

Annex 4 Draft table for monitoring

General info

Crop data are needed for all WHT

There should be a link to the criteria that were used in selection

Weather data are needed for all WHT

Repetitions are needed for publication of results from test plots

Information is needed on the Financial scheme: who pays how much for implement, maintenance etc

Methods to be specified – depending on e.g. aim, funding, etc

Content of meas protocol

What (which WHT)

Where

How to implement (technical info, principle, drawing etc)

Info on implementation (that don't need monitoring)

What to measure

How to measure

How often (time/space)

Draft table is given on next page

WHT	Country	Economic	Social	Environ.	Frequency	Env. impact	Technical	Scale	Repetition?	Document.
Stone line	Burkina							Field		
Zai	Burkina							Field		
Mango ripper (from Zambia)	Burkina							Field		
Percolation ponds with shallow wells	Ethiopia	Costs implement (fixed) & maint (variable). Dimension Monetary & quantity Labour (person days) Who uses water Cost and benefit Yield Expected life WHT	Shift in land use?	Water level Water quality Rate abstraction Paramsfield exp too		Downstream discharge, quant & qual Evaporation		SubC		
Check dams	Ethiopia							SubC		
Hillside cisterns with terraces	Ethiopia							Hill		
Soil improvement	Ethiopia							Field		
Zero tillage	Zambia	Labour Yield Cost& quantity fertiliser, insect etc. Timing operations	e.g.acceptability (if changing over time) conflicts about residue Spontaneous adoption	Soil moist Organic matter Abundance earth worms Bulk density Biomass on field Texture (once) Inf rate (once?) Growth rate &phenol stage	Depends on parameter! Needs to be specified	Pollution Decrease erosion		Field		
Strip tillage	Zambia							Field		
Ripping	Zambia							Field		

Tabia	Tunisia							Hill		
Jessour	Tunisia							Hill		
Recharge wells	Tunisia			Ponding time				Catch		
Zai	Tunisia							Field		
Deep trench	Tunisia							Field		