

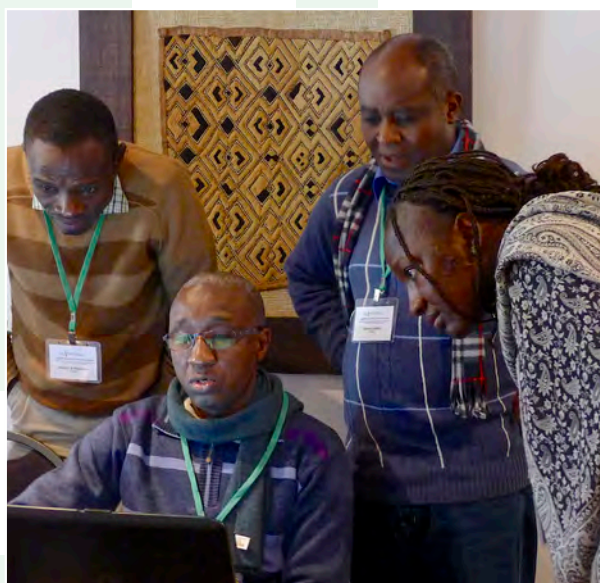


The Agricultural
Model Intercomparison
and Improvement Project

SUB-SAHARAN AFRICA MID-TERM WORKSHOP REPORT

REGIONAL INTEGRATED
ASSESSMENTS

JULY 15-19, 2013
PRETORIA, SOUTH AFRICA





**Report of the AgMIP SSA Mid-term workshop on
integrated regional assessments,**

**Held on 15-19th July 2013,
Pretoria, South Africa**

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Day One

Introduction

Climate change continues to be a key challenge to food production and possess serious threats to food security. AgMIP has continued with integrated regional assessments in sub-Saharan Africa through its four regional research teams and a coordination team. As part of the series of AgMIP's planned three workshops, this report provides highlights and key discussions of the 2nd workshop for SSA-wide AgMIP teams. It was attended by 70 participants including 10 members of the AgMIP leadership team, 4 resource persons representing the Regional Research Teams (RRTs), 6 members from SSA coordination team (CRT), 6 members from CLIP and 14 from SAAMIIP (both from southern Africa), 13 from East Africa AgMIP RRT and 12 from CIWARA (West Africa). In addition, there were 6 stakeholders. The first workshop (Kick-off) had been held in Accra, Ghana in September 2012.

Opening ceremony

Dr. Yacob Beleste, the Host Regional Research Team PI started off the meeting and Jim Jones, who welcomed everybody to the mid-term SSA workshop, led participants in short individual introductions and then introduced agenda for the workshop and for the day. Workshop goals were to:

1. Demonstrate the accurate completion of the mid-term workshop checklist
2. Work together on multidisciplinary analysis of simulation results
3. Ensure that each team has clear work plan to achieve full project goals
4. Work on post-fast-track integrated assessments, analyses, and discuss targeted publications
5. Develop plan for dissemination of AgMIP results to inform stakeholder actions

Detailed workshop program is in appendix 1.

Opening speech by Agriculture Research Council -CEO Dr. Shadrack

Dr. Shadrack welcomed participants to the Republic of South Africa and challenged the participants on the need to ensure sustainable food security for the growing current and future populations. He emphasized that the right data and tools are needed to come up with solutions required to meet the production needs and that AgMIP is well suited to help with this. He mentioned that as a research council (i.e., ARC), they want to be part of this process towards understanding implications of climate change. He wished the team productive discussions and success to generate the kind of information required in order to have productive ecosystems. He finished by asking AgMIP to take advantage of ARC's collaborations in forging ahead and for success of this project, and that they are grateful for AgMIP's choice of South Africa as venue for the meeting and looking forward to participating in this project through future collaborations.



Cynthia Rosenzweig presenting “the state of AgMIP”.

Cynthia Rosenzweig then talked about “the state of AgMIP”. The Handbook of Climate Change and Agroecosystems: Global and Regional Aspects and Implications was introduced and plans for a second book were given. Regional PIs were invited to present their draft chapters in Tampa Florida, early November 2013. Cynthia Rosenzweig’s presentation focused on the global modeling work. AgMIP has wonderful links with other initiatives such as CCAFS. AgMIP has already developed methods for integrated regional assessments (IRA). Key results with RCP 8.5 and 20 GCMs for temperature and precipitation were shown. There is quite some uncertainty with regard to precipitation. Lessons learned in AgMIP were shown.

Current results from AgMIPs’ global modeling work indicates that median of crop ensembles reproduces observed yields well. It was noted that to have rigorous results, best practices in model calibrations are essential. Key sources of uncertainty were presented and AgMIP is working hard towards this. Another important although preliminary result shown was that 9 models show that agricultural prices are projected to go up. Participants were invited to join any of the groups involved with crop model improvements.

Discussions following the highlights of global modeling raised a question of data quality. Farm survey data is not part of what is considered platinum, gold or silver, but is nevertheless important for AgMIP’s integrated regional assessment (IRA) work. Another aspects was that AgMIP global modelling is currently leaving out farming systems level component by looking at individual crops, and noting that we should be concerned about other components of food security including nutritional food security i.e., rather than the traditional crop by crop/ component modeling.

Progress reports of Regional Research Teams and Coordinating Research Team

Each of the RRTs and CRT made presentations of their progress with the fast track. AgMIP eastern Africa had observed that wetter areas show yield increase while projections for dry areas show decrease in

most cases, as expected. The need to get crop, climate and economic modelers to understand results of each other was noted, i.e., intra-discipline understanding since crop modelers showed difficulty understanding results from economists. Other observations include:

- Climate scenarios are the key drivers of the modeling so this needs to be presented in more details (i.e., include also summary statistics), to help in interpreting the results. Further reasons, say for example, why the results from RCP 4.5 and RCP 8 are different should be provided. Is this the strong effect of CO₂ in one case as opposed to the other?
- Clearly differentiating stakeholders for communication/dissemination and for RAP development (these are 2 parts of the stakeholder process) is important.
- In AgMIP, large groups framed the RAPS while small groups targeted/nailed them. It is cutting edge scenario development.
- In bringing stakeholders, we are asking them to help us, not the other way. This is an effective way to draw stakeholders early on in the project. They can then take ownership of the results and help to disseminate.
- How do we document and archive our RAPs?
- For ECOWAS region, need to include Nigeria, as the bread-basket, in future work to ensure wide dissemination in the region.
- How do we groom young scientists? We need to see what to do to have a critical mass of scientist doing modeling. There is interest to see new blood in the system for sustainability of modeling work. The BMGF are interested to see more young professionals as more people get engaged in the assessments. A photo of young scientists (40 years and under) is below.
- Good agronomic management could be better than fertilizers. We need to see how the model can focus on agronomic management within current climate (planting density, manure together with fertilizers). Climate change is not in some cases the most important driver so would be interesting to see presentation of climate scenarios. This is mainly a matter of presentation of results since some of these are already being modeled.
- Economic results should be easy to understand for everybody so need to condense and aggregate that data into ways that are understandable. More creativity is needed here. It was however clarified that some of those economic graphs as presented are diagnostic tools for researchers and are not meant for stakeholders.
- There is need to include who the winners are when we show cases of winners and losers.
- Data are showing that sensitivity to CO₂ and temperature is the same whether yields are high or low. But also, High CO₂ has a direct impact on transpiration and in DSSAT, there is a significant effect on yield. High CO₂ shows a much higher effect in DSSAT than in ApSIM.
- AgMIP is building capacity for assessments of all kinds including agronomic management. This week, we look at what set of experiments we are going to focus on, going beyond the fast track.

A stakeholder raised the following concern “at different crop stages, we get dry spells. How do we build these into the crop models?”

Ken Boote: crop models are already taking care of this since they are dynamic. The challenge is how well the models are doing this. John Antle: interesting question would be “How are the in-season variations being reflected in the modeling?”



Young Scientists (under 40) at the SSA Mid-Term Workshop.

Afternoon breakout

Interdisciplinary team breakouts for Monday afternoon were organized to:

1. Present the mid-term checklist in details.
2. Determine methodological challenges about data and modeling.
3. Share experiences and lessons.
4. Prioritize work while being realistic and to support each other to become collectively stronger.

Stakeholders' deliberations with SSA AgMIP coordination and leadership

The coordination team together with some of the AgMIP leadership held discussions with 6 stakeholders derived from Malawi, Mozambique, South Africa, Kenya, Zimbabwe and Botswana. Brief biographies of these stakeholders are in Appendix 3. The purpose of this session was to give an opportunity to stakeholders to give AgMIP some feedback on the work of the RRT as presented in morning session, and to find out what are the concerns/expectations of the different stakeholders. Although stakeholder linkage had not received much attention earlier on, teams need to link with stakeholders much more and as part of future project proposal. The objectives or key questions of the session were:

1. What you are thinking on what AgMIP is doing and how would AgMIP help in your country?
2. Provide an inventory of key projects in your country on climate change that you think AgMIP should link/collaborate with.
3. What are your concerns for AgMIP to solve with regard to food security issue in your country and the needs of policy makers?

4. What are your suggestions of best ways for AgMIP to disseminate research outputs in your country?
5. What questions do you have for AgMIP?

Stakeholder perspectives from Zimbabwe

The stakeholder is involved in monitoring of agricultural production and mobilization of farmers towards yield goals and food security, in promoting climate-smart agriculture and at the national level, one of 8 persons responsible for climate aspects, disseminating agricultural-extension messages, informing about year by year production, working on dissemination strategies for technological interventions (including mass media and other ICT methods). Initial involvement in AgMIP in Zimbabwe was in developing scenarios but need more involvements in terms of national climate action plans (interface between government and AgMIP).

AgMIP will help answer a lot of questions. What do we do to address climate change issues and meet food security for the many households who depend on agriculture for livelihood? AgMIP modeling will come up with solutions for food security and adaptation by offering best managements. For example, farmers need to make choice of how to target fertilizers, at planting or at top dressing given the little resources available. In packaging technologies, it is needed to know who the players are, what infrastructure are available, accessibility of radio, extent of network coverage among others. Packages can be written for farmer groups that are literate but those not so literate ones may need on-farm demonstrations. Thus, (1) farmers will learn, (2) AgMIP will provided needed guidance on how to do better farming, and (3) AgMIP will advice on most profitable solutions including combinations of management for climate versatility.

Agro-ecological zonations in Zimbabwe were prepared in 1960 and are now being revised involving work between climatologists and agro-meteorologists and looking at scenarios for different regions. National climate change action plan is in the making. AgMIP can assist with information to come up with concrete plans. Also, drought-monitoring center (regional center based in Harare for SADEC zone) is modeling seasonal predictions and providing advice for farmers. Here, synergy with AgMIPs research is needed.

Other areas of concern and where stakeholders and AgMIP scientists can work together include supporting the inadequate socio-economic data, building local capacity to do AgMIP-type of modeling at the national level, engaging many stakeholders so we improve quality of our economic models, exploit the fact that, due to high incidences of crop failure, farmers are keen to listen to and try out tangible solutions and AgMIP can to fill in this information requirements. Final question is 'How do we build in the local knowledge systems? '

Stakeholder perspectives from Kenya

The stakeholder is responsible for climate change and adaptation and participated in preparation of National Climate Change Action Plan, which was launched this year. A national adaptation plan is in the making. Ideas have been endorsed by Cabinet and are captured in Vision 2030. Clean and healthy environment is a key goal in Kenya. For the first time, Kenya's 5-year action plan is having climate

change adaptation and mitigation issues integrated. Once mainstreamed in national planning, it will influence budgeting.

Stakeholder's work also includes knowledge management and capacity building. Although doing well, the country is not there yet. Stakeholder participated in AgMIP eastern Africa teams scenario setting in Kenya (the RAP process) where the team was asked to go beyond maize and include beans, commonly used and also since farmers are concerned about nutrition and food security in event of drought affecting maize. Thus, now Eastern Africa AgMIP team is now taking up beans in the modeling. There is need to consider policy instruments and interventions that are in place currently when moving on with AgMIP project. A key concern is the need to see movement from piloting to implementation to ensure that what we are doing is touching the ground somewhere and have a feel of what is happening in a feedback mechanism. Stakeholder does not want AgMIP to become an academic exercise as many other projects are.

Stakeholder was a member of MET's "Communication, outreach and public information". Media is a big opportunity for public awareness and sensitization.

It was noted that socio-economic outputs can help in specific policies and stakeholders were asked to be very specific so that their need can be included in the TOA models. Since some country teams are behind in the IRA, the need to learn from successes of other teams was noted.

All stakeholders were requested to provide the RCT with information at the national level including copies of the climate change action and adaptation plans, regional level projects and initiatives etc.

Stakeholder perspectives from Botswana

Botswana stakeholder is part of national climate change committee that is guiding government on climate change issues and advising ministry of agriculture on adaptation to climate change. He had not been involved in AgMIP previously. Challenges for AgMIP in Botswana: how will production systems respond to climate change? This information is not readily available. AgMIP is not strong in Botswana with only one person participating (need to involve more persons) and not addressing livestock sector which is very important. There is need and opportunity for capacity building in AgMIP type of integrated regional assessments (i.e., plan to train modelers). Also, lessons from Zimbabwe on aspects such as livestock can be transferred to Botswana. Moving forward, there is need to create more awareness of the AgMIP project to increase its visibility. Botswana is promoting specialized farming (i.e., zoning regions for specific commodities), and AgMIP can help us on suitability of areas for specific crops. Policy makers in Botswana would want to know, for the different productions systems (communal, rangelands), who will be winners or losers in order to target adaptation interventions. In terms of outreach, the stakeholder could facilitate a meeting for presentation of AgMIP project approach and results to the research team in Botswana. Botswana is also ready to collect data needed for AgMIP type of modeling in Botswana (so they need to know what is needed) and these data can be used to build capacity in future. Botswana will follow AgMIP scientists to help with crop-livestock interactions. AgMIP was invited to use Botswana to test the models.

Stakeholder perspectives from Mozambique

Drought and limited investment in dry land agricultural research are key challenges facing Mozambican policy makers while planning interventions to support farmers, mainly small-scale farmers. They need advice and information on simple/cheap technologies that can be accepted, are profitable and adoptable (farmers are resource constrained). Advice on varieties is also sought. The stakeholder has had previous interactions with AgMIP through a project on innovation platforms together with ICRISAT. AgMIP type of research is not as such in progress and also Mozambique has a weak research group. There is no crop insurance system in place.

Stakeholder perspectives from Malawi

The Malawi stakeholder first got information about AgMIP through a crop residue use project he coordinated that included some AgMIP scientists. Malawi has a National Adaptation Program of Action (NAPA) developed in 2006 in response to global concerns (in Ministry of energy and mining) and addresses issues of climate change and adaptation measures in 8 sectors. There are also several projects by NGOs and government ministries on climate change aspects. These include a recently initiated NORAD project to build capacity for managing climate change in Malawi, a DFID project of NAMA dealing with land-use and modeling, a World Bank's big initiative on land use assessment and options targeting vulnerable areas among others. Several other NGOs have projects on climate resilient activities, e.g. conservation agriculture but these are often one-sided (not integrative). These NGOs talk integration but implementation is disintegrated due to their competition. But AgMIP has good integration between the different disciplines and sectors.

Integration of science with development: AgMIP and the other projects dealing with climate change are not seen as talking to each other and this is needed. AgMIP has the advantage that it is research-oriented and the other projects are development-oriented, so AgMIP should inform the development projects of the NGOs in terms of the best technologies for promotion, and to ensure AgMIP is not an academic exercise. There are ongoing thought to establish a committee on technology generation and dissemination. There are many scattered projects yet dissemination is not much in Malawi as in many countries in the region.

AGMIP publicity is low in many countries, i.e., AgMIP is little known. The website is one channel but only technocrats can make use of this. There is need for development of simple briefs that translate the research outputs and that can be handed out. There are opportunities for communication/ dissemination of results using local fora and also "farmer voice radio" (in Malawi) that promotes technologies and, in Malawi, farmers like it.

Stakeholder perspectives from South Africa

The stakeholder is new to AgMIP and joined department of climate change recently. South Africa has gazetted [Climate Change Sector Plan](#) for public comments and inputs. The key challenges as presented in this plan include creating awareness on climate change, improving knowledge on climate change, increasing capacity to respond to climate change impact, research and funding of research projects. A "Climate Change Adaptation and Mitigation Plan" has been developed and now distributed to the public for comments, and before moving for approval by the minister. Also, REDD+ preliminary plan has been

developed and is being continuously updated and aligned to reflect the UNFCC REDD+ negotiations. Several projects on climate change issues have been commissioned e.g., crop suitability over SA for future climates with ARC. Key concerns are that Northwest province of South Africa was declared disaster prone and AgMIP can advise on appropriate management; need to ensure food security for the increasing population and, need for solutions for adaptation strategies for climate change. Suggested communication of AgMIP research results is through awareness workshops that include extensions and farmers.



Stakeholders answering questions in plenary.

General discussion on AGMIP stakeholder engagement (Plenary)

AgMIP should do research for impact working closely with stakeholders. Translation of information that is scientific to policy format is challenging and AgMIP would like to work with the stakeholders on this. It was unanimous that we need to communicate in a way that is attractive to the audience, not to justify our approach and model fitness, but simple understandable way. All research should have outreach component and, “farmers learn better from their fellow farmers”. Channels for dissemination of results are there and AgMIP just needs to explore them and learn how to talk to the community. Stakeholders will provide documents from their countries that are related to climate change action and adaptation plans and food security so that AgMIP scientist can understand what is in the national action plans. This way AgMIP can contribute to the country issues of food security.

Stakeholders should be treated as important persons, who know their country policy situations well, so that they give the information sought. AgMIP should let stakeholders know that without them, there is a missing link and there is no other way to get the information. AgMIP products must be tailored to fit the different categories.

Stakeholders without much previous contact with AgMIP learned of the great potential in AgMIP. AgMIP technologies need to be categorized to implementation capacity since different countries are at different capacity levels.

AgMIP scientists enquired on the type of stakeholders consulted when coming up with the nation climate change action plan as already done for Kenya. This was explained to include stakeholders at all levels; representatives of ministries, other government institutions, NGOs +CSOs (WWF, Kenya climate change working group which is over 300 NGOs), academia, common men and women through country stakeholder forums. We have ownership at all levels. On timing for policy reviews for adaptation, it was noted that this depends on the product in question. Some products will find ready application but others may require policy intervention. In Mozambique, as in many countries also, management recommendations are designed based on the seasonal forecasts.

Another concern was about the scope of our stakeholders and when farmers should be integrated. Farmers are our stakeholders and we have to be concerned about them. But AgMIP as a research project cannot reach so many farmers so we reach the organized stakeholders and groups that can reach out more farmers. But farmers are needed to inform on what AgMIP is doing and incorporate the farmer's perspectives (i.e., take into account farm community concerns to feed into the models).

Climate breakout

This was chaired by Alex Ruane and discussed problems with climate data analysis. The discussion was basically on the problems climate group is encountering when dealing with their data as well as highlights of new scripts that runs with R, yet to be provided.

The following were discussed:

- Best way of displaying/presenting climate data as may be required by stakeholders
- Climate modeler's use of climate scenarios: One model cannot present well the future scenarios. At least five cases need to be considered for a better decision. In addition to the mean/average from scenarios, new scripts will include standard deviations and number of rainy days and will be released soon
- Improvement of the script that runs the climate scenario analysis
- Dealing with data quality control and missing data, where at least 20 years of data is considered reasonable for use other than <15yrs.

Crop modeling breakout

- For which production systems can a full economic analysis be done? (System includes full complement of crops for a location). Economists want major crops that would represent a household's income.
- If not doing livestock modeling, still need to represent livestock in the economic income. Used literature approach in recent paper (used those estimates for the livestock component).

- During group workshops (boot-camps) could have virtual workshop with leadership components on call.

These breakouts continued also during day two so additional highlights are presented under day 2 and subsequent ones.

DAY TWO

Jim Jones introduced the agenda for Day 2 that was:

- RRT interactions with stakeholders
- CRT facilitates stakeholder interactions and learning among groups
- Leaders review and evaluate progress of each team

The need for team integration was emphasized to ensure that crop modelers and climate persons understand interpretations and understanding of the economic results. Interpretation of results will be key across all teams. Each RRT had their breakout meeting with stakeholders from their regions and discussed further work and existing opportunities.

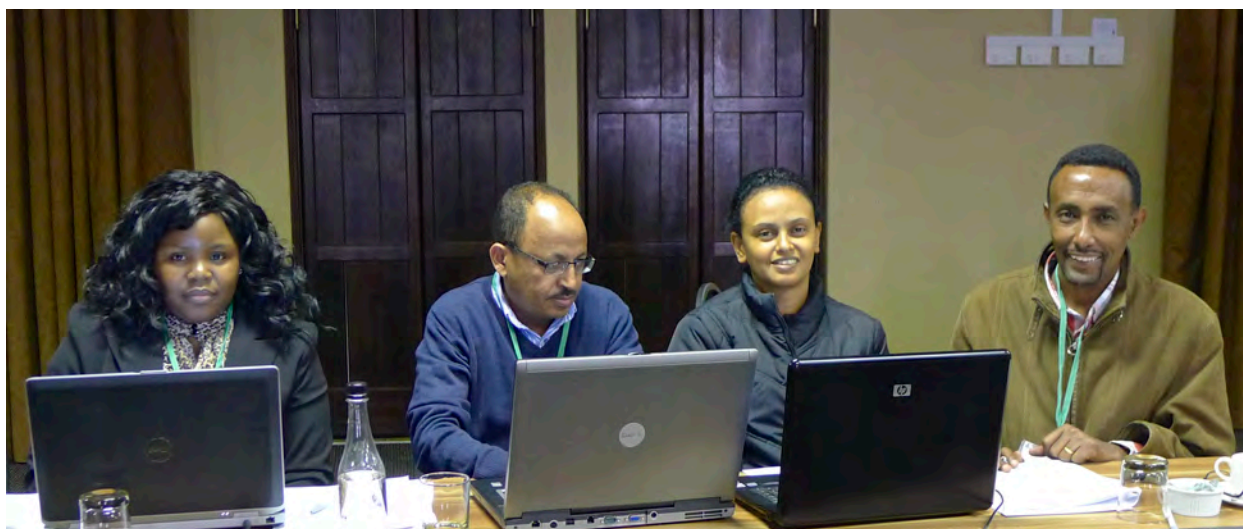
CLIP meeting with stakeholders

The team went in-depth on the issues discussed the previous day at the stakeholder engagement with CRT, including specifics of NGOs', existing projects etc. In Malawi, areas for dry land grazing are being converted into cropland and there is need for models on crop-livestock integration with the aim for intensification. This is a way to avoid conflicts between livestock and crops. i.e., need intensified systems. Civil society Agricultural network (CISANET), NASFAM, FUM, etc. are working in Malawi and need to be analyzed to understand their bias areas. CISANET is the key forum that AgMIP can use to disseminate the research results in Malawi. Key technologies being advocated do not include livestock, yet these should be integrated, thus CLIP project can help with advice on how to do this. Revision of National environment action plan was done. Existing collaboration framework between IFRI and ministry of Agriculture can be used by AgMIP to disseminate research results, taking advantage of forums organized periodically. National meetings held annually in Zimbabwe are also forums for dissemination AgMIP results.

Names of organizations and platforms where climate change and adaptation can be discussed were prepared for each country. The team also evaluated, for each target country, who will do what.

SAAMIIP meeting with stakeholders

SAAMIIP circulated a document to know what each person can achieve in the remaining project period. Looking where the team is and what it can do, looking at each country's regions and sites and listing their data availability. They also discussed with stakeholders how it can influence policy through this project.



SAAMIIP team and stakeholder (far left).

EA meeting with stakeholders

The chair gave an overview of the previous day and goal of the breakout as (1) looking at the interest of and views from the stakeholders present (2) going through results already obtained and relate them to local community and policy maker's needs throughout AgMIP's period and beyond, (3) review of RAPs and (4) recap of yesterday's disciplinary group discussions (Economics, Climate and Crop Modellers).

This team mentioned the need to look at in-season variability.

If farmers maintain the same technology, there are only marginal changes. Let's see the RAPs, how you developed them and how they could be developed in other countries. We need to know what are the alternative agricultural pathways and what adaptation strategy and how do we translate this into our models. How many RAPs in Kenya, and what assumptions, planting windows, fertilizers and amounts being used? How much are these influenced by the RAPs? Team members in different countries are not at the same level and need to learn from Kenyan group that already went through the RAP development process.

Uganda identified key stakeholders to invite for the RAPS but is waiting for facilitation from PI in order to do that. RAPS in Tanzania will be in August and a follow-up dissemination meeting (netting wider to stakeholders) could be in September. Ethiopia prepared preliminary RAPs and now preparing to hold a stakeholder session for RAPs in August. In Kenya, team will convene national stakeholder session (policy makers) before even sharing results widely with other people. Participants will include those from the regions in the country, targeting agriculture.

CIWARA was not represented (i.e., no stakeholder from West Africa).

Crop modeling session

(Tuesday afternoon, i.e, program changed to thematic breakouts)

Data presentation and interpretation was discussed, stepping through the slides of each individual RRT. The need for a standardized template or example of each of the figures needed by the teams was raised and the RCT could coordinate this. Ken Boote and Alex Ruane would be preparing example slides based on the best graphs from the team presentations of day 1. One key challenge is how to take care of inter-annual variability and farmer to farmer yield variability in reporting. Three key presentation ideas include:

1. Standardized reporting: model calibrations to be reported with observed (the independent) on x-axis while simulated (dependent) are on y-axis. Both axes should have same extent for comparisons. Show always RMSE. Include a 1:1 line in the plots.
2. Survey data: Show probability of exceedence graphs for survey data as these are good. Need consistency in colors for a given model throughout. Include some documentation of the survey for example and be openly transparent on the causes of the deviations in yields for survey data.
3. Baseline and scenario simulations: Use boxplots and whiskers for simulated scenarios (see last slide of CIWARA day 1 presentation) including baseline and future climate for each model. Also, for several different scenarios, yield gains/losses can be shown as a ratio using % increase or decrease in yields. See example from AgMIP-EA.

Besides, rainfall from EA group was presented as boxplots and was applauded as example for all teams. On some aspects, such as livestock results of CLIP, specific teams will decide on presentation of the results. Other general issues include the need to show standard errors when reporting averaged yields. For observed vs. predicted plots, show many points, not just 2 or 3 points on a graph.

Climate team breakout

Alex Ruane discussed with the group on best way of providing guidance to modelers on scenarios selections and best way of presenting climate results to stakeholders. He introduced and shared with the group, scripts and papers that can help the group in presenting and interpreting results. The scripts were made in the way that users can modify them simply.

DAY THREE

Day 3 started by a presentation by Jon Antle on economics focusing on impact and adaptation analysis. This demonstrated theory behind analysis of impact without adaptation as well as adoption of an adapted technology, and asking how this new technology will work in the future climate. TOA-MD is designed to do this type of experiments, looking at technology adoption/adaptation and the resulting impacts. Of the two types of variability, (i.e., temporal and spatial), spatial variability was described. As expected, there are heterogeneous populations in a landscape and we need to stratify these populations by looking at their distributions. Climate change assessment without adaptation is assessed as value of current climate and technology minus value of future climate and same technology. From the distribution of the resulting ω , one gets the losers and gainers for this technology under the future

climate by analyzing the area under the curve. For recap on these and testing technology adaptation (future technology), estimation of ω and the variance of the distributions.

Economists don't want bias-adjusted yields; rather they want to see raw data. For example, if crop modelers bias adjust s_1 differently from s_2 , this violates assumption of the economic model.

Breakouts: RRTs continue with meeting as yesterday afternoon.

Field Trip to Brit area and Hartbeespoort dam

Afternoon field trip was fantastic. Thirty-five participants joined in this trip that included a visit to one large-scale farmer where farming is highly optimized in terms of irrigation and nutrient applications. Irrigation is done when the automatic moisture meters indicate the need for this. The farm has up to 40 moisture meters installed. Maize yield is 15 t/ha in this semi-arid environment compared to ~1.7 t/ha average for sub-Sahara Africa. The visitors had an experience seeing the packaging and branding of sweet potatoes direct for supermarkets. A second farmer, 20 km further, is growing beetroots and cabbages using both flood and drip irrigation systems. This is at relatively smaller scale than the first farmer and the produce is usually bought by large-scale farmers who have better market access. Nutrient deficiency was visible including very non-uniform crop stands. The trip ended with a visit to the Hartbeespoort dam supplying water to the irrigation farms.



Workshop participants at small scale Brit area farm.

DAY FOUR

Jim Jones and Cynthia Rosenzweig introduced goals for the day jointly. The teams spent the morning sessions discussing project issues, reviewing progress, prioritizing activities and developing their work-plans for the remaining project period. Part of the prioritization includes selection of key sites that will be taken through the full set of the simulation exercise. To build on what individual teams are planning, and to provide guidance on an appropriate approach, a separate meeting of the AgMIP leadership, RRT Pls and ARPs was convened at noon to discuss the final “home stretch” in the current phase of the AgMIP project and presented to all participants in the afternoon plenary. Here, the key and Core Questions for Integrated Regional Assessment that RRTs need to address in the simulations were introduced as follows:

- 1) What is the sensitivity of current agricultural production systems to climate change? For these, current production system is simulated under current climate (1980-2009, simulation 1) and under future (mid-century) climate (2040-2069, simulation 2). Here, adaptation is not considered. The two simulations will be compared through a TOA economic simulation without RAPS.
- 2) What is the impact of climate change on future agricultural production systems? This is looking into the future. The key issues that we want to address are closely related to Global RAPs and SSPs, and regional RAPS need to incorporate these global productivity trends. The regional analyses should be consistent with the global pathways. The two simulation sets here are “future without climate change” and “future with climate change”. Here, the economic analysis requires the crop/ livestock simulations 1 and 2 as in question 1 but in this case with RAPs.
- 3) What are the benefits of climate change adaptations? This is a key question that stakeholders are asking. They want to know the adaptation options and measures and their economic benefits or value. Here, we look at future climate without adaptation (current production system with trend) and with adaptation (climate-adapted production system with trend). The economic analysis here is TOA with RAP for the no adaptation case and TOA with RAP+adaptation for the second case.

These questions basically help RRTs to move from the fast track to the ‘home stretch’. Previously and as part of the fast track, teams had been collecting data, cleaning those, developing tool for IT and climate and data conversion aids. Teams are then ready to deploy these tools to answering the core questions. The specific climate scenarios required for the core question simulations were explained (RCP 8.5, mid-century, 5 GCMs, Delta scenario, and all farms) but noting also that to assess the broader uncertainty of climate change projections, the 20 GCMs will then be used. It was appreciated that the selected 5 GCMs may not represent the most extreme GCMs for all regions to capture the variability in these but are nevertheless good to allow cross-region comparisons of GCM behaviors. Also, components of the adaptation package in the crop/livestock model were discussed as well as how many of these models are required. From the economics side, a key methodological question is how RAPS will incorporate global and regional drivers, and teams will figure out themselves how to capture this. An IT issues is about organization and execution of large number of simulations. The core questions and frequently

asked questions discussed are available here (see Appendix 4 for FAQs). The scenarios described here and the GCMs are only the core and therefore not restrictive thus RRTs are free to do more than this minimum.

John Antle and Alex Ruane will provide details and algorithms for generating the future projections for the economics part.

See appendix 5 for protocols for naming conventions for data posted to the ftp site.

KEMIC plan is to finalize calibration of SC 627 using data for Nkhata Bay, and use sentinel approach to model climate and soil combinations of Malawi that will be compared with the gridded approach that the team already planned to conduct. In the sentinel site approach, each zone will have a representative climate station and representative soil types (soil being from different sources such as ISRIC-WISE, AfSIS e.t.c), representative management (but could also run different sets of management based observed distributions e.g. on planting dates and fertilization). The two approaches needs to go in tandem otherwise just following on the sentinel site if the gridded approach will not suffice is no good. Following KEMIC's experience, the team recommends that AgMIP explore the need for capacity development for SSA in gridded approaches to scaling up of modeling results. This is best as long-term program where capacity is developed based on university training for PhD.

SAAMIIP breakout

Team discussed using district-level yields as matched case (or quasi-matched case). It also discussed RAPs, noting the need to "be creative." Crop modeling team and economic team need to agree on RAPs and explicit implications for crop modeling for adaptation/future technology.

DAY FIVE

Teams were dismissed to the regional team breakout sessions. IT also had a session.

East Africa presentation at plenary

Team showed disagreement in DSSAT and APSIM models and then presented what they can achieve by February 2014. Each country came up with targets. Achievement will include completion of quality control checks, preparation of a comprehensive report with visualizations, selection of GCMs that represent the range of conditions. A set of 6 simulations that will be conducted were provided.

IT team within this RRT will finalize scripts and programs to set up runs, analyze data and develop visualizations, finalize database and continue populating RRT website and blogs although team is poor on this. Home stretch will include all countries. With an extension, analysis will be extended to include all 20 GCMs, extend to other regions, include more raps, more crops, cover more downscaling techniques, and include more crop models.

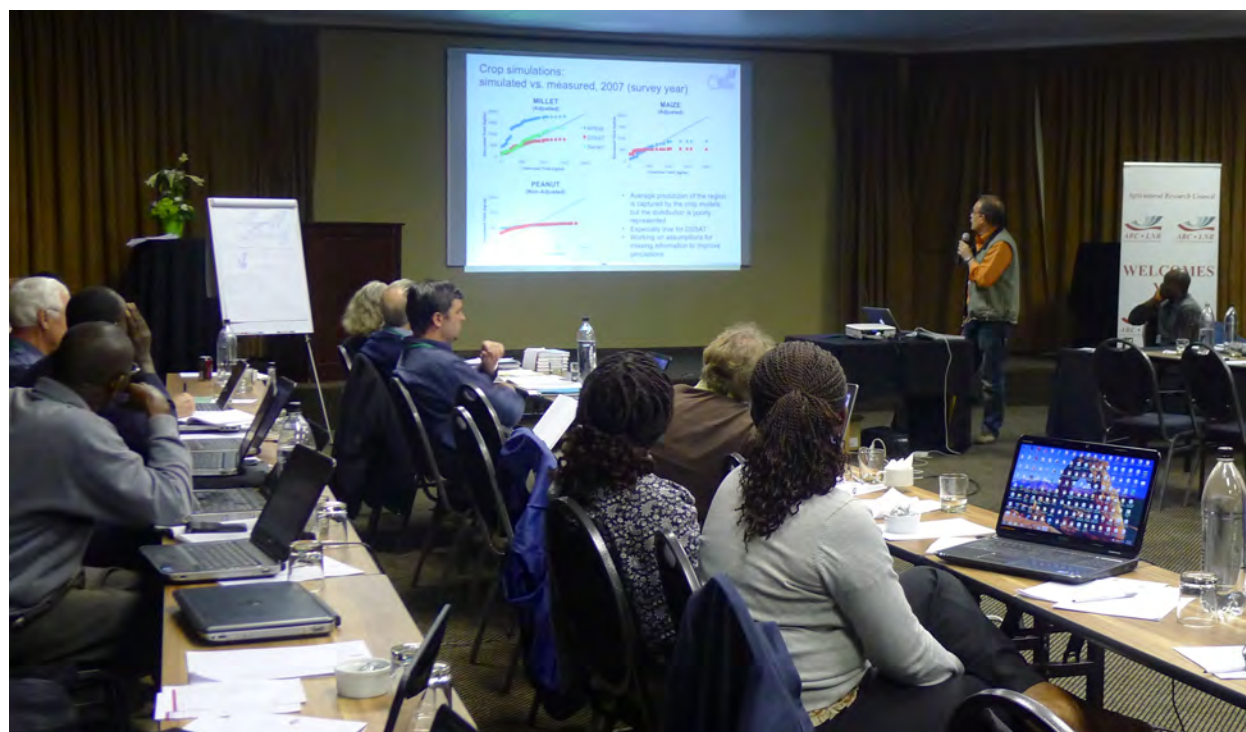
RAPS will be end in August in Ethiopia, Tanzania and Uganda. Country regional reports will be ready end of December where team will also prepare for publications.

For stakeholder engagement, these are divided into direct users and intermediaries including media. By end of August, team will have a full list of stakeholders in each country and at around December, and with some more results, hold national stakeholder engagement. At end of year, we will present a more comprehensive set of results to stakeholders in ASARECA forum.

SAAMIIP presentation at plenary

Climate data show that annual temperature will increase over the baseline while precipitation decreases or decreases depending on the GCM used. The team showed also the presentation and interpretation of results as they understand, a great improvement compared to in day 1. For the homestretch, the team will work with 2 models (DSSAT and ApSIM) and work in 5 countries. Work was shared among the country teams specifying the specific region and crops to be analyzed, whether survey data are matched or unmatched etc. The current thinking on adaptation was shown indicating that commercial farmers may have variety change, irrigation, change of crop, while small-scale farmers also may have variety change, optimization of inputs and change to high value crops. Team targets to finish model simulations latest December 2013. The team has one site per country and there is a crop modeler and an economist in each country to ensure that modeling in each country will continue in parallel.

In discussions, Alex Ruane suggested that teams share the scripts and tools that they develop, including for visualizations, so coordination team can share around.



Day five plenary presentation.

CLIP presentation at plenary

CLIP observed increases in temperature of about 2-3°C from all GCMs as compared to the baseline for the example site, consistent with SAAMIIP. Also, DSSAT overestimated stover in the calibration dataset. In the Home stretch, team will focus on Zimbabwe (complete run), Malawi (climate and crops, limited economics), Botswana and SA (crop and climate). The adaptation package that the team proposes to use was shown including use of long-duration variety, ISFM (combination of organics and inorganics), different crop mixes, decreased animal mortality e.t.c. There are already long-duration varieties in ApSIM that could be used initially. Ideas for extension of AgMIP phase were also provided including effect of temperature on livestock, testing of heat tolerant varieties as asked by stakeholders from Zimbabwe.

Model development and model use capacity is partial. CLIP has capacity for ApSIM but not for DSSAT. They suggested that conversions be made to convert genetic coefficients from one to another. ApSIM requires some coefficient not needed in DSSAT and similarly the opposite direction. Crop modeling global team needs more information on the challenges modellers in RRTs are facing. It is important to understand the differences in the different model results so that it is no longer a black box. i.e., don't forget to take time and interpret the results from the modeling that you are getting.

CIWARA presentation at plenary

CIWARA showed some results from climate, crop and economics side and also the level of completion in the different countries. They also showed what they will achieve by February 2014. The team has reduced from 10 to 5 the number of sites to cover in this phase of the project. On stakeholder engagement, the team identified key questions on this. It also presented what it would want to do in an extension phase of the project that include improvement of agricultural statistics, further develop capacity in AgMIP core skills, and intensify stakeholder engagement among others.

KEMIC presentation at plenary

There is need to define data in AgMIP into Platinum, Gold, silver e.t.c. and starting with the how this will be done. Coordination (RCT) can help to define this and the criteria. Data is very important and we need to load it to the ftp sites. RCT can help to upload data if RRTs have a problem. RCT can coordinate for the publication of data into the AgMIP databases for access to wider groups. Data should be quality controlled and provided with metadata. There will be a way very soon for scientists to publish their data. We do not however want to violate copyright issues.

Agenda for PI call next time should be data publication. We need guidelines on how the data are stored. Another question is on the public release standards so that those putting in data have understanding, i.e., data sharing policy.

Final highlights and feedback from leadership

Alex Ruane presented highlights on C3MP and invited workshop participants to register. Jon provided some guidelines on development of adaptation packages/cases. The materials will put into a short document. The approach should be technically and economically feasible. This process should be seen as an extension of raps work, therefore team work is needed. Also, it helps to have a narrative description of what motivates the adaptation. The adaptation package should consist of crop models

(variety, fertilization, water) and TOA-MD (production systems component, economics/policy components).

AgMIP leadership noted that we did not so much discuss adaptation and that what we are doing here is new and requires inter-disciplinary approach with all disciplines working together. Also the different models differ and therefore model improvement is very important. Where are improvements needed, where do they fail as opposed to what is required. As you document and interpret the results relative to your understanding and data, try to document what you are learning in this first phase. Some could be model improvement or just methodological in terms of the assumptions we make. Document any improvements done as well. We will update you on future plans including extension. In interpretation, teamwork is needed and it will be nice to document where this is done.

We are trying to put together a database and we will develop guidelines. Let us follow the current trends in agricultural data publishing. Let's work together on publishing our datasets.

Finally, Cynthia Rosenzweig took participants through the checklist of workshop goals. We have demonstrated that the fast track check is excellent. Each team developed clear and realistic work-plans for the remaining project period, which required clear thinking of what is possible. The plan for the homestretch (actual analysis across the sites) has been well done. PIs were appreciated for providing abstracts for the draft manuscripts for the second handbook on integrated regional assessments with AgMIP. A lot of progress was made with stakeholder interactions, which was really great.

Appendix 1. Workshop program

Overall workshop goals:

1. Demonstrate the accurate completion of the mid-term workshop checklist
2. Work together on multidisciplinary analysis of simulation results
3. Ensure that each team has clear work plan to achieve full project goals
4. Work on post-fast-track integrated assessments, analyses, and publications
5. Develop plan for dissemination of AgMIP results to inform stakeholder actions

Day 1 - Monday, 15 July

- Goals:**
- 1) Provide overview on “state of AgMIP” to the teams and stakeholders
 - 2) Assess overall progress of teams and disciplinary leaders to date
 - 3) Conduct facilitated discussion with Stakeholders

08:00 **Registration**

08:30 Welcome and Introductions, Workshop goals – J Jones

09:00 Official opening speech (Dr Shadrack Moephuli, CEO-ARC)

09:20 State of AgMIP – C Rosenzweig

10:00 Regional Research Team (RRT) presentations based upon Mid-term Workshop Report-in Template

SAAMIP

CLIP

10:40 **Tea/Coffee Break**

11:10 Continue Regional Project Presentations

East Africa

CIWARA

Regional Coordination Team (CRT)

12:10 Discussion

12:30 **Workshop Photo, Lunch**

- 14:00** Charge to afternoon breakouts – P Craufurd
- 14:15** Climate, Crops, Economic, and Coordination Team breakouts
- RRT members breakout by expertise
 - Present Mid-term checklist results in detail
 - Determine methodological challenges for workshop
 - CRT meets with stakeholders
- 15:30** **Working Tea/Coffee Refreshment**
- 17:00** Facilitated discussion with stakeholder inputs – C Rosenzweig
- 18:00** **Adjourn for the day**
- 18:30** **Reception**

Day 2 – Tuesday, 16 July

- Goals:**
- 1) RRT interactions with stakeholders
 - 2) CRT facilitates stakeholder interactions and learning among groups
 - 3) Leaders review and evaluate progress of each team
- 08:30** Plenary Session - Review workshop goals, day's goals – J Jones
- 08:45** Charge to RRT/CRT breakout groups – P Craufurd
- 09:00** RRTs meet with stakeholders from region to discuss progress, aims, and potential outcomes. Each team will also have a 45 minute technical session to meet with the AgMIP leaders for feedback and guidance on next steps (this technical session will not include stakeholders). CRT members disburse among RRTs to learn more about each regional project and its stakeholder objectives.
- 09:00** SAAMIP visits Leaders
- 09:45** CLIP visits Leaders
- 10:30** **Working Coffee/Tea Refreshment**
- 10:45** East Africa visits Leaders
- 11:30** CIWARA visits Leaders

- 12:15** CRT visits Leaders
- 13:00** **Lunch**
- 14:00** Plenary Session – Charge to RRT Breakouts – P Craufurd
- 14:15** RRT Breakouts – methodological challenges and multidisciplinary assessment
- 15:30** **Working Coffee/Tea Refreshment**
- 17:30** Plenary - Report Back - Review next day plans – C Rosenzweig & J Jones
- 18:00** **Adjourn for the day**

Day 3 – Wednesday, 17 July

- Goals:** Continue RRT & CRT work; Field Trip (Optional)
- 08:30** Plenary Session – Goals for Day 3 – C Rosenzweig
- 08:45** Charge to RRT Breakouts – P Craufurd
- 09:00** RRT Breakouts
- 10:30** **Working Coffee/Tea Refreshment**
- 13:00** **Lunch**
- 14:00** **Field Trip to farms near Hartbeespoort Dam (return at 18:30)**
- 18:30** **Return**

Day 4 – Thursday, 18 July

- Goals:** Continue RRT and CRT work, design work priorities for remainder of project.
- 08:30** Plenary Session – Results from Day 3, goals for Day 4 – J Jones
- 08:45** Charge to Team Breakouts – P Craufurd
- 09:00** Team Breakouts – Leaders Breakout & Float as needed
- 10:30** **Working Coffee/Tea Refreshment**
- 12.00** RRT PIs join AgMIP leaders at noon to discuss remaining work.
- 13:00** **Lunch**

- 14:30** Plenary – Research goals for remainder of Project – A Ruane
- 15:05** Plenary – Data Plan – C Porter
- 15:15** **Working Coffee/Tea Refreshment**
- 15:30** RRT Breakouts – Organize workshop reports and assess priorities for the remainder of the project
- 17:00** Plenary - Report Back - Review next day plans – C Rosenzweig & J Jones
- 17:30** The Coordinated Climate Crop Modeling Project (Optional) – A Ruane
- 18:30** **Adjourn for the day**

Day 5 Friday, 19 July

- Goals:** Teams and Leadership finalize work plans and workshop reports
- 08:30** Plenary - Goals for Day 5 – C Rosenzweig & J Jones
- 08:45** RRT Breakouts & Leaders Breakout – Finalize workshop presentations and create work plan for remainder of project including potential publications
- 10:15** **Working Coffee/Tea Refreshment**
- 10:45** **Plenary** – RRT & CRT Reports – 45 minutes each – status and plans
- 10:45 SAAMIIP
- 11:30 CLIP
- 12:15 East Africa
- 13:00** **Lunch**
- 14:00** **Continue Plenary**
- 14:00 CIWARA
- 14:45 Coordination Team
- 15:30** **Feedback from leadership, Discussion**
- 17:00** **Adjourn**

Appendix 2. Participant list for the SSA Midterm workshop in Pretoria

No	Name	Organization	Country	Email Address
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6	Makananisi Funzani	Climate Change Analyst, Dept of Agric Forestry & Fisheries, Pretoria	South Africa	FunzaniM@daff.gov.za

Appendix 3. Stakeholder biographies

Stephen Mutua KING'UYU, Ag Deputy Director – Adaptation and Mitigation at the National Climate Change Secretariat, Ministry of Environment, Water & Natural Resources, Kenya. Current responsibilities include the domestication of conventions and protocols related to climate change adaptation and mitigation and coordination of the relevant national policy processes. KING'UYU coordinated the preparation of Kenya's National Climate Change Action Plan (NCCAP), which is a policy instrument to help address climate change across the different sectors of the economy.

Dumisani Mbikwa Nyoni, Provincial Agricultural Extension officer in the Department of Agricultural Technical and Extension services, Zimbabwe. Nyoni's current focus is to promote conservation agriculture to address climate change challenges, develop and strengthen input-output value chains to stimulate agricultural production through linking farmers to markets, farmer training on climate change issues, design agricultural project interventions that address challenges associated with climate change, develop use of ICT in agricultural extension, and strengthen research-extension farmer linkages.

Olaotswe Kgosikoma currently works for the Department of Agricultural Research, Botswana, focusing on sustainable use of range and pasture resources. His research interests are interactions between livestock species, rangeland conditions, and fodder crops and climate change, with the goal of assisting farmers to adapt and mitigate adverse impacts of climate change. Kgosikoma is also a member of Botswana National Committee on Climate Change, responsible for advising government and raising community awareness of climate related issues.

Luciano Rafael Majone, Provincial Directorate of Agriculture of Manica, Mozambique, involved in the planning and monitoring of the agricultural sector.

Timothy Gondwe (PhD), Associate Professor of Animal Breeding and Deputy Dean of Agriculture at Bunda College of Agriculture (BCA), Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi. Gondwe teaches Applied Animal Breeding, Advanced Quantitative Genetics, Biometry and Computing (msc level), Biostatistics and Research Methods (phd Aquaculture), Village and Commercial Poultry Production, Livestock Production Systems, Undergraduate Animal Breeding and Genetics, and design and analyses of students' experiments and surveys using SAS, Genstat and SPSS Statistical Packages. Dr Gondwe has been engaged in designing and training of government and NGO food security projects on harmonization of monitoring and evaluation system for projects in Malawi.

Makananisi Funzani, Climate Change Analyst, Department of Agriculture Forestry & Fisheries, Pretoria, South Africa. Previously Ms. Funzani worked as an Agriculture Resource Technician where she focused on the land care program and communicating disaster and climate change management to farmers.

Appendix 4. FAQs

AgMIP RRTs: The Home Stretch

Climate Team FAQs

1) Which specific climate scenarios are required for core question simulation sets:

- RCP8.5
- Mid-Century
- Delta Scenario ('XA.AgMIP' in Climate Codes)
- 5 GCMs [CCSM4 (E), GFDL-ESM2M (I), HadGEM2-ES (K), MIROC5 (O), MPI-ESM-MR (R)]
- All farms

2) Why do we all use the same 5 GCMs?

- We are interested in consistency among regions and therefore require the same 5 GCMs to be used in all locations in Sub-Saharan Africa and South Asia.
- The 5 GCMs above were selected for their:
 - Widely used in recent assessments
 - Rigor of processes and resolution
 - Performance in monsoon regions

3) Will we assess the broader uncertainty of climate change projections?

- Yes, for 2 crop models, RCP8.5, Mid-Century

3a) Mean Changes Only

- 20 GCMs run only through crop/livestock model (no TOA runs)
- Delta Scenarios ('XA.AgMIP' in Climate Codes)
- 1 field: Best calibrated crop/livestock model location

3b) Mean and Variability Changes

- 20 GCMs run only through crop/livestock model (no TOA runs)
- Mean and Variability Scenarios ('XF.AgMIP' in Climate Codes)
- 1 field: Best calibrated crop/livestock model location

Crop/Livestock Model Team FAQs

1) How many crop/livestock models are needed for core question simulation sets?

- 2 crop models
- 1 livestock model (CLIPs)

2) How many crops/livestock are required for a given production system?

- At least one

3) What are the crop/livestock model components of the adaptation package?

- Regional Research Teams devise combination of adaptations represented in crop/livestock model parameters

Economic Model Team FAQs

1) Will we use a RAP for core question #1?

- No

2) What RAP will we use in core questions #2 and #3?

- Regional Research Teams are developing R1: Current Trends Continue

3) How will RAPs incorporate global and regional drivers?

- Begin with national-level drivers from global economic model
- Adjust to regional drivers

Information Technologies Team FAQs

1) How can we organize and execute large number of simulations?

- Core question crop/livestock runs at all farms: DOME
- Climate sensitivity runs at one location: Take experiment file (e.g., from QuadUI) for location and add 40 fields that each have different climate

2) Where will inputs, outputs, and products be archived?

- Utilize AgMIP data flow for Regional Integrated Assessments

Appendix 5. Mid-Term Workshop Checklist

This document provides a checklist that will help each team determine whether they are on track to produce all needed elements for the full examination of an integrated assessment at the July Mid-term Workshop. We will go through the entire integrated assessment for this single scenario in your integrated assessment region at the workshop, and then will develop a clear plan for the full assessment(s) going forward from the Midterm workshop to the end of the project (which will include additional elements). Details of these files and the associated methodologies are provided in the AgMIP Integrated Assessment Handbook (available at <http://www.agmip.org/wp-content/uploads/2013/05/AgMIP-Regional-Research-Team-Handbook-v4.1.pdf>)

Checklist – Climate Time Series Files

The .AgMIP file name is shown here to indicate that these files will need to be consistently formatted following the example in the AgMERRA dataset, and the naming convention detailed in the handbook also provides information about the specific files created. These will enable the full suite of crop modeling runs and agro-climatic analyses for the project.

Using New York City (USNY) as an example:

*** 1.1 obtain AgMERRA estimated climate series for main weather location**

first step: send an email to Alex (alexander.c.ruane@nasa.gov) with location's latitude, longitude, elevation, full name, and a 4-character code (e.g., USNY)
file: **USNY0QXX.AgMIP**

*** 1.2 combine with observations and quality control main weather station**

first step: collect observations and calculate biases of AgMERRA time series. Fill in gaps using methodologies described in Section 4 of AgMIP Regional Integrated Assessment Handbook to achieve 1980-2010 daily file with all AgMIP variables.
file: **USNY0XXX.AgMIP**

*** 1.3 create CMIP5 GCM delta scenarios for Mid-Century (2040-2069) RCP8.5 using the CCSM4 global climate model scenario**

first step: download CMIP5 datasets (meantamax, meantasmin, meanpr, and lat/lon files) and Matlab/R scripts package
file: **USNYIEXA.AgMIP**

Check List – Crop Modeling for Integrated Assessment

- ☐ **2.1** Document calibration of selected cultivar used (indicate experimental site, number of years, and type of experimental data used for calibration). Provide the cultivar genetic coefficients and evidence of calibration (simulated and observed anthesis and maturity with statistics, and graphical time-series if done). Provide model-ready input files.
- ☐ **2.2** Provide completed template spreadsheet (Survey_Data_Import file) of entered field survey data that includes all farmer fields.

- * **2.3** Document source and identity of weather data used for farm survey simulations (including the weather used for simulating farm survey seasons, as well as the historical baseline weather (USNY0XXX.AgMIP), and the future climate scenarios (e.g., USNYIEFA.AgMIP). Also confirm that your weather files follow the AgMIP-scripting method and that the future climate scenario is for the correct time-slice and RCP).
- ☐ **2.4** Document source of soil profile information and provide soil profiles (either as separate page on the template spreadsheet, or as separate soil profile that can be viewed).
- ☐ **2.5** Provide Field Overlay files (DOME or DOMES) used to fill in missing information relative to the farm survey simulations. For example, that will give evidence for setting initial soil water, initial soil nitrate and ammonium, assumption for initial crop residue, stable soil C pool fraction, etc. This may require a short amount of explanatory text.
- ☐ **2.6** Provide the ACMO file with the simulated crop yield outputs for the matched farm yield survey fields, with explanation. Discuss causes for outliers in observed and simulated farm yields, *but as requested by economists, do not make any bias adjustments*.
- ☐ **2.7** Provide the ACMO file of successful 30-year simulations for baseline weather, for all farms (30 years per farm, show simulated yields for individual years, no averaging). Also provide Seasonal Strategy file (DOME) to provide sowing date rules and other assumed management information.
- ☐ **2.8** Provide the ACMO file of successful 30 year simulations for the appropriate identified climate scenario, for all farms (30 years per farm, show simulated yields for individual years, no averaging). This is for historical management without RAPS. This will require an additional Seasonal_Strategy file (DOME) to provide sowing date rules and other assumptions.
- ☐ **2.9** For adaptation simulations, provide Seasonal_Strategy file (DOME) with RAPS adaptations, sowing rules, and assumptions, along with ACMO file of 30 year simulations for climate change scenario with adaptation, for all farms (30 years per farm, show simulated yields for individual years, no averaging).
- ☐ **2.10** Provide evidence of interactions with economists on your team to confirm their understanding of the files and how to interpret crop modeling results, with yield distributions associated across farms in the matched survey case, and yield distributions associated with multiple weather years per individual farm.

Check List – Economics Team: TOA-MD Modeling

This checklist is to be used by RRT's economists for TOA-MD data preparation, model setup and results review. This checklist should be used for each scenario that is being modeled (i.e. Fast track, and adaptation scenarios).

DATA: Review data received from crop modelers and economic survey data

- ☐ **3.1** Make sure you received data from crop modelers in ACMO format
- ☐ **3.2** Check actual data for outliers, make histograms
- ☐ **3.3** Check simulated yields distributions

- **3.4** Correctly estimate relative yields and predicted future yields - Follow instructions provided on the updated Appendix 1 of the Handbook v4.1
- **3.5** Stratification: decide if stratification is needed/possible
- **3.6** Calculate statistics and double check they are correctly estimated (check predicted/modeled standard deviations, CVs) - Check again for outliers, strange values, etc
- **3.7** Make sure input parameters are consistent with scenario being modeled
- **3.8** Estimate and make sure RHO12 (correlation between returns in systems 1 and 2) makes sense
- **3.9** If needed, estimate and check values for correlations between returns to activities within systems (e.g. RHOC1, and RHOC2 for crops).
- **3.10** Use DATA and STUDY sheets to document the scenario that is being modeled.

MODEL Setup: Review key TOA-MD parameters and output data

- **3.11** Select the appropriate value for Do_Climate (Setup sheet)
- **3.12** Check units and select appropriate value for C_UNITS, L_UNITS, P_UNITS
- **3.13** Check units for CVs
- **3.14** Check STD_C, STD_L, STD_P: Standard deviation of net returns
- **3.15** Check activity Weights
- **3.16** Check fixed costs (are they needed?, enter correct values and check values for T1, T2 ,R)
- **3.17** Review all sheets making sure all the values are correct, consistent and in the correct places

Model Results:

- **3.18** Check output sheets for consistency
- **3.19** Check range of tradeoff points
- **3.20 Interpretation:** Review results to make sure they are consistent with economic theory and TOA-MD economic/statistical properties

Check List – Technical Stakeholder Engagement

The workshop includes engagement of at least one technical stakeholder (TS) per team for the first 1.5 days of sessions. This is owing to 1) A requirement by the funder (UK/DFID) to engage stakeholders broadly and across time; 2) Recognition that TS engagement is part of the underway work; and, 3) To ensure teams are not too far down the product line for a country before taking into consideration the likely areas of influence or need. The TS interactions should actually help to shape the work. Below we provide some criteria to help you in your selection of suitable TS. Teams should plan to have no fewer than two TS participating. AgMIP (HQ) will fund one, with the team funding the other.

- **4.1** TS works in one of the countries in your region
- **4.2** TS contributes technical expertise at a sub-national or national level

- **4.3** TS would likely benefit from exposure to the fuller AgMIP SSA representation
- **4.4** TS would likely engage in the technical discussion session on the afternoon of Day 1
- **4.5** TS would likely be interested and able to explore some RAPS-like work with your team in the morning of Day 2.

Team PIs will reach out to TS and provide information and full contact information also the Coordinating Research Team PI (Job or Dileep) with a copy also to agmip@columbia.edu. AgMIP HQ will fund one TS for each team.

Appendix 6. FTP site naming conventions

1. CLIMATE

1.1 The merged historical period file (file name format: USNY0XXX.AgMIP). This come from historical observations merged with the MERRA-based data (bcMERRA is the same as AgMERRA), and should be complete from 1980-2010 with all variables and should not have any major outliers or physical discontinuities (e.g., $T_{max} < T_{min}$).

1.2 The historical period files for each farm in the region (e.g., if we had 12 farms around New York, we would have files name formats NY010XXX.AgMIP --> NY120XXX.AgMIP). These come from the agmip_farm2climate R scripts and the WorldClim data.

1.3 An example of the future climate data (from agmip_simple_delta.R and agmip_simple2full.R) from one GCM (use CCSM4 if you are looking for a first one to upload). File name format: NY01GEXA.AgMIP --> NY12GEXA.AgMIP

2. CROP

2.1. Crop model files for DSSAT (or XML for APSIM) documenting cultivar genetic coefficients used (provide experimental data for site used for calibration).

File name format: Files X, A, T, *.SOL, *.WITH, and *.CUL used for DSSAT models (in the standard DSSAT naming conventions), and the XML files for APSIM (with corresponding cultivar, management, soils, weather information in the APSIM naming conventions).

2.2. Field survey data entered. File name format: Survey_Data_Import-Region-Crop.csv

2.3. Field Overlay files (DOMES) used to fill in missing information for farm survey simulations. File name format: Field_Overlay_Region-Crop-Model.csv [Note: provide all (multiple) DOMES associated with the above Survey_Data_Import-Region-Crop.csv files]

For all the below ACMO files please use the following naming format:

ACMO-region-stratum-ClimID-RAPid-MgmtID-model.csv

For example

ACMO-Machakos-1-0XFX-0-0-DSSAT.csv for baseline,

ACMO-Machakos-1-MTFA-3-2-APSIM.csv for future conditions.

2.4. ACMO file with simulated crop yield outputs for the matched farm yield survey fields.

2.5. ACMO file of 30-year simulations for baseline weather, for all farms, with Seasonal Strategy file (DOME) for sowing rules and other assumed management information.

2.6. ACMO file of 30-year simulations for climate scenario, for all farms, with Seasonal Strategy file (DOME) for sowing rules and other assumed management information.

2.7. ACMO file of 30 year simulations for climate scenario with adaptation, with Seasonal_Strategy file (DOME) with RAPS adaptations, sowing rules, and assumptions.

3. ECONOMIC

3.1 Modeling:

- TOA-MD Input files (excel files). Use the TOA-MD data file name

format: MD4data_YYYY.xls (YYYY:Project identifier: team, region and scenario description)

- TOA-MD Output files (excel files). Use this TOA-MD output File name format: MD5_YYYY.xls

3.2 Reporting: use previously provided template to report results:

- RRTs FT-AD Report (PowerPoint and Excel files). Use the file name format of the templates provided and add the project identifier: YYYY_RRTs FT-AD Report.Ppt and YYYY_RRTs FT-AD.xls

3.3 RAPS:

- DevRAP Matrix Use the DevRAP filename and add the Project identifier: YYYY_DevRAP.xls

- RAPS Documentation (based on template we distributed). Use this File name format: YYYY_RAPS Documentation.doc

- RAPS Presentation – Summary of RAPS narratives. Use this File name format: YYYY_RAPS Summary.PPT