

AgMIP

The Agricultural
Model Intercomparison
and Improvement Project

TOA-MD ECONOMIC MODELING WORKSHOP

APRIL 29-MAY 3, 2013
DUBAI, UAE



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**





AgMIP TOA-MD Economic Modeling Workshop Report

Dubai, UAE April 29-May 3, 2013

John M. Antle & Roberto O. Valdivia

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1. Introduction

An AgMIP-sponsored workshop on regional economic modeling and impact assessment using the TOA-MD model was held in Dubai the week of April 29 (Monday) – May 3 (Friday), supported by additional funds from ICRISAT and CCAFS, and organized by the AgMIP Regional Economics Team at Oregon State University. The goal of the meeting was to review and build on the fast-track analysis to implement a complete climate impact assessment and technology adaptation analysis for at least one regional case study for each Regional Team (see the agenda attached). The participants at this meeting were the economists who set up and ran the TOA-MD model for their team's Fast Track analysis (see the attached participant list).

2. Summary

This section presents a summary of the key accomplishments, issues and conclusions of the workshop.

Key accomplishments were:

- Fast Track exercises were reviewed and economic components were corrected as needed. A summary of the results to date was produced, however, all of the teams need to finalize crop model simulations before the fast track economic analyses can be finalized – see below.
- RAPS were reviewed and methods for the further development were discussed. A summary of RAPS developed so far was produced.
- Methods for using crop model simulations in economic modeling were discussed and advanced in the course of the workshop. In particular, methods for incorporation of time-variation in yields were developed and tested. Related data and protocol issues that need to be addressed by the AgMIP Leadership were identified.
- Methods for incorporating Livestock components were discussed.
- Fast Track exercises were extended to whole farm systems, and complete climate impact and at least one adaptation scenario were modeled (in some cases, using pseudo-data when crop model simulations were not available). Summaries of these results were prepared.
- The climate change impact exercise was extended to include an adaptation analysis (focusing the adaptation strategy on the fast track selected crop).
- Plans for RAPS and modeling methodology publications were discussed.
- In the course of the work, various modeling and methodology questions were discussed.

Key Issues identified:

- Issues related to climate data and crop modeling:
 - In some cases, historical and future weather data did not conform to AgMIP protocols being used by crop modelers.
 - Simulated yield data did not conform to AgMIP protocols for some teams; crop model simulations by some teams were not done with management variation; data were not provided to economists in ACMO format in all but one case; many teams provided data that were bias-adjusted or averaged, rather than native crop model outputs not bias adjusted, by survey farm and by year.
- Issues related to economic modeling were mostly on interpretation of results. However, for some teams it remains to be seen whether the economist(s) are able to conduct analysis independently.
- Issues related to communication and coordination within Regional Teams were identified.

Conclusions and next steps:

The economists agreed to the following approach to advance the Regional Teams' work:

- First, the group agreed that the first RAPS developed should be “business as usual” and then modify those pathways to represent other plausible futures, possibly including “wild card” cases.
- Second, the Fast Track analysis must be completed correctly. The key missing element for most teams is crop model simulations completed according to AgMIP protocols.
- Third, in the opinion of the Regional Economics Team, it is critical to demonstrate the capability of the teams to conduct full assessments as soon as possible. Thus, it is critical for the climate and crops scientists to provide the data needed to complete full impact assessments and adaptation analyses for the Fast Track study areas. To accomplish this, the Fast Track analysis needs to be extended to include the major crops in each of these systems, and simulations need to be completed for multiple climates. With these data the economists can complete a full impact assessment and analysis of adaptations for these study areas. For example, in the Niore, Senegal Fast Track study done by CIWARA, the Fast Track analysis was based on millet. Two other important crops in this system, maize and peanuts, need to be done for multiple CMIP5 climates, RCPs and future time periods.
- The Regional Economics Team advises that before the July meetings, all major crops in the Fast Track study areas should be completed with at least one CMIP5 climate, for RCP

4.5, for the mid-century period. To accomplish this, the climate and crop modeling scientists will need to complete this work by June 21 for the SSA teams and by June 28 for the SA teams so that the data can be provided to the economists in time for them to complete their analysis and present results at the July meetings. If this is not feasible for all climates and time periods, at least some climates and crop model simulations should be completed according to the AgMIP protocols.

- **To ensure that the work is done correctly, the AgMIP Regional Economics Team recommends that the data should be provided to the Regional Team economists as well as to the resource persons for each team and at least one AgMIP Leader who can verify that the protocols have been followed. A conference call with the lead crop modeler and economist from each team with their resource person and corresponding members of the AgMIP leadership is recommended as soon as possible to ensure intra-team coordination and communication is occurring, and that a plan is in place to meet deadlines for the July meeting.**

In addition, the following actions will be taken by the Regional Economics Team:

- The Regional Team Handbook will be revised to reflect refinements of the procedures for utilizing simulated crop yields in economic analysis.
- The Regional Team Handbook will be revised to update the RAPs development process. The DevRAP matrix tool will also be updated.
- Projected global prices for major commodities will be obtained from the global economic model inter-comparison exercise and included in the Handbook with guidelines for their use.
- The templates for the Fast Track summary reports will be revised.

3. Summary of Activities and Accomplishments by day.

Monday, April 29, 2013

Topics:

- Introductions
- Fast Track Presentations
- Modeling Issues

Summary:

The workshop started with introductions and expectations from each attendee and a statement of objectives from John Antle. Then each team gave a presentation on their Fast Track Reports. These presentations explained the data used and results obtained from TOA-MD simulations. The session concluded with a discussion on data and modeling issues that researchers

encountered. Some examples of these issues included the problems obtaining data from crop modelers, calculating statistics/parameters from the data, dealing with outliers, estimating correlations, setting tradeoff points, and stratifying the data. In addition, John Antle requested all participants to prepare a tentative title for a paper for which they could be lead author.

Regional Teams Presentations:

1. "Climate Change Impacts on West African Agriculture – A Regional Assessment," by West Africa team (I. Hathie)
2. "Modeling the impact of a variable and changing climate on rice agricultural system in Sri Lanka for AgMIP," by Sri Lanka team (Herath)
3. "Modeling the impacts of a variable and changing climate on rice and sugarcane agricultural systems in Sri Lanka," by Sri Lanka team (Dumindu and Erandika)
4. "Impact of Climate Change on Adoption, Income and Poverty," by East Africa team (R. Mulwa)
5. "Integrated Assessment of Climate Change Impacts on Principal Crops and Farm Household Incomes in Southern India (TNAU)," by South India team (Paramasivam)
6. "Integrated Assessment of Climate Change Impacts on Principal Crops and Farm Household Incomes in Southern India (ANGRAU)," by South India team (Sunandini)
7. "Crop Livestock Intensification Project in Southern Africa, Site: Zimbabwe, Nkayi," by Southern Africa-CLIP team (S. Homan-Kee-Tui)
8. "Strengthening simulation approaches for understanding, projecting, and managing climate risks in stress-prone environments across the central and eastern Indo-Gangetic Basin," by North India team (Harbir)
9. "Southern Africa Agricultural Model Inter-comparison and Improvement Project," by South Africa team (Mogos)
10. "Modeling the Impact of Climate Change on Wheat, Rice and Cotton in Pakistan" by Pakistan team (Irfan A.)
11. "The Economic Impact of Climate Change: A Multi-dimensional Impact Assessment for smallholder maize and wheat grown in Ethiopia," by East Africa team (Kebede)
12. Uganda (participant provided an update on progress) (J. Bonabana)

April 30, 2013

Topics:

- Review of Methods for Crop Model Simulations
- Update Fast Tracks

Summary:

The session began with a presentation on relative yield calculations by John Antle. This presentation outlined an approach for calculating future relative and predicted yields that allows for variation across time and space. Next, the regional teams worked on finalizing their fast track reports and performing a simulation with time varying relative yields. This exercise led to the assessment of the type of data economists have received from crop modelers. Some teams did not have the requisite crop modelling data to calculate relative yields for each farm

in each future year (the crop modellers need to provide simulated yields for every site and every year). In order to continue with the exercise these teams generated “pseudo” datasets so they could become familiar with the process they will follow when they have all the data. The teams reviewed their fast track using a checklist to assure consistency and correct model parameterization. Then the teams reconvened and discussed results and issues from the day.

Documents for Appendix:

- Fast Track Review Checklist
- Relative yields AgMIP handbook update

May 1, 2013

Topics:

- Livestock
- RAPs
- Data

Summary:

The session began with a review of the previous day’s topics and issues moving forward with economic impact assessment modeling. In particular, John Antle suggested that yield distributions may not be stationary over time and, if this is the case, it may be better to examine shorter time intervals on a year by year basis. Then Sabine Homann-Kee Tui gave a presentation on livestock modeling based on the CLIP’s activities. She discussed characteristics of livestock-crop integrated systems, strategies for calculating livestock activities’ parameters for TOA-MD, and how future livestock production could be modeled under climate scenarios. This was followed by a demonstration by John Antle on different ways to model and parameterize livestock activities in TOA-MD (e.g. how to input livestock parameters that are in per-animal units). It was noted that the documentation of the TOA-MD model includes technical documents and there is one referred to modeling Livestock. During the second part of the session, the regional teams gave reports on the development of their RAPs. These presentations covered the RAPs meetings, development process, outcomes, issues, and future plans. An update of RAPs methodology was then presented by Roberto Valdivia. Roberto provided an outline for the development of RAPs and proposed that each team develops a Business as Usual RAP as the starting point. The teams agreed to start their RAPs development with a BAU RAP. The day’s session ended with team breakouts for finalizing the characterization of each region’s system 1 (base climate, base technology) for TOA-MD analysis.

Workshop Presentations:

- “CLIP: Livestock Modeling,” by Sabine Homann-Kee Tui.

- *Regional Teams RAPs presentations*

1. South India
2. East Africa (Kenya)
3. Southern Africa (CLIP)

4. Pakistan
5. East Africa (Ethiopia)
6. Sri Lanka
7. North India

- "RAPS, Update on Methodology" by R. Valdivia

Date: May 2, 2013

Topics:

- Translating RAPs into model scenarios
- Team preparation of full systems for Fast Track studies
- Design and implementation of preliminary adaptation Scenarios

Summary:

John Antle started the day with a short lesson on using TOA-MD to assess climate change impacts under different adaptation scenarios. –ADD Figure for CC IA: Base Climate, Base tech -> CC, Base tech, etc..(John's presentation)

Then Lieven Claessens gave a presentation on a study which developed climate change adaptation scenarios for small farmers in Kenya (Claessens et al, 2012, Ag Systems). He described how future scenarios were developed and parameterized for TOA-MD, and how to interpret and explain the results from this type of analysis. Next, the regional teams were given time to develop adaptation scenarios. This exercise allowed teams to practice how TOA-MD is used to analyze scenarios with future climate and technology adaptation. The day concluded with a discussion on publication ideas. John Antle suggested the possibility of a RAPs paper, a yield methodology paper, and a special issue in a journal.

Workshop Presentations:

"A Method for Evaluating Climate Change Adaptation Strategies for Small-Scale Farmers Using Survey, Experimental and Modeled Data," by Lieven Claessens.

Date: May 3, 2013

Topics:

- Adaptation presentations
- RAPs plans
- Publications and Outreach

Summary:

The session began with a short demonstration on examining data by John Antle. Then the regional teams presented reports on their progress from the workshop (the teams followed a template to report the updated fast track and adaptation analyses). These reports included the updated fast track analysis, one adaptation analysis, and publication proposals from each

member of each team. The session concluded with a discussion on how the project will proceed. This covered a to-do list for regional teams and AgMIP economic leadership and ideas for publications and outreach. The tasks for regional teams are to finalize fast tracks, extend fast tracks (multiple crops and climates), complete climate change impact and adaptation analysis for fast track study sites, and complete RAPs; for AgMIP economic leadership the tasks are to revise the AgMIP handbook on yield calculations, plan a strategy to incorporate global prices (e.g. fertilizer and fuel), revise the workshop report templates, and distribute updated DevRAPs. The following publication topics and ideas were proposed: regional RAPs, yield methodology, fast tracks, policy briefs, working paper series, and special issue of a journal. The outreach avenues offered were farmer publications, radio and local press, students (e.g. university seminars), and journalists.

Workshop Presentations:

Workshop reports (includes notes on what needs to be fixed for finalizing)

1. Southern Africa-CLIP (look at future yield calculation, correct labels, interpretation)
2. Pakistan (pseudo data; negative per-capita income, correct labels, interpretation)
3. West Africa (extremely large reduction in yields in future)
4. South India- ANGRAU (expand tradeoff points on climate change assessment)
5. East Africa- Kenya (correctly interpret the fast track results; use the correct system 1 for adoption analysis)
6. Sri Lanka- Rasnaya Herath (interpretation)
7. South Africa- SAMIIP (use correct system 1 for adoption analysis)
8. South India- TNAU (too few observations per stratum)
9. North India (check yield calculations)
10. Sri Lanka- FECTS

4. Planning

- Present at July meeting completed FT case studies with full system, multiple RAPs and multiple climates, mid-century with CC impact assessment w-o adaptation and with adaptation.
- RAPS paper
- yield methods paper
 - matched, time averaged
 - matched, time varying (by year)
 - un-matched (need to work out details)
- reviewing papers? The teams mentioned the need for a systematic way to review papers within AgMIP before being submitted (quality control).
- special issue: (need to find a journal)
 - Methods
 - RAPs

Appendix 1. List of Participants

AGMIP TOA-MD Workshop

Dubai, April 29 - May 3

Participants List

	Name	Project/institution	Country	Email
1	Charles Nhemachena	South Africa	Zimbabwe	cnhemachena@hsrc.ac.za
2	Mogos Teweldemedhin	South Africa	Namibia	mogosteweldemedhin@gmail.com
3	Joseph Amikuzuno	West Africa	Ghana	amikj26@yahoo.com
4	Ibrahima Hathie	West Africa	Senegal	ihathie@yahoo.com
5	Harbir Singh	North India	India	hs.pdfsr@yahoo.com
6	Dinesh Kumar Thapa	North India	Nepal	darlami.dinesh@gmail.com
7	Rasnaya Herath	Sri Lanka	Sri Lanka	herath.rasnayaka1@gmail.com
8	Erandika Wijekoon	Sri Lanka	Sri Lanka	erandikawijekoon@gmail.com
9	Dumindu herath	Sri Lanka	Sri Lanka	duminducherath@gmail.com
10	Sabine Homann-Kee Tui	Southern Africa-CLIP	Zimbabwe	s.homann@cgiar.org
11	Lieven Claessens	Southern Africa-CLIP	Kenya	l.claessens@CGIAR.org
12	Arthur Chibwana	Southern Africa-CLIP	Malawi	arthurchibwana@gmail.com
13	Muhammad Ashfaq	Pakistan	Pakistan	ashfaq9@hotmail.com
14	Syed Asif Ali Naqvi	Pakistan	Pakistan	syedasif_1@yahoo.com
15	Irfan Ahmad Baig	Pakistan	Pakistan	irfybaig@gmail.com
16	Richard Mulwa	East Africa	Kenya	richard.mulwa@yahoo.com
17	Khamaldin Mutabazi	East Africa	Tanzania	khamaldin@yahoo.com
18	Jacqueline Bonabana	East Africa	Uganda	jbexim@gmail.com
19	Kebede Gebru	East Africa	Ethiopia	solomonmanjur@gmail.com
20	P.Paramasivam	South India	India	params@tnau.ac.in
21	R. Balasubramanian	South India	India	rubalu@gmail.com
22	Suresh Kumar	South India	India	rithusuresh@yahoo.com
23	Sunandini Prema	South India	India	sunandinigp@yahoo.in
24	Nedumaran Swamikannu	ICRISAT	India	S.Nedumaran@cgiar.org
25	Caleb Dickson	Oregon State Univ	USA	caleb3105@gmail.com
26	Parakrama Samaratinga	Sri Lanka	Sri Lanka	parakrama@ips.lk
27	Gokul Paudel	CIMMYT	Nepal	g.paudel@cgiar.org
	AgMIP Econ Leadership team:			
28	John M. Antle	Oregon State Univ.	USA	john.antle@oregonstate.edu
29	Roberto O. Valdivia	Oregon State Univ.	USA	roberto.valdivia@oregonstate.edu

Appendix 2. Fast Track Check List.

FAST TRACK REVIEW CHECKLIST		
TOA-MD AgMIP Workshop, Dubai 2013		
1. DATA	CHECK	Comments
- Check actual data for outliers, make histograms	<input type="checkbox"/>	
- Simulated yields distributions	<input type="checkbox"/>	
- Correctly estimate relative yields and predicted future yields	<input type="checkbox"/>	
- Stratification: decide if Stratification is needed/possible	<input type="checkbox"/>	
- Calculate statistics and double check they are correctly estimated (check predicted/modeled standard deviation, CV) - Check again for outliers, strange values, etc	<input type="checkbox"/>	
- Estimate can make sure RHO12 makes sense	<input type="checkbox"/>	
- Estimate and check values for RHOC1, RHOC2 if needed	<input type="checkbox"/>	
2. MODEL		
Setup:		
- Do_Climate = 1	<input type="checkbox"/>	
- Check units and select appropriate value for C_UNITS, L_UNITS, P_UNITS	<input type="checkbox"/>	
- Check units for CVs	<input type="checkbox"/>	
- Check STD_C, STD_L, STD_P: Standard deviation of NRs	<input type="checkbox"/>	
- Check activity Weights	<input type="checkbox"/>	
- Check fixed costs (are they needed, correct values (check also T1, T2, R))	<input type="checkbox"/>	
- Review all sheets making sure all the values are correct, consistent and in the correct places	<input type="checkbox"/>	
Results:		
- Check Output sheets:	<input type="checkbox"/>	
o Look for consistency	<input type="checkbox"/>	
o Check Tradeoff points	<input type="checkbox"/>	
- Interpretation	<input type="checkbox"/>	

Appendix 3. Flip Chart Summaries.

Out reach.

- Pol Briefs
- RAPS
- former's publication.
www.
- Radio + local lang. pubs.
- students - university.
- Journalists.

Publications

- review process?
- RAPS / ^{Regional} CCAPS
- Yield Method.
- AE / ASAE / CCIA Paper
- Special ISSUES.
- Diss Papers
- Individ. Ideas.
- Policy Briefs

To Do:

- Revise Handbook
- Global prices
 - major crops
 - fert + fuel.
- Wkshp Reports (revise)
- DevRAP update

To do:

1. Finalize FT
2. Extend FT
 - multiple climates + crops.
3. Complete CC Impact
 - + Adapt for FT Study Sites
 - + RAPS

Appendix 4. Workshop Agenda.



AgMIP TOA-MD Workshop Agenda

Dubai, UAE April 29-May 3, 2013

Sunday April 28

Arrivals

Monday April 29 **Review goals, team progress, modeling issues**

- 8.00 Registration (Meeting Room located in Second floor)
- 8:30 Welcome and Objectives, Data, Introductions
- 9:00 Team presentations
- 10:00 Break
- 10:20 Team presentations
- 12:00 Lunch
- 1:00 Team presentations
- 3:30 Break
- 3:50 Discussion of modeling issues
- 4:30 Review agenda and plan workshop products
- 5:00 Wrap up: plan for Tuesday

Tuesday April 30 Finalizing Fast Track

- 8:30 Review methods for using crop model simulations (JA)
- 10:00 Break
- 10:20 Team breakouts – update fast track
- 12:00 Lunch
- 1:00 Continue breakouts/discussion of results
- 3:00 Break
- 3:20 Present new results & discuss
- 5:00 Wrap up – dinner logistics
- 7:00 Group dinner – depart hotel by bus

Wednesday May 1 Livestock, RAPS & Data

- 8:30 Methods for Livestock (Sabine & TOA team)
- 10:00 Break
- 10:20 Livestock plans - discussion
- 11:00 Reports on RAPS
- 12:00 Lunch
- 1:00 RAPS methodology discussion, update
- 2:00 Whole farm data cleaning, setup (assignments of variables)
- 3:00 Break
- 4:00 Data examples & discussion
- 5:00 Adjourn

Thursday May 2 Teams design and implement adaptation scenarios

- 8:30 Adaptation example: Kenya example
- 9:30 Prepare adaptation exercise
- 10:00 Break

10:20 Teams breakout for adaptation exercise

12:00 Lunch

1:00 Teams continue

3:00 Break

3:20 Teams continue

5:00 Wrap up

Friday May 3 **Teams present adaptation scenarios and results, discuss plans for RAPS, publications and outreach**

8:00 Team presentations and discussion

10:00 Break

10:20 Review the Economic Protocol

12:00 Lunch

1:00 Meeting report completion, and planning for July meetings

2:00 Planning: Publications (methods paper, RAPS paper, special issue)

3:00 Adjourn