

AgMIP

The Agricultural Model Intercomparison and Improvement Project

The Impacts of 1.5 and 2°C Warming on Agriculture

JULY 12-14, 2017

IIASA

LAXENBURG, AUSTRIA

 COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK



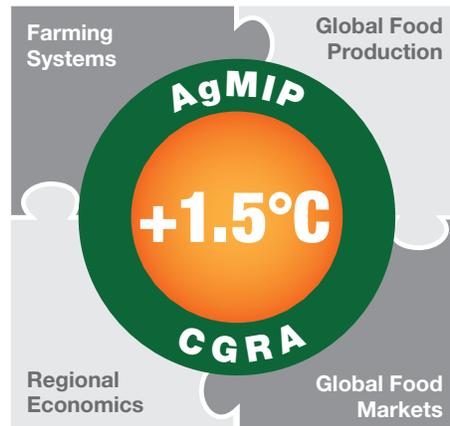
International Institute for Applied Systems Analysis



This workshop was made possible by USDA award number 58-0111-16-010 for the project entitled “The Rapid Assessment of Agriculture in a +1.5° C: An AgMIP Coordinated Global and Regional Assessment” awarded to Columbia University PI Carolyn Mutter. The workshop was organized and led by Alex Ruane (NASA), with contributions also by Cynthia Rosenzweig (NASA), Carolyn Mutter and Meridel Phillips (Columbia), Petr Havlik and Hugo Valin (IIASA), Gerrit Hoogenboom and Cheryl Porter (UF), John Antle and Roberto Valivia (OSU), Daniel Mason-D’Croz and Keith Wiebe (IFPRI) and Ron Sands (USDA-ERS). The workshop was co-hosted by Hugo Valin and Petr Havlik (IIASA), with administrative and logistical support provided by Cynthia Festin (IIASA) and Erik Mencos (Columbia). Technical support was provided by JJ Amidei and Romeo Molina (IIASA), with Tea and Coffee served by Mirjana Tomic and Susanne Deimbacher (IIASA). The workshop logo was created by Shari Lifson (Columbia).

Special thanks to the IIASA Director, Pavel Kabat for hosting, together with Anneke Geschelschap-Kabat, a very special workshop dinner at Krug in Gumpoldskirchen on the occasion of their birthdays. Special thanks also to Cynthia Festin, who looked after every aspect of workshop and after-workshop needs, and provided a fine tour of the beautiful grounds complete with interesting anecdotes.

A tremendous amount of progress was possible owing to the excellent workshop environment, enthusiastic participation, and results that built upon work of a prior AgMIP-IFPRI CGRA 1.5 and 2 C Workshop, also supported by USDA award number 58-0111-16-010. That workshop was held at IFPRI headquarters on February 21-23, 2017, generously co-hosted by Mark Rosegrant and Keith Wiebe (IFPRI), for which a summary is available [here](#).



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The second workshop in a series for the
 Coordinated Global and Regional Assessment of
 Agriculture for Global Warming of 1.5 and 2°C
 Co-hosted by AgMIP and IIASA

IIASA, Laxenburg, Austria | June 12th-14th, 2017

SUMMARY

The AgMIP CGRA Rapid Assessment of Agriculture in a +1.5C Scenario focuses on understanding the impacts of the changes in climate required to reach a stable world only 1.5 or 2 degrees C above pre-industrial mean global temperatures. The approach aims to identify the different mitigation pathways that will keep global temperatures below the 1.5 degree threshold, to understand the differences between the 1.5 and 2 degree scenarios, and to present the changes that will result from these pathways in different aspects of the agriculture industry.

The project intends to directly contribute to the IPCC Special Report on 1.5C in 2018, as well as the Special Report on Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems. Teams consist of groups working in climate scenario analysis, global and site-based crop modeling, and global and regional economics assessments. Additionally, the group hopes to expand analysis into livestock simulations, dietary pathways, and food security metrics.

The workshop at the International Institute for Ap-

plied Systems Analysis in Laxenburg, Austria over the week of June 12-16, 2017 provided a space to further develop coordination efforts between groups on both technical and abstract levels. Each group contributed a summary of their specific analysis with scales, parameter inputs and outputs for different runs. They revisited the core questions behind the IPCC Special Report, namely, how to establish a future scenario that is limited to 1.5 or 2 degrees C above pre-industrial temperatures, and how the agriculture industry will adapt in such a world. The approach was built on the extreme scenarios that involve either minimal or full contribution to mitigation efforts by the agricultural sector, with further scenarios in between addressing land use, climate-smart agriculture, and dietary pathways. The group delivered progress reports on coordinated scenario design runs, including “benchmark” scenarios of perfect mitigation (with no climate change), and the current period (with climate change and present technology).

The climate team displayed disciplinary progress showing historical observations and future projections for the 1.5C and 2C worlds from scenarios de-

veloped by the HAPPI (Half a degree Additional warming, Prognosis and Projected Impacts) rapid assessment project. Climate changes derived from HAPPI scenarios for specific crop growing seasons have been used to drive global crop model yield changes, and to create local weather scenarios using the AgMIP mean-and-variability approach. The HAPPI climate dataset involves mean climate changes across multiple ensemble members, which is more applicable for the CGRA 1.5 rapid assessment, although longer-term analysis will also address comparisons with transient CMIP5 future scenarios and extreme climate events and shocks.

Presentations from the global crop team provided information on the latest phase of the Global Gridded Crop Modeling Intercomparison project (GGCMI), which allows for a broad sensitivity analysis of carbon dioxide, temperature, rainfall, nitrogen and adaptation variations within each crop and model. Initial response surfaces of these results can show quick estimations of yield changes across two climate variable axes for single points, regions, or as a global average. Using an interpolation of the results of these sensitivity tests, the climate scenarios from HAPPI data have been used to develop yield changes on a country level for use in upcoming global economics runs.

The regional crop team showed preliminary results from 30-year crop rotations created with replications of historical data using a weather generator tool. At this workshop, the group focused more on mitigation and adaptation packages for regional crop models rather than yield impacts due to the recent changes in climate scenarios and upcoming further development in local weather scenario creation. Initial analyses show that the weather generator performs well with a good correlation to monthly and yearly data, and that crop yield responses are similar to those seen in AgMIP regional team studies in Punjab and Senegal. The goal for the regional crop team coming out of this workshop will be to build on the current and future climate scenarios from HAPPI and GGCMI and assess crop rotations, current practices, and proposed adaptation and mitigation scenarios for the 1.5C and 2C worlds.

The regional economics team showcased previous studies looking at the potential for soil carbon sequestration, including the importance of variability of adoption rates and supply curves between different regions. They outlined the two main periods of focus: near term (focus on prices and policies) and emergent equilibrium (focus on global patterns of climate change and mitigation). The plan for regional economic analyses going forward is to understand immediate policy and socioeconomic shifts in sentinel regions, and to match global scenarios to specific RAPs and corresponding SSPs and RCPs.

Very preliminary analyses from the global economics team were shown using the outputs from the HAPPI climate and GGCMI yield results in the IMPACT model. The current phase of the global economic analyses focuses on the core AgCLIM50 scenarios, including a decomposition exercise and an assessment of these 1.5C and



2C yield changes. The first runs from HAPPI climate data show a yield decline that is slightly worse than previous studies using RCP2.6, but further work needs to be done to assign a time period to these scenarios.

Regional AgMIP teams from both Pakistan and West Africa presented results on crop rotations in specific districts, showing yield changes for different climate combinations and the potential economic effects and vulnerability of households in these areas. The importance of stakeholder engagement was stressed as an input for determining crops to model, intervention packages, and agricultural adaptations. Preliminary results for these regions are available online with the AgMIP Impacts Explorer tool.

Further presentations looked at more in-depth analyses and regional studies. Participants heard about solution spaces to achieve the 1.5C and 2C worlds, including analysis of the land use sector and the effects of competition for land use. The direct HAPPI/GGCM assessments using the ISI-MIP2b results have also begun and plans are underway to develop a more robust analysis of “multi-bread-basket” failures and the impacts of those shocks across the world. Furthermore, the AgMIP Wheat Team presented scenarios and a model assessment study across 60 locations in addition to a first comparison with GGCM model results, which was relatively consistent. Colleagues with the MACSUR project showed initial crop responses from the European heat stress study, and proposed a planned CGRA study with the goal of better understanding and representing exogenous yield trends. The WASCAL project in West Africa was presented including plans to address future food production targets using studies with varying fertilizer and land expansion, while planning further harmonization between WASCAL and the CIWARA Navrongo study. Finally, the importance of dietary pathways and the methods for modelling diet shifts

in global economic models was addressed, and the emphasis in the IPCC AR5 of considering both supply-side and demand-side mitigation measures.

Detailed discussions and breakout sessions focused on four main topics. In the first session addressed climate-crop methodologies and global results comparison with field tests. Participants proposed developing a method for creating the “best-possible” crop maps as a combination of global and regional models, possibly configuring the AgMIP Wheat Team sites and comparing those results to global-level analyses. In the second session, discussions focused on global-regional economics methodologies and how global model parameters can be optimized to provide regional model inputs. Overall, the economics team highlighted the importance of developing an intermediary level of analysis, such as country-level yield and price shocks. The third and fourth sessions discussed mitigation and adaptation challenges, clarification of definitions of adaptation versus mitigation, and the advantages and potential drawbacks of various strategies. The World in 2050 was also discussed, a project showing pathways towards achieving all of the sustainable development goals and ideal projected targets for both 2030 and 2050.

The workshop closed by updating the coordinated scenario table, distinguishing priority scenarios and runs for the 1.5C rapid assessment versus further long-term analysis, and planning further coordination and data transfer efforts. One of the main goals for this workshop was to develop a core set of CGRA assessment papers, which was accomplished by outlining brief synopses of publications for each team and assigning author lists. Going forward, the hope is to expand these synopses into full abstracts, begin writing up methodologies and preliminary results, and revising protocols to reflect progress.



AgMIP GRIDded Crop Modeling Initiative

IIASA, Laxenburg, Austria | June 15th-16th, 2017

Twenty participants in the AgMIP GRIDded crop modeling initiative (AgGRID) met at IIASA in June as a side session for the AgMIP CGRA 1.5 degree meeting. AgGRID participants concluded that “the state of the project is strong”. Much time was spent discussing the AgGRID flagship project, the Global Gridded Crop Model Intercomparison (GGCMI). GGCMI has already contributed to more than a dozen publications, many in high-impact journals, and the new Phase 2 CTWN-A archive is already proving to be very useful for model evaluation and statistical emulator design. Early planning for GGCMI Phase 3, which will be coordinated with other climate impact sectors in collaboration with the ISI-MIP team, was also kicked off in Laxenburg.

Also discussed at the meeting was a raft of new projects for AgGRID that are in various stages of planning or implementation. This includes new gridded high-resolution regional projects in India (protocols finalized for Phase 1 with first simulations expected by the end of August 2017) and China (early planning stage), both of which will focus on important topics beyond direct climate impacts including irrigation, groundwater depletion, and farm and system-level adaptations. Also discussed was a new fast-track project being conducted for the AgMIP CGRA 1.5 degree project in partnership with the HAPPI-MIP group to look at the impact differences between 1.5 and 2 degrees C. Protocols and data for this project are available on the GGCMI data server and simulations have already started and are expected to be finalized in the next several weeks. We also finalized plans for our first major model improvement workshop, which brings together field-scale and gridded crop modelers with leaders from the FACE experiment community to look at how to improve the way that CO₂ effects are represented in models. This exciting effort is being led by AgGRID super-star participant Thomas Pugh from the University of Birmingham.



Another exciting new set of projects that was launched at the IIASA meeting, in collaboration with new AgGRID partners Alan Robock and Lili Xia from Rutgers University, looks at the effects of other types of natural and human-induced climate change, including small-to-large scale nuclear war/winter, geo-engineering, and volcanic activity. These projects are expected to run over the next several years and, besides being important assessment topics in their own right, will push us to confront many challenging boundaries in crop model use, such as ozone, UV, CO₂, and cold temperature effects and adaptations.

Finally, AgGRID took some time to look far into the future and think about what we want to do in 2020 and beyond. Plans were developed to look deeper into our models for understanding differences and doing model improvement, use crop-models for historical agricultural reanalyses, real-time global food system monitoring, forecasting, and drought early-warning, and improve regional and global gridded input and reference data sources with remote sensing products. Altogether an exciting and productive meeting in a beautiful setting, with participants giving high praise such as “that was not nearly as boring as I thought it would be.” Thanks to everyone who attended and helped us push the AgGRID team into this new and exciting era!

AgMIP Global Economics Workshop

IIASA, Laxenburg, Austria | June 15th, 2017

Participants:

Hermann Lotze-Campen (MAgPIE), Petr Havlik (GLOBIOM), Hugo Valin (GLOBIOM), Shinichiro Fujimori (AIM), Tomoko Hasegawa (AIM), Daniel Mason D’Croze (IMPACT), Elke Stehfest (IMAGE), Willem-Jan van Zeist (IMAGE), Ignacio Perez (CAPRI), Thomas Fellmann (CAPRI), Hans van Meijl (MAGNET), Abigail Snyder (GCAM) [and Page Kyle via skype], Marcel Adenauer (OECD), Roberto Valdivia (TOA, AgMIP Regional Econ), Franz Sinabell (WIFO Vienna; MACSUR), Depayan Debnath, FAPRI (currently OECD)

Outcome:

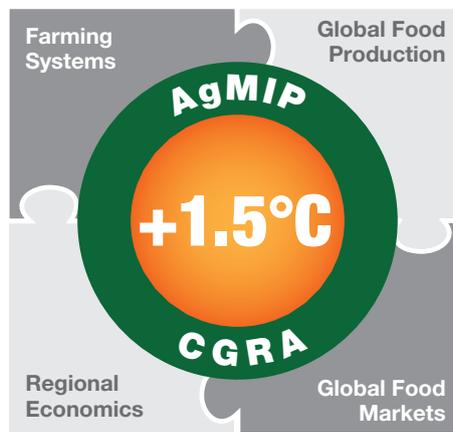
The group discussed technical issues on scenario definition for the AgSSPs and reporting of relevant model outputs. Shinichiro gave an overview of the current status of submissions on the core scenario set. Elke reported on the status of the decomposition analysis. Tomoko presented a draft paper on food security impacts of different SSPs, across various global economic models. Roberto and Daniel reported on first experiences in exchanging global model outputs with regional economics teams. A template for data transfer from all global economic models has been agreed. For an extended CGRA, the plan is to also include national level models/teams, depending on specific countries chosen. A global-regional econ workshop is planned at JRC, Sevilla, in the first quarter of 2018 (Task force: Petr, Ignacio, Daniel, Roberto).

The following papers are planned to be submitted for the Nov. 2017 deadline for IPCC SR1.5:

- Decomposition analysis across global econ models and SSP1/2/3 (Elke)
- Food security impacts (Tomoko)
- Synthesis paper on the AGCLIM50(1) project (Hans/Ignacio)
- Mitigation challenges for agriculture and land use, comparing “RCP1.9” vs. RCP2.6 (Petr, tbd.)

Later, e.g. for SR “Land”, the Global Econ group is planning a Special Issue (submission by fall 2018).





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Follow-on Working Groups:

AgMIP Global Gridded Crop Model Intercomparison (GGCMI)

AgMIP Global Economics

June 15th-16th, 2017

WORKSHOP OBJECTIVES:

1. Coordinate various AgMIP assessments of 1.5 and 2°C warming
2. Develop next set of Coordinated Global and Regional Assessments
3. Assess methodologies for connecting across scales and disciplines
4. Identify key sources of uncertainties across scales and disciplines
5. Convene AgMIP Global Economics and GGCMI teams for joint analysis of current outputs and planning of next work priorities

WORKSHOP OUTPUTS:

1. Preliminary analyses of +1.5 and 2°C Assessments
2. Synopses and established lead author teams for papers oriented toward informing IPCC Special Report on +1.5 and 2°C
3. CGRA Protocol framework for contributions to IPCC Special Report on Land / Food Security
4. Priority scenarios for next assessments on adaptation, mitigation, food security, and food policy

AGENDA

Day 1: Monday, June 12th

Day 1 Goals:

- Revisit overall motivation for research
- Consider regional context (examples from Pakistan and Senegal)
- Share preliminary results of +1.5 and 2°C assessments
- Incorporate learning from +1.5 and 2°C studies of AgMIP partners

- 7:45am:** Bus for participants departs Vienna hotels (Albertinaplatz)
8:30am: Check-in
- 8:45am:** Plenary – Gvishiani Room
8:45am: Welcome from AgMIP (Alex Ruane, Cynthia Rosenzweig and Petr Havlik)
8:55am: Welcome from IIASA (Pavel Kabat)
- 9:15am: Overview of CGRA (Cynthia Rosenzweig)
9:35am: Overview of +1.5 and 2°C Assessment Approach (Alex Ruane)
10:00am: Pakistan Regional Integrated Assessments Summary (Ashfaq Ahmad and Muhammad Ashfaq)
10:15am: Senegal Regional Integrated Assessments Summary (Dilys MacCarthy)
- 10:30am:** Coffee Break
- 10:50am:** Disciplinary Progress
10:50am: Climate Analysis (Alex Ruane and Meridel Phillips)
11:15am: Crop Impacts (Joshua Elliott, Alex Ruane and Christoph Müller)
- 11:45am:** Lunch
- 1:15pm:** Disciplinary Progress (Continued)
1:15pm: Regional Crop Approach (Gerrit Hoogenboom and Cheryl Porter)
1:45pm: Global Economic Results (Daniel Mason-D'Croz)
2:15pm: Regional Economic Plans (Roberto Valdivia)
2:45pm: Discussion
- 3:00pm:** Coffee Break
- 3:20pm:** Additional Assessments
3:20pm: Solution spaces to achieve +1.5 and 2°C Worlds (Petr Havlik)
3:35pm: HAPPI/GGCM (Carl-Friedrich Schleussner and Christoph Müller)
3:50pm: AgMIP Wheat +1.5 and 2°C Scenarios (Frank Ewert)
4:05pm: MACSUR European Heat Stress (Heidi Webber and Frank Ewert)
4:20pm: European Wheat Price Impacts (Frank Ewert)
4:35pm: WASCAL Agricultural Impacts (Heidi Webber and Dilys MacCarthy)
4:50pm: Dietary Pathways for Mitigation and SDGs (Hugo Valin)
- 5:10pm:** Discussion of Key Findings
- 6:15pm:** Plenary Adjourns (bus departs for workshop dinner at 6:30pm)

Day 2: Tuesday, June 13th

Day 2 Goals:

- **Identify New Methodological Developments and Priorities**
- **Evaluating uncertainties around the core assessment framework**
- **Comparing with additional but related assessments**
- **Determine paper-writing teams**

7:45am: **Bus for participants departs Vienna hotels (Albertinaplatz)**

8:30am: **Plenary – Gvishiani Room**

8:30am: Day 2 Goals (Alex Ruane, Cynthia Rosenzweig, and Petr Havlik)

8:40am: **Introduction to Breakout Sessions**

8:40am: Climate-crop methodologies (Alex Ruane and Christoph Müller)

8:45am: Global-regional economics methodologies

(Hermann Lotze-Campen and Roberto Valdivia)

8:50am: Mitigation Challenge (Petr Havlik and Gerrit Hoogenboom)

8:55am: Adaptation Challenge (Joshua Elliott and Shinichiro Fujimori)

9:00am: **First Breakout Groups (Gvishiani Room and Raiffa Room)**

a) Climate-crop uncertainties (Alex Ruane and Christoph Müller)

b) Global-regional Economics

(Hermann Lotze-Campen and Roberto Valdivia)

10:10am: **Coffee Break and Group Photo**

10:40am: **Second Breakout Groups (Gvishiani Room and Raiffa Room)**

c) Mitigation (Petr Havlik and Gerrit Hoogenboom)

d) Adaptation (Joshua Elliott and Shinichiro Fujimori)

11:45am: **Lunch**

1:00pm: **Plenary**

Joint mitigation and adaptation strategies - *Can we identify examples where efforts for one help/hinder the other?* (Gerrit Hoogenboom)

1:15pm: Reports from breakout groups

1:40pm **Linking Additional CGRA Elements**

1:40pm: Linking in AgCLIM50 (Ignacio Perez-Dominguez)

2:00pm: Using Food Security Indicators (Tomoko Hasegawa)

2:20pm: Linking in MACSUR and WASCAL Studies (Heidi Webber and Dilys MacCarthy)

2:40pm: Linking in Wheat Team Assessments (Frank Ewert)

3:00pm: **Coffee Break**

3:20pm: Update from MACSUR (Hermann Lotze-Campen and Franz Sinabell)

3:30pm: **Determining Paper Teams and Synopses**

3:30pm: Core CGRA Assessment Papers – Discussion

3:50pm: Additional Assessment Papers -- Discussion

4:10pm: *Assignment: Write up basic outline, key figures, and synopsis*

5:10pm: Discussion

6:00pm: **Plenary Adjourns** (bus returns to Vienna at 6:15)

Day 3: Wednesday, June 14th

Day 3 Goals:

- Set priorities and directions for the CGRA working group
- Affirm CGRA contributions to IPCC Special Reports
- Share ideas on future collaboration and funding

- 7:45am:** Bus for participants departs Vienna hotels (Albertinaplatz)
- 8:30am:** Plenary – Gvishiani Room
8:30am: Day 3 Goals (Alex Ruane, Cynthia Rosenzweig, and Petr Havlik)
8:40am: The World in 2050 (Naki Nebojsa)
- 9:10am:** Overall Participation and Orientation of CGRA
May break into two groups for discussion if >30 people in attendance
- Priority Frameworks Elements for Inclusion/Development
 - Priority Researchers & Groups for Inclusion/Development
 - Priority Scenarios for Assessment
 - Funding Opportunities
 - International Initiatives
- 10:20am:** Coffee Break
- 10:40am:** CGRA and the IPCC Special Report on Land (Alex Ruane)
- Key questions and requests for information
 - Role / Prominence of Food Security
 - Timelines and need for iconic figures
- 11:00am: Discussion on priority scenarios for CGRA assessments
- 11:45am:** Lunch
- 1:15pm:** CGRA and the IPCC Sixth Assessment Report (Cynthia Rosenzweig)
- Timelines and need for iconic figures
- 1:45pm: Discussion on priority scenarios for CGRA assessments
- 3:00pm:** Coffee Break
- 3:20pm:** Discussion
- Timelines for +1.5 and 2°C Report Completion
 - Game plan for paper completion
 - Priority scenarios for CGRA assessments
 - Opportunities for collaboration and funding
- 5:30pm:** CGRA Workshop Adjourns (Bus returns to Vienna at 5:45pm)

Day 4: Thursday, June 15th

- 8:15am:** Bus for participants departs Vienna hotels (Albertinaplatz)
- Global Gridded Crop Model Intercomparison Working Group (Gvishiani Room)
 - Global Economics Working Group (Raiffa Room)
- 5:15pm:** Bus for participants returns to Vienna hotels (Albertinaplatz)

Day 5: Friday, June 16th

- 8:15am:** Bus for participants departs Vienna hotels (Albertinaplatz)
- Global Gridded Crop Model Intercomparison Working Group (Gvishiani Room)
- 4:15pm:** Bus for participants returns to Vienna hotels (Albertinaplatz)

AgMIP COORDINATED GLOBAL AND REGIONAL ASSESSMENT WORKSHOP

IIASA, Laxenburg, Austria | June 12th-14th, 2017

PRESENTATIONS

Day 1

[Welcome and Workshop Goals](#) (Alex Ruane, Cynthia Rosenzweig, Petr Havlik)

[Overview of CGRA](#) (Cynthia Rosenzweig)

[Status of USDA/AgMIP Coordinated Global and Regional Assessment of Agriculture in +1.5 and +2.0 C Worlds](#) (Alex Ruane)

[Regional Integrated Assessment of Rice-Wheat and Cotton-Wheat Cropping Systems of Punjab, Pakistan](#) (Ashfaq Ahmad and Muhammed Ashfaq)

[Impact of Climate Change on Livelihoods of Smallholder Farmers: Nioro Senegal](#) (Dilys MacCarthy)

[Climate Scenarios and Uncertainty for 1.5 and 2.0 C Worlds](#) (Alex Ruane and Meridel Phillips)

[Constructing Global Yield Projections for +1.5 and +2.0 C Worlds](#) (Joshua Elliot, Christoph Müller, Alex Ruane, Meridel Phillips)

[Regional Crop Approach](#) (Gerrit Hoogenboom)

[Update from the Global Economic Modelling Group](#) (Daniel Mason-D'Croz)

[Regional Economics Plans Coordinated Global and Regional Assessment +1.5/+2.0 C Worlds and Beyond](#) (John Antle, Roberto Valdivia)

[Solutions spaces to achieve 1.5 and 2.0 C World](#) (Petr Havlik)

[AgMIP – Wheat 1.5/2.0C Scenario](#) (Frank Ewert, Senthold Asseng, Pierre Matre)

[Half a degree additional warming, prognosis and projected impacts \(HAPPI\)](#) (Carl-Friedrich Schlegel, Christoph Müller)

[MACSUR European Heat Stress Study & planned CGRA Study](#) (Frank Ewert, Heidi Webber)

[Climate Change Impacts on Food Production in Sudan Savanna of West Africa](#) (Babacar Faye et al)

[Climate Change Impacts on Landuse, Crop Production, and Prices in Europe](#) (Heidi Webber & Frank Ewert)

[Dietary Pathways for Mitigation and SDGs](#) (Hugo Valin)

Day 2

[The Impact of +1.5 and +2.0 C warming on Agriculture](#) (Alex Ruane)

[Mitigation Challenge](#) (Petr Havlik and Gerrit Hoogenboom)

[Adaptation in crop models](#)

[Climate Crop Uncertainties Report Back](#)

[Region-Global Economics Report Back](#)

[Climate Change and mitigation Impacts on Food Security](#) (Tomoko Hasegawa)

[Linking in MACSUR and WASCAL Studies](#)

Day 3

[The Impacts of +1.5 and +2.0 C Warming on Agriculture](#)

[Aspen Global Change Institute Workshop Core Risk and Resilience Framing](#)

[A Global Research Initiative in Support of a Successful Implementation of the UN 2030 Agenda](#)

(Caroline Zimm)

AgMIP COORDINATED GLOBAL AND REGIONAL ASSESSMENT WORKSHOP

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