Minutes of THE PLENARY MEETING IN ALICANTE, SPAIN,

March 20-22, 2013

Jane Brandt and Nicky Geeson

Draft April 8th, 2013
Final April 23rd, 2013

Present:
Alterra: Erik van den Elsen, Violette Geissen, Coen Ritsema, Jaap Bloem
TUC: Ioannis Daliakopoulis
Unibas: Gianni Quaranta
CNRS: Sonia Kefi, Florian Schneider
UA: Susana Bautista, Angie Mayor, Ana Urghege, Matthijs Boeschoten
UAVR : Jacob Keizer, Oscar Gonzalez
MEDES : Nicky Geeson, Jane Brandt, Rosanna Salvia
UNIVLEEDS : Luuk Fleskens
UNIBE : Gudrun Schwilch, Hanspeter Liniger, Matteo Jucker, Nina Lauterberg
UU : Max Rietkerk, Mara Baudena
JRC: Martha Dunbar
CUT: Kyriacos Themistocleous
WU: Peter de Ruiter
CEAM: Ramon Vallejo, Jaeme Baeza, Athanasios Smanis, Alejandro Valdecantos

Annexes:
Annex 1: Action list

Wednesday 20 March 2013

Study site presentations of activities particularly related to WP3 and 5

Geissen (chair)

Caramulo mountains, Varzea study site

Keizer *Presentation*[1]

Vallejo The spartum doesn't encroach in your burnt plots? What is the mortality. Is the proportion sprouting high? Perhaps increasing the fire frequency is favouring these species

Keizer In the control sites, management can also play a big role. And the spartum is removed, maybe to favour hunting rabbits.

Geissen In the drought plots, would you cover one? Are you planning to look mainly at one species? Maybe species would provide additional information for the modelling.

Keizer We would also like to look at pines.

Albatera Range, Alicante

Bautista and UA student *Presentation*

Bautista These photos were taken in November but part of the measurements were taken in December. The dead material was still there. Some of them are now resprouting. We are looking at those which are between death and life, to see if this might be a tipping point. However this choice of live or dead plants may be influencing the results. This needs to be discussed in more detail.

Bautista Things related to relative abundance, interaction between species, spatial patterns etc, are all part of WP 5.

Geissen It would be good to clarify what data is needed for the modelling from which WP (**Action 5**). It looks as if most of the information you need will come from WP5, but if you need information about how particular plants react or other data that can come from WP 3, you need to say so now.

Fleskens Is grazing a driver in this site?

Bautista In Cyprus, Crete and Italy grazing is active. In Spain we have 2 sites, one where fire is the main driver and the other, Albatera, where past exploitation is the driver. In the new site, Santomar it looked as if grazing might also be an important driver and so the site might produce information to compare with the other sites.

Geissen It would be good to predefine the criteria for the selection of grazing sites in all field areas (**Action 6**). For fire it is clear, there are sites that have experienced 1, 2 or 3 fires. Some similarly clear criteria for the grazing sites would be useful.

Valencia Mountain range

Valdecantos *presentation*

Valdecantos It is the production of cones and seeds plus also the geomorphology and land use issues that determine the recovery after fire.

Valdecantos The Marilola site also goes to pine, but if there are repeated fires the ecosystem that regenerates is shrubland.

[1] All presentations can be found on the CASCADE website

Vallejo The weather conditions the year after the fire are important, as is predation of seeds by ants.

Schwilch The table you show in your presentation was really useful.

Geissen We already have a table of drivers that it would be good to complete with information like this (**Action 7**). We also need to have some history of the sites, for example when did the B horizon disappear?

Vallejo I am not optimistic that we will every really understand this. WP 2 will provide the broad picture of land use changes and this is probably the most information we can get, although we may have air photos from the 1950s.

Geissen I was thinking about an explanation the particular history of some of the terraces we saw.

Castelsaraceno, Italy

Quaranta *presentation*

Geissen You already have a lot of data.

Ruiter It is excellent that we already have for one site all the measurable information. Our group also has some microbial information for your site. In the light of the data you have from your site, I would like to give the other sites some further direction about what to do in theirs (**Action 8**). I would like to discuss this all on Friday in more detail.

Messara Valley, Crete

Daliakopoulos *Presentation*

Rietkerk How do you measure infiltration?

Daliakopoulos Using the mini-disc infiltrometer as sent to us by Erik.

Bautista We are not measuring infiltration yet – we are still deciding which method to use.

Geissen Let's decide this on Friday, but I think we should use the same method in all study sites.

Daliakopoulos We have done no work on WP 5 yet.

Geissen discussion of soil profile descriptions

Pegia, Paphos, Cyprus

Themistocleous *Presentation*

Vallejo you need to decide the target plant species for wp3

Themistocleous Susana and Peter will come to Cyprus in three weeks and will decide the target species with us.

Bautista where did you start the soil moisture probe?

Schwilch how do you control the semi-grazed area?

Themistocleous It is around the shelter, but not in the path of the animals

Themistocleous Out migration is not so important in this area – grazing is the most important activity in the area. We have not started on WP 5 yet.

Discussion about catastrophic shifts and tipping points

Geissen I would like to continue the discussion about what is a tipping point, bearing in mind what we were looking at in the field yesterday. Can catastrophic shifts be seen separately in the plants and the soils? Should we also take a time component into account. Is a change that is not reversible in 20 years catastrophic, or only ones that aren't reversible in 500 years.

Rietkerk The interactions between plants and soil are intertwined. If vegetation changes then the soil also changes significantly. I suggest that timescales of decades rather than hundreds of years are more appropriate.

Geissen So, a human generation or so is an appropriate time scale. If a wild fire occurs the seedlings may be washed away by erosion but there maybe a bit of the organic layer left and the soil can still be fertile. For the plants it could be a catastrophic shift, but the soil is still ok.

Geissen I understood that catastrophic shifts in vegetation can occur at an earlier stage because the seed bank is lost.

Vallejo We also have a back ground drivers of cultivation and abandonment which can change vegetation composition for decades. Pines may not be the best indicator of a shift because they can live in very poor conditions. On top of this background, the fires are the current driver. Fires facilitate the colonisation by fire-prone species and we could move into a regime of more frequent fires. If this happens the soil will become increasingly poor in soil organic matter.

Mayor It is also a question of stability. After a fire there is a sudden change in vegetation, but the changes in soil occur over a long time. You have to wait until the state becomes stable.

Geissen How will we deal with this time component in the project?

Ruiter We can wait and see if there are hints in the project, or see shifts by looking at different states. If we see a change, what kind of change are we seeing? We need to know more about the system to know if it is a change or a shift. Sudden shifts are linked to a strong hysteresis and we can't get back. The closer we get to a shift, recovery times will become longer. Can only look at indirect system props, or shifts that might have happened. Compare different states and different system properties To get a picture that the shift we are approaching has a certain character. WP 3 and 5 are focusing on shifts of a certain character but we will always have to deal with indirect observation. Have to separate the changes we see from sudden to gradual and with and without hysteresis.

Geissen Take these thoughts away with you and we can discuss them again on Friday. I want you also to think about what the indicators of a sudden shift might be (**Action 9**).

Ruiter Your question is relevant. Shifts need to be identified in the local context of the site.

Kefi I don't think we can decide on this now –the definition of a shift may be what we reach at the end of the project.

Jucker When I started to look at the subject, this was the main problem I encountered. I think we need to look at the issue from a management perspective; we need to look at the ecosystem services because the key shifts are those that changes dramatically the relationship between the land users and the local environment is the key one. I think this can help prioritise the different environmental processes.

Bautista I don't think we should separate soil and vegetation shifts, they are part of the same system. Systems change from one stable state to another stable state.

Vallejo We have vegetation and soil and also the disturbance regime which depends on the vegetation. We have selected degraded systems that are not recovering for some reason. We are looking at many soil and vegetation parameters to see why this is.

Quaranta Rather than think about catastrophic shifts we should talk about critical transitions. In Castelsaraceno we have moved between three states. In the 1950s the land use was mixed agriculture. Then there was a critical transition to pasture and, possibly, to abandoned pasture invaded by shrubs and therefore no longer providing any services to the population. These critical transitions are identified in the storyline for the site.

Rietkerk The term catastrophic is derived from catastrophic mathematical theory. The term "critical transitions" is seen more in the literature now.

Geeson We have vegetation, soil, economic factors in your diagram, but we haven't yet talked about the climatic drivers.

Geissen I would like us all to have the same concept that we are approaching from different disciplines.

Themistocleous The climate is very important. We have had a lot of rain in recent years. Socio-economic aspects are also important. In the past people raised animals, but now they are moving into tourism.

WP2 Historical evolution and current state of med dryland ecosystem - description and work for the near future

Daliakopoulos*Presentation*

WP 3 Experiments to unravel regulating processes in plant-soil ecosystem dynamics - description and work for the near future

Ruiter *Presentation*

Geissen I suggest that we keep the questions for Friday for WP 2, 3 and 5 until Friday.

Ruiter On Friday we have to make the final decisions about what parameters we are going to measure and what not.

WP 4 Manipulative field mesocosm experiments on ecosystem dynamics – description and work for the near future

*** This will be presented on Thursday.*

WP 5 Landscape assessments and threshold dynamics - description and work for the near future

Vallejo *Presentation*

WP 6 Development and application of integrated soil-water plant models - description and work for the near future

Kefi *Presentation*

Ruiter Can the plant functional groups relate to the traits?

Jucker Can they also be related to things like palatable groups of plants?

Kefi Yes, they can.

Kefi Usually we say a cell is about 50 cm sq.

Mayor We could also apply to obtain all the images we need in one go.

Kefi We don't need images of very large areas. Most of the sites are quite small.

Ruiter It would be interesting to have a discussion with each study site about functional groups and traits and strategies of plants in their site (**Action 10**). Traits are a given property of a plant, but their strategies can be changed according to environmental conditions. However this will need to be discussed for each region.

Geissen How do you want to link with WP 3? Could you give an example of what the model output would be for example for Susana's study site?

Kefi The outcome is a graph with the patchy distribution and species composition. Then you can add a stress of your choice to that.

Kefi It depends if you can distinguish shrub from herbaceous plants from aerial images. The relation with WP3 has changed since the original project design. Our model is less tightly linked with WP3 than Max's model.

Geissen What will the indicator tool box contain?

Kefi Let me give you the example of the indicator of variance. When a system approaches a tipping point, it becomes slower and slower to respond to perturbations. Therefore the variance increases. This is a generic leading indicator. If you are looking at variance over time, you need time series. Where there are 3 spatial replicates we can compare the signal in the three states. If we have a site that was abandoned 10 years ago and aerial images that follow its development, that is a perfect situation. We can look at different situations in space that correspond to different states. The spatial information gives us a lot more information.

Liniger You also have to consider when the image is taken, to choose the optimal time.

Kefi I guess it would be to take it at the same time each year, possibly in the spring before the annuals start growing.

Liniger We are still not clear what the key inputs you need for the model and what the outputs are.

Kefi You are right – we do need to give this presentation.

WP 7 Evaluation of land use and management to prevent catastrophic shifts - description and work for the near future

Schwilch *Presentation*

Ruiter Can you say any more about resilience in relation to management practices?

Schwilch The idea of management practice is to prevent the ecosystem getting towards a shift. However the practice itself needs to be robust in a changing climate or changing economy.

Ruiter So, management is also dynamic?

Schwilch Yes, it is.

Liniger What we are doing in this assessment it to correct the basic information about land management that is available, so there will be a number of indicators that people mention that we can include in the SLM practice assessment.

Ruiter So, grazing is an indicator, a driving force and a management option.

WP 8 Scenario analysis of upscaling preventive and restorative measures - description and work for the near future

Fleskens *Presentation*

Salvia Are you going to distinguish between private and public stakeholders?

Fleskens Yes, I think this is why we are not going to go for a straight cost-benefit analysis. If we think about the vast areas of the landscape that are becoming less economically relevant, we need to understand what people want from these areas.

Kefi You will start your modelling in 2014, so we still have a year to work on the biophysical modelling.

Fleskens Yes, it will be a gradual process once the biophysical models start.

Ruiter Grazing may be the main source of income of the local farmer, shifts need to be prevented and the management option may be to reduce grazing, which would reduce the farmer's income. But the modelling may be wrong and someone is forced to reduce his income unnecessarily. We can go wrong in two ways, by not doing anything, or by giving incorrect advice.

Rietkerk There is literature about exactly this point.

Fleskens The resilience factor Gudrun mentioned is important. There may be some low cost interventions that provide good benefits.

Ruiter The question remains, whose money is it?

Baudena How can you determine what the desired ecosystem is in this context? Do you ask the stakeholders what their goals are?

Fleskens Yes, the goals are determined together with the stakeholders.

Ruiter So we have to determine who the stakeholders are.

WP 9 Knowledge transfer and dissemination – description and work for the near future

Geeson *Presentation*

Ruiter I think we should write a song. I was once in a project called Vital Soil for which we wrote a song about the tiny creatures in the soil. It was well remembered.

Thursday 21 March 2013

First results from WP 4 – Manipulative field mesocosm experiments on ecosystem dynamics
Bautista and Urghege *Presentation*

Rietkerk Your sponges behaved differently from your vegetation in the first period?
Bautista What seems to happen is that two of the species behaved similarly to the sponges and according to the hypothesis. However, Phyllirea did not behave the same, because of the way it grows. In the sponge experiment there was a varying number of sponges arranged in a varying range of patterns. In the plant experiment the patches grew as they wanted and the bare soil connectivity was not determined by the patterns. The same degree of connectivity can be achieved by a high variety of vegetation patterns.
Liniger From your plots collected the equivalent of 3 mm runoff from 85 mm rainfall. This is relatively low, but influential.
Bautista Yes, the runoff coefficient is very small, but your point is very important because we don't know what amount of resource loss the system can withstand. In semi-arid areas, runoff coefficients of 3-4 % are normal so these figures aren't so abnormal.
Liniger So single events may be very important. How deep is your soil profile?
Bautista It is deep because it is an artificial slope, but we were measuring the top 15 cm.
Liniger The top 15 cm are very exposed to transpiration loss. My impression is that there is little difference between patches because either the plants transpire the water, or because it evaporates.
Bautista In this experiment we are not aiming to control the water balance. We are looking at potential for drier soils loosing soil in runoff. In other experiments where we are looking at the water balance, we are measuring much deeper soil moisture much deeper.

Preliminary results from WP5 – Landscape assessments of threshold dynamics
Boeschoten and Bautista

Ruiter The old restoration site is closer to the reference site than the new restoration one? Why do you have this combination of old and new restoration sites?
Boeschoten I was told that the old restoration wasn't well done.
Baudena What is the stability index?
Bautista It represents the potential for restoration.
DaliakopoulosYou said that your stakeholders value biodiversity. I would have thought that if they are farmers, they wouldn't value biodiversity much. What kind of stakeholders were there?
Bautista To complete the participatory experiment in the PRACTICE project, the stakeholders selected these indicators of ecosystem services. They told us which ones we should measure to see which actions were successful or not. To identify the stakeholders we did an initial brainstorming in the team, and identified 5 or so key people in the area. Then we asked them who else might also be important to include and we repeated this until we had a group of about 30 and started to get the same names being repeated. So we think we have a good representation of stakeholders in the areas. We were surprised that they valued biodiversity and discussed that with them. This area is no longer productive so they may be valuing different things in it which might the affect touristic potential.
Jucker What kind of stakeholders did you have in the platform?

Bautista They included: a hunting association, the local municipality, some NGOs, a tourist association, someone from the Swiss channel water harvesting system, the foresters, the mayor, teachers and educators in general, a trekking group, a couple of farmers and someone who gets money from the site by gathering snails. It was quite a diverse platform.

Liniger Do you have separate results for each stakeholder group? This information would be very important for WP 7.

Fleskens Thinking about the use of this information in the models, how can we be certain that some of the ecosystem services are not double counted?

Bautista We are doing 2 things – establishing a hierarchy and grouping together those that mean the same. This list of ecosystem services is what they suggested.

Ruiter I am surprised how the different services are weighted. I would have expected that C sequestration would have been more highly valued.

Bautista Well, it was mentioned which is a start. But maybe they equate C sequestration with areas in which there are larger trees.

Modelling progress and work for the near future

Rietkerk *Presentation*

Geissen Can you explain what is shown in the feedback graphs?

Rietkerk It is a theoretical exploration and there is no real data attached to it. However we want to close the gap between these models and the field slope we saw this morning.

Geissen So you could produce these graphs for different plants communities?

Rietkerk Yes, the idea is to mimic the field plots.

Ritsema How would you measure hydraulic connectivity in the field.

Mayor It is measured by the potential average length that runoff can reach on the surface. The algorithm calculates the max flow path that runoff can reach from every cell. The path can evolve along the inter patches and stops when it hits a patch. The flow length index is the average.

Rietkerk It does predict the runoff well.

Mayor We don't know what are the most realistic values are for alpha the term in which plant species and soil types are combined. We are going to use experimental data to get information on this.

Ritsema Could there be an interflow from bedrock in these areas as well as surface runoff?

Mayor Subsurface flow could also exist, but bare soil connectivity concerns the surface runoff.

Bautista Bare soil connectivity may also affect other processes because we think that it affects the evaporation pattern as well. Subsurface flow is always present too and increases the general amount of water availability in lower parts of the slopes. However, we've already seen this in the data that Ana showed. You can calculate the water available for a patch from the bare soil connectivity and its position along the slope.

Geissen We saw a lot of stones on the soil surface, and the water was finding its way through the stones. The stones seem to have an importance influence. Could this be included somehow in which patch is connected to the water and which is not?

Rietkerk This microtopography is included in the bare soil connectivity.

Bautista My feeling is that it will increase the runoff and connectivity.

Ritsema Do you already have data about the amount of sediment transported on the slopes?

Bautista Yes, it follows the same pattern as runoff

Ruiter Can you explain the feedback between plant pattern and ecosystem function diagram?

Rietkerk Plus signs indicate a positive feedback between the two elements.

Data storage and database progress and work for the near future
Dunbar (presentation postponed due to illness)

WP9 Training - Knowledge transfer and dissemination
Geeson *Presentation*

Ruiter It is important that we are clear about the intellectual property of the research but isn't it all the property of the project?
Geeson All publications have to contain a standard acknowledgement and disclaimer. Erik will have to send this to everyone (**Action 11**).
Mayor Does this rule about giving notice apply to conference talks and presentations?
Geeson Yes, it does.
Baudena Couldn't we have the notice posted on the project website instead of emailing everyone (**Action 12**)?
Ruiter It is different talking about papers and the presentations. I would say that we need to be very strict about papers, but may be more relaxed about the rest. If we have rules about everything, it may be that we tend to ignore them, even regarding papers.
Ruiter I once saw a civil engineering project that had a big road sign that they installed next to their sites. Maybe this is something we could consider.

Brandt *Presentation*

Friday 22 March 2013

WPs 2, 3 and 5 - Discussion of setup and integration of field work

Geissen This morning we are going to discuss the field work, the kinds of analysis we will apply, and the parameters available for modelling.

DaliakopoulosWe have all the images that are avail from Landsat. This was a milestone for us. We are also doing research on how to correlate it with some of the data you've given us and what we have available. However, we also have to have a storyline from all study sites, and this has to be done by each study site leader (**Action 13**). We have the report of our own site and we can distribute this as a template for all the other sites.

Geissen This is a good idea. Provide the study site leaders with the template and indicate what data is still missing

Bautista Do you have all the data you asked us for? I found that you were requesting a lot of data from us. If you have used all the different parameters for your site, you could show us what needs to be done with it. The study sites are currently very busy with loads of tasks.

Daliakopoulos We asked all study sites to fill in the questionnaire to see what the range of available data was. The idea was to use only data that is common to all study sites in the report. If everyone has population density, then it can go in the report but, if they don't, it may be better to miss it from all reports.

Bautista Normally I don't have population data, but we may be able to find it. If you could send us an example of the richest data site it would be useful for us.

DaliakopoulosSo we could send you our full report instead of the template.

Geissen The idea was that the study site leaders would receive a template from you. Let's look at the questionnaire that you sent. *(showed on screen)*

Bautista I understood that there would be a global analysis of all sites.

DaliakopoulosI can provide the NDVI changes for all sites, but they need to be looked at in the context of the local storyline. Instead of a template, I will send you our full report.

Geissen You sent a template in the beginning, and asked the study site leaders what data they had. This is completed for all study site. The interpretation of the satellite images is your task as WP leader. Based on this and the information you have from the study site leaders what is missing? Don't give too much work to the study site leaders but clarify for them what is expected for their contribution.

Bautista I suggest that you try to assess the story for all the sites and, if there is anything that needs to be clarified, ask the study site leaders.

Themistocleous You can see land use changes from the NDVI.

Daliakopoulos You already have written study site description, an outline of your field site. However the historical evolution of the site is something you know better than I do. I think that this has to go into the report as well. It's not only about interpreting satellite images. There are underlying events that happened 60 years ago that will need to be added. It's not a question of providing data, but the story.

Mayor This is not something that we know, we will have to look for it.

Daliakopoulos You could point us to the literature instead. You know who the experts are and what projects have been running in your area. I can follow this up.

Geissen This work needs to be finished by the end of June. You send the study site leaders the landsat image changes and tell them what bits need to be explained.

Fleskens The interpretation of the drivers is in the second part of WP2

Daliakopoulos The drivers and the changes are of course closely linked

Keizer Maybe we can turn the question around, and tell you the main story about land cover change and you can see if the how this is reflected in the images.

Daliakopoulos There is a timeline of events in the questionnaire.

Keizer Could you detect the historical events on the images?

Daliakopoulos You know your study site and the important points in time better than I do.

Bautista In Santomera we know that there was a wave of abandonment in the 1960s. With this information can you adjust the story combined with the images. So we don't need to do anything else about that.

DaliakopoulosIf we could do this we could be half way.

Geissen So Ioannis, give them clear instructions about what you have and what you need. By the end of April you need to summarise what you can see from the satellite images and ask for any missing information that you need to complete the storyline (**Action 14**).

Dunbar I haven't seen these WP3 summary sheets yet. I would like to talk to all the study site leaders today to clarify what data will be available (**Action 15**).

Bautista The vegetation parameters to be measured are already in the protocol for measurement; we just need to double check if they are going to be measured or not.

Ruiter I suggest we have a list of the documents that will be shared by everyone. Some people seem to have key documents and others don't.

Elsen There is already a page of the project website with a list of documents that are finalised.

QuarantaWhat about using the drop box?

Geissen Let's use drop box for the work in progress, but use the website for things that are finalised (**Action 16**).

Liniger *Presentation on soil hydrology*

Vallejo *Slide Quick look to soil data – Castelsaraceno. This highlighted important differences between soil properties of the sites that may obscure the analysis*

Daliakoupolos You are suggesting that there is no replication between the three places?

Bautista The most important problem is that in the Castelsaraceno site there are differences in the soils of the replicates.

Geissen If we are to have replicates, at least we must have the same bedrock and same soil structure. This is why the initial check list we sent you is so important. If we don't have these factors similar then there will not be replicates.

Daliakopoulos What is the acceptable range for pH for the plots to be considered replicates. If I have one plot with a soil pH 6.5, is a soil with pH 7 a replicate?

Vallejo It is important that you don't move from one buffer system to another.

Rodriguez You don't want to change too many factors, and to make them as basically similar as possible, this is the idea of the blocks.

Ritsema The preference is that the blocks are not too different from each other.

Bautista It is a requirement that within blocks there is the same soil. It is convenient that the replicates are similar to reduce the background noise. In Santomera we have a single site, and not a block design.

Ruiter We should know by now the layout of all the sites. It doesn't matter if they are in blocks or random, but we have to know which they are for the data analysis.

Geissen Before you start the intensive sampling, please complete the very basic data that we asked for in the questionnaire (**Action 17**).

Ruiter In all regions we have a mixture of more or less independent replications. In the blocks and treatments we have repeated measurements. As far as I can judge the layout is more or less OK for all sites. Sites should start monitoring in early April at the latest (**action 38**).

Geissen I agree with you but want to ask the partners to complete this basic soil data check.

Ruiter I would say that we are not going to change the plots now.

Bautista I don't agree. If we don't have the basic design right now, we need change it. We have to be sure that if we have a block, everything inside it needs to be homogeneous. This

is crucial. We also need to decide what a plot is, what a block is and what needs to be homogeneous. We are all using different terminology (**Action 18**). Before we go on to look at particular measurements we need to check these very basic things.

Geissen Within each site we need to make sure that at least there is the same geology for all degradation states. The same geology gives more or less the same soil pH and same texture. Also you need to check the soil depth to make sure that it too is comparable. You can exclude the salinity measurement. Thank you very much Gianni for doing the first analysis, because you have highlighted the issue for us.

Bautista Consistency of slope is also important.

Geissen I hope it will not be too big a problem for you to adjust your sites.

Geeson **Action 18.** Let's have a separate methodological glossary including terms like "block" and also including all the abbreviations that are use.

Ruiter We also need to have a final discussion about what will be measured, the design of the roofs and the dates. I have also the microbiological data from the Italy site.

Discussion of data base and sampling regime

Geissen *Showed document "Soil sampling and parameters 29-10-2012" which describes the soil properties to be determined at the start of the project, and then four times per year and continuous TDR.*

Discussion of each measurement techniques

Gonzalez **Action 19.** I will write a guideline for the use of the minidisc infiltrometer.

Geissen **Action 20**. Ioannis will send the infiltrometer to Gianni after he has finished using it. You can use whatever method is available for soil texture. However I suggest that the method is also recorded in database.
Soil density – can be done in the field, but it is a destructive method so needs to be done outside the plot.

Gonzalez You should dry the sample, but estimate the volume of stones and soil separately. **Action 21.** I will also provide a short description of this, including difficulties that may be encountered.

Geissen For pH it is important that it is measured using a KCl extraction for comparability. Corg – there are several methods. Walkley and Black could be the easiest one. I suggest that you tell us which method you use and we send the same samples between labs (**Action 22**). (** was this eventually agreed or not?)

Ritsema This sampling regime applies to the drought experiments too?

Bautista We need to use the same terminology for the experiment locations. We have 9 plots that can be organised in blocks, in the same site or they may be split into three blocks or sites. The experimental unit is the plot. Then within the plot there are three treatments/degradation states.

Ritsema So are the one-off measurements to be collected in each plot?

Bautista They should be done in each plot, maybe an averaged sample.

Ruiter Within one plot you may have different patches.

Geissen *Referred to de Ruiter's presentation which showed the sampling design.*

Bautista We have not changed the sampling scheme, but the names in Peter's presentation are not the standard ones. **Action 23** I suggest that Paco sends the standard names for each measurement point.

Ritsema Are the samples going to be merged or measured separately?

Geissen Separately, in order to get an idea of heterogenetity.

Bautista Didn't we agree that we would do first measurements at 2 depths then afterwards only in the upper layer?

Geissen No we agreed with the scheme in Peter's presentation. We also agreed that it would be started in November. However, because of delays it will now start next month.

Daliakopoulos We have finished our first sample. When should we do the next one?

Bautista We are trying to match the seasonal changes – rather than measure strictly every 3 months. So it does not have to be at the same time in each study site. We want to capture the key changes in each place.

Geissen **Action 24.** Everyone should send the time line of what they have done to Peter. However, in general **Action 25.** everyone should sample 1. in the early spring; 2. at the peak of growing season; 3. at the end of the summer; 4. in the middle of autumn.

Keizer We also need to think about when we are going to move the TDR at the end of the year 1 monitoring because we also need it to measure the drought experiments in year 2.

Vallejo I strongly suggest that after the first sampling we take a look together at them all before continuing with the next.

Keizer Because of the amount of sample analysis that needs to be I think that we should send a summary of the key issues rather than all the data.

Geissen We could use the drop box for exchanging this information.

Ruiter We need to decide on the dates that we are going to do the sampling and to fix a date for discussing the key issues.

Bautista We will do our first sampling now then at least by the first week of May we should all have our first set of data. Then we can have a meeting to discuss it.

Geissen **Action 26.** I will propose a date for this skype conference to discuss the first data set.

Bautista The same thing applies to vegetation data which also needs to be looked at. We should circulate the results from the first vegetation sampling before doing the next one. Have all study sites measured all the monitoring vegetation? **Action 27.** all study sites should circulate their data to me and to each other and we can take a look at it.

Ruiter *Presentation on soil microbiological monitoring*
I suggest we discuss with each study site leader individually what soil microbiology they would be interested in studying.

Bautista I suggest that we commit ourselves to reduce by half the things we are measuring in the next seasons and in the drought experiment. This is for both scientific and budgetary reasons. There is a hierarchy in the things we are measuring and we need to select a few key indicators.

Geissen But the there are only four parameters we are measuring four times a year.

Bautista So we will only be measuring one nitrogen form after the first sampling?

Geissen Yes.

Drought experiment

Geissen The drought experiment will need to be in place before the autumn rain starts and will only be installed in the partly degraded sites. There will be three treatments: control, plots covered for 3 months and plots covered for 6 months. There will be monthly sampling in these.

Bautista Does it make more sense to put them in the degraded site instead? Maybe there is more opportunity for finding tipping points there.

Geissen Maybe we could decide site by site to locate them in the place that is most likely to experience a tipping point.

Keizer I think it is physically too difficult to take samples each month. Why not just sample at the end of the exclusion period and then during the recovery period.

Bautista That is a good idea. **Action 28.** I suggest we change the monitoring regime. However I think we need to watch the vegetation in the meantime and if necessary make sampling if something happens to the plants.

Geissen Would monthly sampling make more sense or just at the end of the exclusion period?

Baudena From the modelling point of view, if the conditions are not changing then there is no point in taking measurements, but if they are rapidly they should be measured more frequently.

Geissen **Action 29.** Bearing Hanspeter's presentation in mind, since we have skipped one of the roof experiments, we will have a spare TDR set to install deeper in the soil. What about the drought plot size and how many plants are being covered? Which roof design will we use?

Ruiter I have only seen one roof, the one we saw here. We discussed its advantages and disadvantages. The temperature effect is probably not a big deal.

Bautista The discussion was more about trying to keep the conditions similar between the control and the roofed plot. If we are intending to do this without altering the microclimates, we will have to have something like our design.

Themistocleous The whole point of having a roof is to have a major reduction in the precipitation.

Geissen We can change the height of the roof and make it bigger.

Quaranta Should we allow the animals under the roof so that the grazing regime is constant?

Bautista I suggest we avoid animals for this system.

Geissen I think the roof should be higher and larger with the same smaller plot in the middle

Bautista There are things that are less and more important. It is most important to reduce the rainfall. It is not so important to reduce it completely.

Ritsema If we are looking at a single species, would it be better to cover more than one individual?

Bautista By doing this we are just increasing noise in the system.

Geissen Do we have time to monitor this year the differences in microclimate under the different roofs?

Ruiter I thought that there may be disadvantages of having a control roof, but maybe they are not that large.

Baudena The size of the roof is determined by the size of the patch.

Geissen What is wrong with Gianni's idea of a mobile roof? *(general agreement that it was impossible in the non-Italian sites without a trained cow)*.
We have reduced the number of roofs and sampling dates. The height and size of the roof is variable.

Bautista The size and height of the roof is a trade off according to the local situation.

Keizer I suggest that the study site leader proposes the height and size of the roof (**Action 30**).

Bautista The important decision is about whether the control plot also has a roof or not, rather than it is of a standard size. The size of the roof depends on the size of the target plant.

Geissen **Action 31. Conclusion of discussions**. There will be

- Two roofs for rainfall exclusion like Susana's model (for 3 and for 6 months extended drought). The height and size depends on the vegetation type.
- the control plot also covered but through which rain can fall, like Susana's
- natural, uncontrolled plot.

Measurements should be made at the end of the exclusion period, but the plant should be watched to see if there are any changes in its condition between monitoring.
N mineralisation should be added to the first sampling with a view to deciding if it should be continued in the next sampling.

Action 32. All study sites should send their design for their rainfall exclusion plots to Alterra.

Ruiter **Action 33.** Jaap will contact the site leaders to see if they have any problems with making the microbiological measurements. He will also provide the methodology.

Bautista For those sites with single plants, I suggest that the plant and its surrounding bare patch are covered by the roof.

WP5

Vallejo *Presentation on the sampling scheme and timetable for WP 5*

Vallejo It is important that all sampling in the treatments start at the same time. Sampling will be once per site, perhaps in Portugal once per year. Sampling should be made at the end of the summer.

Bautista I'm not sure about sampling at the end of summer, I'm worried about the potential effect of the summer on the treatment.

Keizer At the end of the summer we are also setting up the rainfall exclusion experiments.

Vallejo What about moving it to the winter when the system is more stable, or to late autumn?

Action 34. WP5 sampling to be started in late autumn.

Action 35. Partners are asked to confirm the shadowed and empty cell system in the site, driver, reference, degraded, restored table.

Schneider It would be useful to also have a list of species that are not present in the late autumn but are present at other time of year.

Geissen Do the modellers think that the design we are proposing is OK.

Baudena WP 3 is an experiment in itself. If you want to also provide parameters that could be used to feed our model, I think that a single plant in a plot would be useful. What depth are you measuring soil moisture?

Vallejo In Crete we have a dominant species that changes during the year.

Geissen So we meet virtually in the second week of May. **Action 36.** The modellers to write a simple description of the integration of the modelling with the experimental work for us to also consider in May.

Rietkerk The modellers will also be in direct touch with the study site leaders.

Schneider If we require some parameters that we don't see in the data now, we will ask for them (**action 37**).

Planning and reporting

Elsen *Presentation*

Fleskens When you fill the system with the project data, is it flexible enough to reflect any slight changes in who worked on what WP?

Elsen Not really, because the man-months are also reflected in the budget.

Annex 1 Action List

First 4 actions were retained from earlier actions lists

No	Action	WP	Who	When	Remarks
1	Start monitoring	3	SS	1 April 2013	Started in Portugal, Spain, Italy, Crete?
2	Take samples for microbiological analysis	3	SS	1 Sept	2 measurements to be taken everywhere
3	Provide chart to help estimate stone cover	3	Violette Geissen	10 April	
4	List of which parameters should be included in database maintained by JRC	All	WPs	30 Sept 2013	List soil data available
5	Clarify what data is needed for the modelling from which WP	3,6,8	WP3,6,8	1 May	
6	Quantify grazing pressure levels for degradation states in SS with grazing	2	WP2, Grazing sites	1 May	WP2 to send request, SS to provide data
7	Complete table of drivers	2	SS	1 May	
8	Give direction and timeline about what to do in WP3 in study sites	3	Peter	1 May	
9	Specify what indicators of a sudden shift might be	3	SS/All	1 June	
10	Have a discussion about functional groups and traits and strategies of plants in their site	3,5	WP3,5 with SS	1 Sept	
11	Send standard acknowledgement and disclaimer to everyone	1	Erik	1 May	
12	Post notices on project website instead of emailing everyone	1	Alterra	continuous	Partners need to inform Alterra
13	Storyline from all study sites	2	SS with WP2	1 June	
14	Summarise what can be seen from the satellite images and ask for any missing information needed to complete the storyline	2	WP2	End April	
15	Talk to all the study site leaders to clarify what data will be available	2	WP2	10 April	
16	Use drop box for the work in progress, and website for things that are finalised	1	Alterra, All	continuous	
17	Complete data in the WP3 questionnaire	3	SS	1 May	
18	Separate methodological glossary including terms like “block” and also including all the	9	WP9 with All	1 Sep	

	abbreviations that are used				
19	Guideline for the use of the minidisc infiltrometer on website	3	Erik	10 April	Guideline made by Oscar
20	Send the infiltrometer to Gianni	3	Ioannis	ASAP	As soon as Crete has finished
21	Short description on preparation of samples for soil density measurement, including difficulties that may be encountered	3	Oscar	15 April	
22	Tell WP3 which method you use for which measurement	3	SS	1 May	Include this info in the questionnaire mentioned at action 17
23	Send the standard names for each measurement point to Peter	3	Paco	1 Aug	To be included in glossary action 18
24	Send the time line of what you have done to Peter.	3	SS	15 April	To be included in action 8
25	Sample 1. in the early spring; 2. at the peak of growing season; 3. at the end of the summer; 4. in the middle of autumn	3	SS	On-going	
26	Skype conference to discuss the results of first round of soil sampling.	3	WP3 with SS	Second week May	
27	Circulate vegetation data and soil data to Susana and to each other so we can take a look at it	3	SS	30 April	Monitoring according to schedule in action 25
28	Sample only at end drought experiment unless there is a change in vegetation in the meantime	3	SS	See schedule task 3.2	
29	Install spare TDR deeper in the soil.	3	SS	1 Aug	3 depths at 3 plots, depth depending on depth root zone; keep 5 cm between depths (e.g. if root zone is 20 cm, install at 5 cm, 10 cm and 20 cm)
30	Propose the height and size of the roof	3	SS	15 May	See also action 32
31	There will be • Two roofs for rainfall exclusion like Susana's model (3 & 6 m exclusion). The height and size	3	SS	15 Sept	

	depends on the vegetation type. • the control plot also covered but through which rain can fall, like Susana's • natural, uncontrolled plot.				
32	Send design for rainfall exclusion plots to Alterra	3	SS	1 June	
33	Contact the site leaders to see if they have any problems with making the microbiological measurement & provide the methodology.	3	Jaap	1 May	
34	WP5 sampling to start	5	SS	Late autumn 2013	
35	Confirm the shadowed and empty cell system in the site, driver, reference, degraded, restored table	2,3	SS	1 May	
36	Simple description of the integration of the modelling with the experimental work	3,6,8	WP3,6,8	Before skype meeting May	Max to take the lead & write a 1-2 A4 draft by end of April
37	Ask study site leaders for parameters needed for modelling	3,6,8	WP6	continuous	
38	Start of WP3 monitoring	3	SS	1 April	