

Ninth Global Workshop Report

*of the Agricultural Model Intercomparison
and Improvement Project*

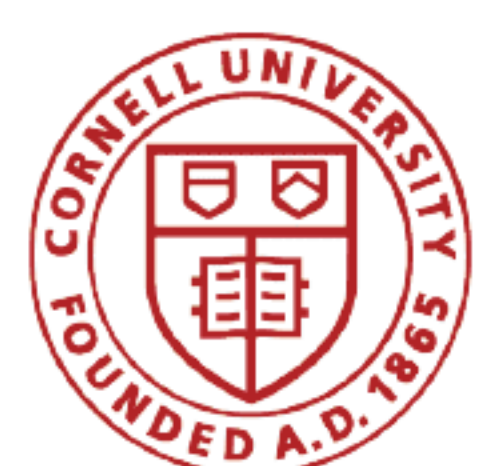
June 26-30, 2023

Columbia University
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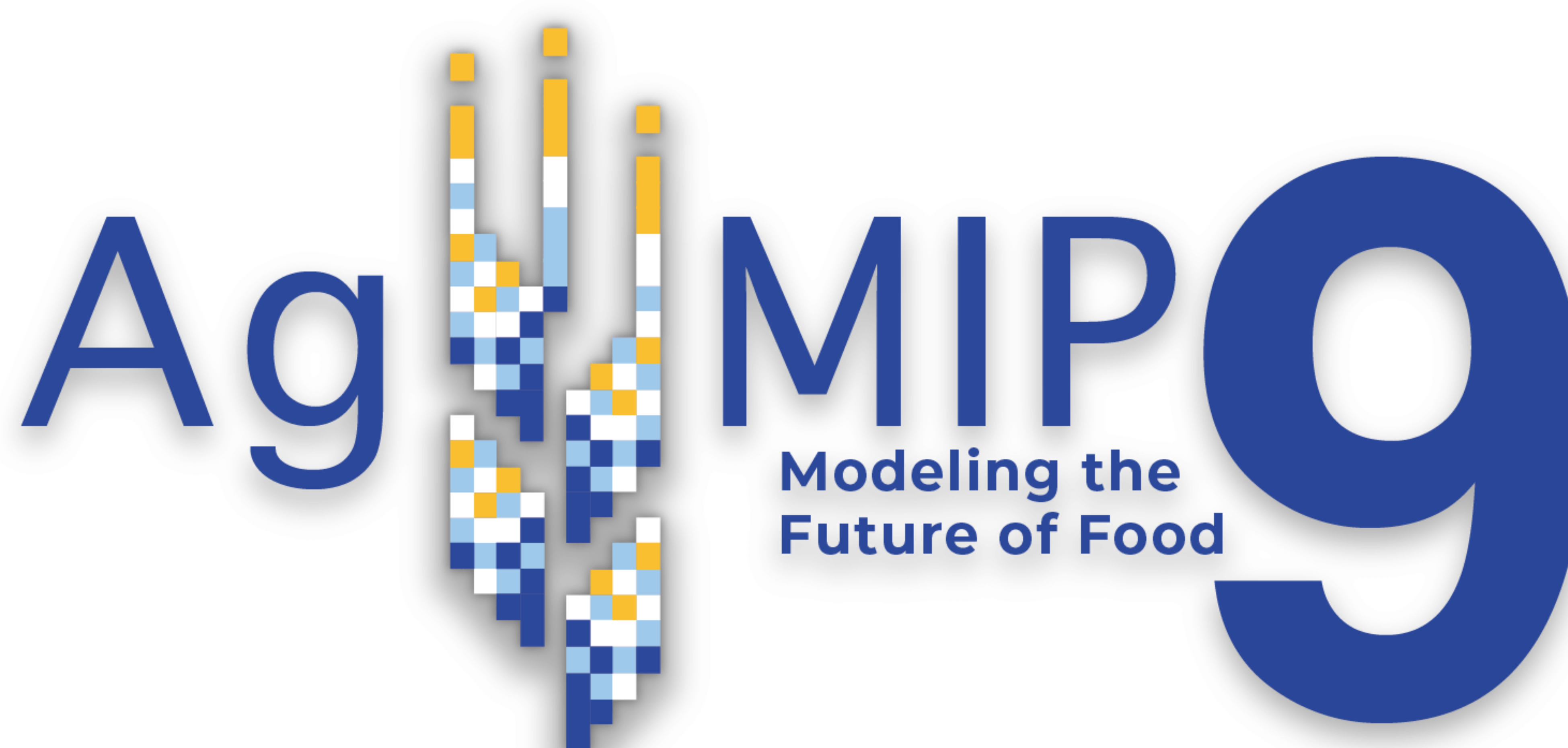


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EXECUTIVE SUMMARY

The Ninth Global Workshop of the Agricultural Model Intercomparison and Improvement Project (AgMIP9) was held at Columbia University in New York City, New York, USA from June 26-30, 2023 and convened over 300 modeling experts from 44 countries and key stakeholders both in person and virtually. Beyond AgMIP's underlying goals and mission, there were six focus areas – or main themes – of the workshop:

1. Improve Models and Integrated Assessments
2. Utilize New Tools to Address Food System Challenges
3. Enhance Inclusion, Equity, and Justice in Food System Modeling
4. Synergize Adaptation and Mitigation Along the Value Chain
5. Deepen Collaborations for the Future of Food, Land, and Health
6. Strengthen Science-Stakeholder-Policy Linkages for Future Systems

AgMIP9 featured over 50 sessions, including Plenaries, Paper and Poster Presentations, AgMIP Team Working Sessions, Radical Collaboration Sessions, and Side Team Meetings. Having a variety of session types throughout the week encouraged AgMIP community members to interact in novel ways and break down research and networking silos.

As the first major gathering of AgMIP post-COVID, AgMIP9 reinvigorated its community members through the various presentations and sessions that took place throughout the week. AgMIP9 felt to be a turning point in the group's history: the beginning of AgMIP2.0. AgMIP has solidified its foundational tenets, but will continue to push forward and establish new approaches to how the future of food can be modeled in the unprecedented times of climate extremes and post-global pandemic. A key focus moving forward will be refining and empowering its approach to stakeholder engagement and research communication. The workshop ended with shared excitement looking towards the future and the next Global Workshop: AgMIP10 which is under discussions to take place in late 2024 or early 2025.

INTRODUCTION

The Agricultural Model Intercomparison and Improvement Project (AgMIP) was founded in 2010 and has grown to an extensive international network consisting of over 1,200 scientists and 50+ research and application teams aiming to assess and predict the state of global food systems under current and future climates, agricultural development, shifting consumer demand, and the emergence of other interacting pressures and acute stresses. To do this AgMIP has created a transdisciplinary collaborative space for climate, crop, livestock, economics, and nutrition experts. Not only does AgMIP use ensembles and coupled versions of the latest models, it also works to improve these models to better portray the performance of food systems under future conditions. At the heart of AgMIP is its collaboration with key sectoral stakeholders and observational programs – AgMIP models are made alongside those directly involved in the “on the ground” work in order to provide ready-to-use products that aid decisions at multiple scales across the globe.

The Ninth Global Workshop of the Agricultural Model Intercomparison and Improvement Project (AgMIP9) was held at Columbia University in New York City, New York, USA from June 26-30, 2023 and convened over 300 modeling experts and key stakeholders from 44 countries. Beyond AgMIP’s underlying goals and mission, there were six areas focused on for the duration of the workshop. The main themes of the workshop were:

1. Improve Models and Integrated Assessments

2. Utilize New Tools to Address Food System Challenges
3. Enhance Inclusion, Equity, and Justice in Food System Modeling
4. Synergize Adaptation and Mitigation Along the Value Chain
5. Deepen Collaborations for the Future of Food, Land, and Health
6. Strengthen Science-Stakeholder-Policy Linkages for Future Systems

Throughout the week, over 50 sessions were held, including six Plenaries, 21 Paper Presentation sessions (each with multiple author presentations), 12 AgMIP Team Working Sessions, five Radical Collaboration Sessions, and 16 Side Team Meeting Sessions. All sessions were hybrid, with both in-person and virtual participants, with the exception of select closed-door side sessions. Poster presentations were also featured throughout the entire week, and attendees were able to filter through and view posters during breaks and lunches. Having a variety of session types throughout the week encouraged AgMIP community members to interact in novel ways and break down research and networking siloes.

The remainder of this AgMIP9 Workshop Report delivers AgMIP9’s key takeaways and provides details on each session that took place throughout the week. The complete lists of presentations, presenters, workshop participants, and workshop agenda can be found in the report’s appendix. Recordings of the workshop plenaries are also available and are linked in their respective sections.

AgMIP9 Session Types

- Plenary Sessions: Each plenary focused on one of the six workshop themes. Plenary sessions consisted of keynote speeches and panel presentations, followed by an opportunity for the AgMIP community to ask the keynote speakers and panelists questions.
- Paper Presentation Sessions: Allowed AgMIP community members to share their latest research findings with the larger group. Presenters had approximately 15 minutes to speak, including an opportunity for questions and answers at the end. These sessions were organized to facilitate participants ability to see multiple sessions related to their topics of interest while also encouraging attending sessions outside of their immediate interest.
- AgMIP Team Working Sessions: An opportunity for workshop participants to focus on specific AgMIP research areas and questions and collaborate with individuals outside of their areas of expertise. Team working sessions were designed to alert participants to ongoing AgMIP activities, to encourage feedback and discussion around activity aims, and to show participants how they could join and participate in Team activities.
- Radical Collaboration Sessions: A new addition to the AgMIP Global Workshop programming – provided a space for workshop participants to break down silos and interact with other experts that they may not usually work with. These sessions were designed around areas that appear to be on the cusp of major collaborative breakthroughs that would dramatically benefit agricultural sector decision making.
- Poster Presentations: Allowed AgMIP community members to share their latest work outside of the workshop's Paper Presentation Sessions. Posters were available for viewing throughout the entirety of the main workshop programming.
- Side Team Meeting Sessions: Took place outside of the main workshop programming, and provided an opportunity for existing and newly-forming AgMIP Teams to gather and discuss latest work and next steps in their area of research. Several of these sessions were oriented toward advancing in-progress work among teams that have ongoing research and thus those seeking an introduction to these topics were encouraged to present corresponding Team Working Sessions in the main program.

DAY 1, JUNE 27

Welcome and Introduction

Dr. Cynthia Rosenzweig opened the workshop by acknowledging AgMIP's generous donors and providing an overview of the days ahead. She then introduced the AgMIP Executive Committee, of which Drs. Senthod Asseng, Mario Herrero, Hermann Lotze-Campen, Laure Tall, and Anthony Whitbread provided brief opening remarks. Dr. Vellingiri Geethalakshmi participated virtually from India throughout the workshop.

Dr. Rosenzweig went on to thank the AgMIP Steering Council and introduce one of its co-chairs, Dr. Morven McLean. Dr. McLean acknowledged the vastness of the AgMIP network, which expands beyond just those present at this year's workshop. She explained that the Steering Council would be meeting throughout the week in order to advance AgMIP's role in the science, stakeholder, and policy spaces. "In short, we are here to support you and all of the work you do," Dr. McLean concluded.

Finishing off the introductory remarks, Dr. Rosenzweig explained the six overarching objectives of the workshop, and that each would have a dedicated plenary session throughout the week.

Dr. Alex Ruane then introduced the various areas of expertise of the workshop participants in attendance. He emphasized that from climate to crops, livestock to soils, and economics to machine learning, there was an extensive diversity of knowledge and experience present at AgMIP9. Dr. Ruane encouraged participants to engage with one another and to make new connections, especially con-



Dr. Cynthia Rosenzweig

sidering the lack of in-person conferences during the last few years.

AgMIP9 Keynote

Dr. Jessica Fanzo, Columbia Climate School

In her keynote address, Dr. Jessica Fanzo discussed how the present is a critical time for food systems and modeling, using an optimistic and uplifting perspective, as opposed to a more typical pessimistic one. She acknowledged the founding of the Columbia University Climate School, as well as the brand new Food for Humanity Initiative, which seeks to bring together climate and food systems knowledge and leaders.

Instead of a data-heavy presentation, Dr. Fanzo chose to focus on the research community itself. The food system "needs a lot of fixing," she stated, and went on to explain why—she mentioned a variety of components, including past governance decisions, extreme weather events, the global COVID-19 pandemic, and the climate crisis. Turning to how we think about these issues, she urged researchers to consider how food systems interact with other systems, such as

those of education and health. Dr. Fanzo also emphasized the inequities of the negative impacts of the current food system.

After pointing out the pressing issues with the food system and its adjacent systems, Dr. Fanzo reminded the audience that positive change and achievements are occurring as well. “We have to remember what’s not working,” she said, “but we also have to remember what is working, if we want to make sustainable change.”

Dr. Fanzo then shifted to give guidelines on how researchers can move “beyond-tinkering,” and make sure their work is impactful for policymakers and beyond:

1. Remember our shared history
2. Keep generating the evidence base
3. Scale the evidence and tools
4. Use the momentum
5. Don’t ignore policy, politics, and politicking
6. Grapple with elephant in the room: the power imbalance in the global food system

To finish, Dr. Fanzo shared her reason for hope in food systems science. “Research can and does bring about wholesale changes in attitudes, political thought, and action,” she said. In order for it to do so, she gave specific advice to researchers, including to hone in on real-world issues, to consider political incentives for change, to mitigate trust issues and biases, and to purposefully prioritize equity.

Plenary: Improving Models and Integrated Assessments

Keynote: Cynthia Rosenzweig, NASA GISS/Columbia Climate School

Panel:

Gerrit Hoogenboom, University of Florida (Moderator)

Minpeng Chen, Renmin University of China

Madina Diancoumba, ZALF

Christoph Müller, PIK

Marco Sanchez-Cantillo, FAO

Following the AgMIP9 Keynote was the first plenary session of the week, which focused on agricultural and food models in the age of climate action. Dr. Rosenzweig began by describing four lessons we learned from the COVID-19 pandemic—the importance of models, the stochasticity of food system shocks, the need to increase equity, and the existence of a digitally hybrid world.

After Dr. Rosenzweig gave an in-depth overview of AgMIP’s mission, the panel portion of the session began with its moderator, Dr. Gerritt Hoogenboom, who introduced each of the four panelists.

Dr. Madina Diancoumba, the first panelist, started by describing how heterogeneous agricultural landscapes and climate change are having an impact on soil, water, nutrient balances, and crop productivity in West Africa. She stated that these influences and impacts are not captured well by current crop models. To improve these models, Dr. Diancoumba suggested that researchers focus on calibrating them to local crop characteristics, local weather, local practices, and local soils, although this may be difficult, due to limited data availability regarding West Africa specifically.

Next was Dr. Christoph Müller, who spoke more about global-scale models, as opposed to local. He emphasized the importance of evaluating food system models, in order to increase their accuracy for various usages. In order to do this, he said that researchers need to work together to define standards for model evaluations, and asked the audience to contribute to this effort via an online survey.

Dr. Minpeng Chen spoke afterwards, with a focus on policymaker and stakeholder perspectives. In order to produce models that address the needs of policymakers, she explained that researchers could model the links between different potential models, including food security, economic development, and biodiversity. This would entail collaboration between various disciplines. She also emphasized that quick and simple modeling tools are helpful for policymakers when making decisions. Dr. Chen described the importance of a good understanding of socioeconomic context, as well as the high potential of a data and knowledge sharing platform. To finish her section of the panel, she stressed the importance of models that enhance quantitative adaptation assessment.

Dr. Marco Sanchez-Cantillo was the final speaker of the panel, and also centered his portion around policy optimization. “We can no longer analyze sector challenges,” he said, “but rather, we need to analyze systems challenges.” Because researchers must consider multiple systems when thinking about the future, models are increasingly complex and allow for policymakers to improve their decision and budget making capabilities. The plenary session ended with a Q&A session for the panelists.

Plenary: Utilizing New Tools to Address Food System Challenges

Keynote: Sibiry Traore, ICRISAT

Panel:

Alex Ruane, NASA GISS/Columbia Climate School (Moderator)

Ioannis Athanasiadis, Wageningen University and Research

Medha Devare, International Institute for Tropical Agriculture

After an introduction by Dr. Alex Ruane, the moderator of the panel section of this plenary session, Dr. Sibiry Traore began by discussing the complexity of the global food system and its challenges. He posed the question of whether or not “we really have a clear idea of which challenges we want to address, and whether we have a good sense of the big picture?” To respond to this question, he reminded the audience that for every hungry person in the world, there are two obese people. This, he urged, is something to keep in mind when



Dr. Alex Ruane

formulating research questions relating to food systems.

Dr. Traore then shared three humorous and insightful cartoons, which each conveyed one central point—new tools and approaches must actually be applicable to the people producing and consuming food. Many new technologies and methods tend to lack knowledge “from the ground,” which needs to be improved. Dr. Traore provided examples of how researchers are approaching this improvement: parameterizing crop models and predicting agricultural transitions with machine learning, remote sensing, and belief extraction. Following Dr. Traore’s presentation, Dr. Ruane gave a brief introduction to the panel topic and the two panelists: Drs. Ioannis Athanasiadis and Medha Devare. He first discussed the IPCC’s concept of climatic impact-drivers, and their impacts on the agricultural sector and global food system. Because of the abundance of these climatic impact-drivers, Dr. Ruane stated that crop models must “move beyond consideration of just average conditions.” Although certainly a challenge, doing so would improve the applicability and accuracy of the models.

Dr. Ruane then touched on the idea of high-quality configurations as a foundation for multiple applications. Researchers are gaining access to large amounts of new data, but before it is usable, there are structural issues that must first be addressed. Dr. Ruane finished his introduction by describing variables that cannot be easily predicted (shifts in dietary demand, degradation of land and water resources, new markets and trade subsidies, etc.) and asking—can we model food systems development and adaptation potential?

Dr. Ioannis Athanasiadis’ talk focused on agricultural modeling and artificial intelligence (AI), as well as prospects for the newly launching AgMIP Team on Machine Learning (AgML). He started by considering if AI will assist researchers in addressing food security issues, but warned the audience not to expect a “ChatGPT moment.” Food systems problems are not clearly defined and very complex, and AI will not be able to simply solve them. Additionally, he warned against a highly data-driven AI approach to solving food systems problems; this is both because there is not yet enough agricultural data, and because we want people to be the focus of our solutions.

So, Dr. Athanasiadis proposed a “use-inspired, hybrid approach” to using AI when solving food systems problems—this would involve using process-based models and data-driven models together, where each is most effective, inclusively and responsibly. He stated that the best way to implement this approach is “the AgMIP way,” by intercomparing various protocols.

Dr. Medha Devare followed with a presentation about various new tools for data collection, aggregation, comparison, and usage. She started by talking about a data collection tool called DataScribe, which allows for data from different projects to be easily comparable and aggregatable. The platform ensures that data is standardized across projects, saving time and promoting collaboration. Dr. Devare also described attempts to standardize previously collected data, in order for it to be easily utilized alongside novel data. She then introduced a tool called AgWise, a collaborative framework with the goal of generalizing scripts, models, and other approaches to provide

tailored solutions for various agricultural scenarios.

Dr. Ruane then posed a closing question for the entire panel: are these really new tools, or are they pre-existing tools that have just taken a while to successfully take hold in the agricultural community? Dr. Traore answered first, stating that while remote sensing itself is not a novel tool, its granularity and timeliness has improved in recent times. He also argued that the same applies to many methods in machine and deep learning, as well as “whatever we put under the umbrella of artificial intelligence.” In his response, Dr. Athanasiadis largely agreed, and emphasized the increase in quality and capabilities of AI softwares. Additionally, he pointed out that new approaches focusing on optimization and reinforcement learning are emerging currently. Dr. Devare provided a close to the panel with her answer, in which she emphasized how difficult it is to get researchers to share data. She drew on tools from the biomedical sphere when describing how data sharing could be improved in food systems modeling research.

Day 1 Lunch – World Regions

For the first group lunch of the week, participants were encouraged to sit with fellow researchers grouped by world regions, including:

- Australia & Oceania
- Central and South America & Caribbean
- Europe
- Middle East & North Africa
- North & East Asia
- North America
- South Asia
- Sub-Saharan Africa

To inspire discussion, the following questions were posed:

- What are the main agricultural systems, populations and markets at risk of climate extremes and climate change in your region?
- What new AgMIP partnerships are needed to assess the changing nature of agricultural and food system risk in your region?
- How can we strengthen ongoing AgMIP partnerships to overcome technical and structural challenges to build a more productive and resilient future for food?

Day 1 Paper Presentation Sessions

Following lunch, seven Paper Presentation Sessions took place concurrently and were prompted by the following question: What are the latest research results and key findings for applications?

Session titles, leaders, and presenters:

PS1A: Improving crop models to capture extreme climate responses

Leaders: Gerrit Hoogenboom and Montse Salmeron

- Lessons Learned from Crop Model Inter-comparisons – Kenneth J. Boote
- Simulation of Evapotranspiration and Soil Temperature under Maize: an Inter-comparison Among 41 (ET) and 33 (Soil T) Maize Models – Bruce A Kimball
- Intercomparison of soybean models for simulation of evapotranspiration and uncertainty under variable environmental conditions – Montse Salmeron
- Response of crop models’ sub-routines to changes in atmospheric CO₂ – Davide Cammarano

PS2A: Regional integrated assessments

Leaders: Laure Tall and Sabine Homann-Kee Tui

- Can crop variety affect climate change impacts signal on major crop yields in Senegal? – Babacar Faye
- Consortium on Climate Change, Sustainability & Conservation (CCSC): A Way Forward for Sustainable Food Security & Smart Policies to Address Global Food Systems – Wajid Nasim (Virtual)
- Balancing co-benefits and trade-offs between climate change mitigation and adaptation under mixed crop-livestock systems in semi-arid Zimbabwe – Sabine Homann-Kee Tui
- Don't put all your eggs in one basket: legumes diversification to improve resilience of rainfed cropping systems in subhumid Zimbabwe – Valentin Pret
- Improving the ozone damage parameterization in Community Land Model 5 (CLM5) – Jyoti Singh
- Effects of climate change and autonomous adaptation on spring barley production across 18 sites in Europe – Mareike Köster
- Enabling Anticipatory Action to Reduce Acute Malnutrition – Molly Brown, presented by Walid Ouaret
- Projecting a food insecure world: Equity implications of land-based mitigation in IPCC modelled mitigation pathways – Sreeja Jaiswal (Virtual)
- Hotspots for Fall Army Worm in Africa under CMIP6 scenarios – Rosita Endah epe Yocgo (Virtual)

PS3: Global assessments of food systems, trade & diets in a changing world

Leaders: Dominique van der Mensbrugghe and Daniel Mason-D'Croz

- Modeling Global Cropland Expansion: Trade-Offs with Biodiversity, Carbon Emissions, and Food Security – Julia M. Schneider
- Options for reforming agricultural subsidies from health, climate, and economic perspectives – Marco Springmann (Virtual)
- Assessing impacts of climate change on agricultural markets taking uncertainties in global crop yield projections into account – Ruth Delzeit (Virtual)
- Addressing the Rising Food Demand in The Gambia: Can Climate-Smart Agriculture and Increased Crop Productivity Reduce Dependence on Imports? – Tony Carr

PS4: Modeling nutrition, food security and crop losses

Leaders: Lew Ziska and Jose Guarin

- Increased mineral fertilizer use on maize can improve both household food security and regional food production in East Africa – Gatien Falconnier
- Climate change impacts on global crop productivity and its nutritional value – Jonas Jägermeyr

PS5: Seasonal forecasting and food shocks

Leaders: Phil Alderman and Kaela Lucke

- Combining a Process Based Model with Machine Learning for Potato Yield Prediction in Prince Edward Island, Canada – Mariaelisa Polsinelli
- Assessing the performance of crop forecasts for in-season nitrogen management of winter wheat – Marlene Palka
- Implications of wheat supply disruptions for global food security – Rogerio de Souza Noia Junior
- Multi-Breadbasket Failures and Shocks to Food Systems: AgMIP Simulations – Ron Sands

PS6: Data assimilation and remote sensing

Leaders: Meijian Yang and Luke Monhollon

- Exploring the role of model structure and input uncertainty in data assimilation-based crop yield prediction: a comparative study of three crop models and their ensemble – Hossein Zare
- LAI Integration to Reconcile Cultivar and Soil Inaccuracies in DSSAT-Maize – Luke Monhollon

- Coupling WOFOST with Sentinel-2 data to estimate maize yields under rainfed small-scale farming systems in the Eastern Cape, South Africa – Luleka Dlamini
- Combining model-based optimization and data assimilation: The next generation of decision support systems? – Raphael Linker
- Satellite-based modeling of sugarcane photosynthesis and transpiration at the field scale – Xiangming Xiao

PS7: Data and information technologies advances for Ag modeling

Leaders: Pierre Martre and Walter Baethgen

- Climate information's translation into agricultural and economic terms to support strategic decisions in crop production: the case of SIMAGRI in Senegal – Adama Faye, presented by Walter Baethgen
- A global open-source dataset of monthly irrigated and rainfed cropped areas (MIRCA-OS) for the 21st century – Endalkachew Kebede
- COMPASS: An ensemble modeling platform based on containerized crop models – Kwang soo Kim
- GLUEOS: A high performance computing system based on the orchestration of containers for the GLUE parameter calibration of a crop growth model – Kwang soo Kim
- MySmartFarm: A crop growth monitoring and decision support system for Scottish farmers – Mohamed Jabloun, presented by Mike Rivington
- Crop2ML: a framework for crop model component exchange and reuse to increase model reproducibility and accelerate model improvement – Pierre Martre

Day 1 AgMIP Team Working Sessions

After a brief coffee break and for the last session of the day, workshop attendees then divided up for AgMIP Team Working Sessions and were encouraged to think

about the following:

- What are main AgMIP activities in this area?
- How can new participants get involved?
- What are plans and priorities for the next year?

Session titles and leaders:

- WS1: Crop model intercomparison and improvement
Leaders: Senthold Asseng and Jean-Louis Durand
- WS2: Modeling the global food system
Leaders: Hermann Lotze-Campen and Ron Sands
- WS3: Regional integrated assessments for policy planning
Leaders: Roberto Valdivia, Dilys MacCarthy, and Geethalakshmi Vellingiri
- WS4: Seasonal forecasting and data assimilation
Leader: Phil Alderman
- WS5: Mitigation models and food system emissions
Leaders: Francesco Tubiello and Kevin Karl
- WS6: Linking models for diets and nutrition
Leaders: Pauline Scheelbeek and Tony Carr

Evening Reception

All workshop participants were invited to attend an Evening Reception, which included refreshments and hors d'oeuvres. Dr. Cynthia Rosenzweig provided a welcome and introduction, and brief remarks were made by Dr. Jeff Shaman, Interim Dean of the Columbia Climate School, and Dr. Gavin Schmidt, Director of the NASA Goddard Institute for Space Studies. Dr. Rosenzweig also introduced Science & Art in the Time of Coronavirus, an art exhibition connecting climate research with artistic expression by Kate Doyle, which featured a video that was played while attendees mingled.

DAY 2, JUNE 28

Plenary: Enhancing Inclusion, Equity, and Justice in Food System Modeling

Keynote: Kate MacKenzie, NYC Mayor's Office of Food Policy

Panel:

Laure Tall, IPAR (Moderator)

Sithembile Mwamakamba, FANRPAN

Carolina Saavedra, Stone Barns Center for Food & Agriculture

Roberto Valdivia, Oregon State University

The moderator of the panel portion, Dr. Laure Tall, introduced this plenary session, by speaking on how the global food system is rooted in colonialism. She emphasized both how food systems are negatively impacting the environment, and how important it is to recognize food as a right. Tall then introduced the keynote of the plenary, Kate MacKenzie.

Ms. MacKenzie began her presentation with a brief overview on the Mayor's Office of Food Policy—it is a codified Mayoral Office that provides advice to the Mayor and other leadership on all

issues related to food. Because New York City's food system is very large and complex, the office advises in many different areas, including food assistance, food business, and food purchasing. MacKenzie stressed that the Office strives to have equity at the core of its policies. She then showed a report released annually by the Mayor's Office of Equity, which details the social indicators of equity across various sectors.

Ms. MacKenzie introduced to the audience Mayor Eric Adams' 10-year food policy plan, Food Forward, which contains five primary goals:

1. All New Yorkers have multiple ways to access healthy, affordable, and culturally appropriate food
2. New York City's food economy drives economic opportunity and provides good jobs
3. The supply chains that feed New York City are modern, efficient, and resilient
4. New York City's food is produced, distributed, and disposed of sustainably
5. Support the systems and knowledge to implement the 10-year food policy plan

She highlighted certain aspects of the plan, including an algorithm to determine the distribution of emergency food to soup kitchens and food pantries.

Ms. MacKenzie then shifted to focus on one specific strategy of the Mayor's Office of Food Policy, and how it connects to climate goals and research. She explained that New York City was the first city in the United States to join the World Resources Institute's Cool Food



Dr. Laure Tall (left) and Ms. Kate MacKenzie (right)

Pledge, which provides resources and support to decrease carbon emissions directly attributable to food purchases. New York City has committed to decreasing these emissions by 25% by 2030, with hopes to reach even a 33% decrease. She explained that in order to make these decreases, the city has been analyzing the sources of all of its food purchases. Data collection for this analysis began in 2019 and is continually evolving and improving.

Ms. MacKenzie also noted that for the first time ever, this past April, New York City included food initiatives in its sustainability plan. Following only buildings and transportation, food is ranked as the third major contributor to greenhouse gas emissions in New York City, according to the Mayor and Chief Climate Officer's integrated greenhouse gas inventory. In response to this information, the city has launched the Plant Powered Carbon Challenge to motivate the private sector to decrease carbon emissions by 25% as well—it promotes the serving of foods that require less carbon to produce.

Following the keynote address by Ms. MacKenzie were the panelists—Ms. Carolina Saavedra, Dr. Roberto Valdivia, and Dr. Thembi Mwamakamba—who were introduced by Dr. Tall. Carolina Saavedra spoke about her experience as a Community Education Manager at Stone Barns Center, a nonprofit farm, education, and research center. In this position, she works to “bridge the community to the farm’s experimental work,” with community having vast meaning, including soil health scientists, those who live in proximity to the farm, urban farms, and more. Saavedra also spoke from her perspective working at La Morada, an indigenous and family-owned restaurant



From left to right: Ms. Carolina Saavedra, Dr. Roberto Valdivia, and Dr. Thembi Mwamakamba

in the Bronx, with a focus on activist work. Additionally, she touched on her experience working with Bruckner Mott Haven Community Garden. Linking these three spaces, said Saavedra, is mobilization “via communal needs,” whether it be soil microbes’ needs, community health needs, or educational needs. Each of the three organizations discussed by Saavedra utilize food to promote equity and justice in some way.

Dr. Roberto Valdivia spoke after Ms. Saavedra, and began by suggesting that although there seems to be consensus that social inequities must be addressed in order to achieve food system transformation, not enough is actually being done to achieve this. He also referenced a paper that urged food system scientists to try to understand what is happening at the local and social levels when creating models.

Last to speak was Dr. Thembi Mwamakamba, who addressed the question of “how do we enhance inclusion, equity, and justice in food systems, and how do we link researchers to policymakers?” Her simple response was to “leave no one

behind.” She urged the audience to think deeply about this response, and stated that we need to create an open environment, where all are accepted to participate and sharing—knowledge, expertise, technology, financial resources—is encouraged.

Keynote: NASA Perspectives on Agriculture from Field to Space

Karen St. Germain, Director of the Earth Science Division, NASA

Having joined virtually, Dr. St. Germain began by describing the data NASA currently produces and how the agricultural sector uses it, and then shifted to discuss what the organization is moving towards next. NASA, she said, has been trying to spotlight its agricultural work and increase engagement with the agriculture community. This has included various outreach initiatives, such as attending Commodity Classic 2022 and visiting producers at the ground level. This includes presentation of AgMIP’s projections for climate impacts on wheat and maize systems (run by the AgMIP Global Gridded Crop Model Intercomparison).

Dr. St. Germain then described how NASA’s remote sensing is being used to understand the various systems of our planet, from weather and atmospheric dynamics to the carbon cycle and ecosystems. Members of the audience, she said, are working towards integrating this earth science data to benefit agriculture—because farmers cannot control the environment, it is important that they understand it.

She mentioned how NASA listens to feedback from agricultural producers. For example, they have suggested

improvements in the U.S. drought monitor, which NASA is now working on updating and enhancing. Tools like these can help the agricultural community visualize environmental trends at local and national scales. Dr. St. Germain also highlighted SWOT, a new method of estimating sea surface height with much higher resolution. SWOT also allows for the measurement of water surface height of inland water bodies.

Dr. St. Germain discussed NASA’s recent memorandum of understanding with the USDA, with intentions to increase collaboration. Specifically, the MOU seeks to increase the organizations’ focus on “climate-smart agriculture,” advance the usage of earth science when making decisions at the field level, and reduce greenhouse gas emissions.

Dr. St. Germain also gave an outline of the informational value chain at NASA:

1. Generate information
2. Develop services
3. Deliver services
4. Use services
5. Evaluate services

She stressed that the evaluation phase “comes back and feeds the whole process.”



Dr. Karen St. Germain's virtual keynote

Towards the end of her talk, Dr. St. Germain described NASA's "Earth science to action strategy," another method of looking at their value chain of information. It begins with foundational knowledge, which is advanced with Earth system science and applied research. This leads to solutions and societal value, and ideally results in furthering public understanding and exchange. Importantly, this final stage of public understanding and exchange then loops back and impacts our foundational knowledge. Finally, Dr. St. Germain discussed how researchers should think of their work moving forward.

Day 2 Paper Presentation Sessions

For the second session of Day 2, seven more Paper Presentation Sessions took place and posed the question: What are the latest research results and key findings for applications?

Session titles, leaders, and presenters:

PS1B: Improving crop models to capture extreme climate responses

Leaders: Gerrit Hoogenboom and Montse Salmeron

- Quantification of uncertainty in impacts on crop yield due to the GCM and RCM scenarios and Crop simulation models in diverse environments – Soora Naresh Kumar
- Improving DSSAT-Nwheat to extreme wet climate responses – Rogério de S. Nória Júnior
- Finding adaptation options for small-holder farmers in West and Central Africa by improving the modeling of millet under climate risk scenarios using APSIM – Akinseye Folorunso, presented by Madina Diancoumba
- Interdependence among subregional crop production affects global crop failure risk – Sifang Feng

- Extreme rainfall reduces one-twelfth of China's rice yield – Xuhui Wang

PS8: Livestock, grasslands and multi-cropping

Leaders: Katrien Descheemaeker and Kevin Karl

- ECOSMOS-Forage model for simulating palisadegrass – Fabiani Denise Bender (Virtual)
- Sustainable intensification of cereal-based cropping systems in semi-arid sub-Saharan Africa: intercropping or combining cereal and legume sole crops? – Gatien Falconnier
- Global Rangeland Modeling Highlights Zones of Challenge and Opportunity for Livestock Production Areas Under Future Climate Change Conditions – Greg Kiker
- Land use modelling needs to better account for multiple cropping to inform pathways for sustainable agricultural transitions – Katharina Waha
- Advancing modelling tools to analyse livestock-grassland-cropland interactions – Mariana Rufino
- Innovative knowledge of rainwater harvesting techniques in semi-arid ecosystems: Maize-bean intercrop productivity and resources use efficiency – Weldemichael Tesfuhuney (Virtual)

PS9: Crop model products in practical application

Leaders: Willingthon Pavan and Naresh Kumar

- Innovating and scaling risk-reducing measures for farmers and livestock keepers in the drylands – Anthony Whitbread
- Optimization of small farm holder profit using the MISSION framework's model-predictive in-season irrigation or nitrogen fertilizer scheduling – Anupam Bhar, presented by Balaji Pokuri
- Development of an integrated system that combines a cropping system model and a tool for the optimisation of manure redistribution – Mara Gabbrielli

- AgWise: A Collaborative Analytical Framework for Tailored Fertilizer Recommendations – Siyabusa Mkuhlani, presented by Meklit Chernet (Virtual)
- Simulation modelling assisted climatic risk adaptation in small-holder farms in India – Soora Naresh Kumar

PS10A: Projections of future crop productivity

Leaders: Florian Zabel and Julia Schneider

- Initial climate change impacts on crop yields may misinform stakeholders – Alex Ruane
- Don't mind the yield: central lesson from a decade of AgMIP – Christoph Müller
- Estimating global genetic yield gap by designing crop ideotypes – Mikhail Semenov (Virtual)
- Historical look at crop water productivity: the results of global crop modelling – Oleksandr Mialyk
- Is crop intensification necessary to increase the yield potential of wheat under climate change? – Pierre Martre
- Methodologies to assess changing climate risks on agroecosystems – Yean-Uk Kim

PS11: Land and climate modeling

Leaders: Audrey Brouillet and Kaela Lucke

- Attribution and impacts of excessive rainfall and drought on maize yields in low-inputs systems using crop models – Audrey Brouillet
- Detecting wheat response to drought under elevated CO₂ using remote sensing metrics – David Helman
- Land Surface Model Sensitivities and Its Impacts on Land Cover Change in the Northern Great Plains – Kaela Lucke
- Effect of Historical Climate Data on Reference Evapotranspiration and Crop Water Requirement for Maize Crop – Ligalem Agegn Asres (Virtual)
- Safeguarding China's climate spaces for crop production – Wenfeng Liu (Virtual)

PS12: Water resources

Leaders: Shichao Chen and Christopher Jung

- A land use change model to simulate the global development of irrigated cropland areas – Christopher Jung
- Coupling high-resolution DSSAT crop model into NASA Land Information System – Meijian Yang
- Spatial and temporal variability in global irrigation water demand under climate change – Shichao Chen
- The irrigation impact model intercomparison project (IRRMIP) – Yi Yao

PS13A: Modeling mitigation and adaptation

Leaders: Roberto Valdivia and Sonali McDermid

- The limits to adaptation in agriculture: Physics, the chemistry of biology, and human behavior – Gerald (Jerry) Nelson
- Spatial reallocation helps to reduce methane emissions from paddy rice cultivation – Huey-Lin Lee (Virtual)
- Assessing risks and opportunities for land use transformations to achieve multiple social and ecological benefits considering climate change impacts – Mike Rivington
- Using Whole Farm Modelling to Inform Land Use Planning for Greenhouse Gas Emissions Mitigation and Offsetting – Mohammad Ibrahim Khalil
- Climate 'penalty' on the efficacy of cropland soil mitigation strategies – Shelby C. McClelland

Day 2 Lunch – Early-Career Researchers

The theme for Day 2's lunch was Early-Career Researchers: middle- and late-career AgMIP community members were tasked with sitting with an early-career researcher. The following questions were provided to steer conversations:

- What is the best way to find an entry point into a big community like AgMIP?
- How can we identify cutting-edge problems and projects that will

- distinguish our careers?
- How can we blend technical expertise and connections into broader contexts and applications?
- What are the emerging technologies and methods that more established scientists need to learn to keep up with new generations?

Day 2 AgMIP Team Working Sessions

After lunch, participants separated for another block of AgMIP Team Working Sessions. Question prompts again included:

- What are main AgMIP activities in this area?
- How can new participants get involved?
- What are plans and priorities for the next year?

Session titles and leaders:

- WS7: Soils, water, and carbon
Leaders: Bruno Basso and Claudio Stockle
- WS8: Machine learning for agricultural models
Leaders: Ioannis Athanasiadis and Lily-Belle Sweet
- WS9: Pests, diseases, weeds and pollution losses
Leaders: Lisa Emberson, Jose Guarin, and Simone Bregaglio
- WS10: Priorities for AgMIP climate inputs and products
Leaders: Alex Ruane and Sonali McDermid
- WS11: Global and regional gridded modeling
Leaders: Jonas Jägermeyr and Christoph Müller
- WS12: Finance for food systems solutions to climate change
Leaders: Philippe Benoit and Kevin Karl

Plenary: Synergizing Adaptation and Mitigation Along the Value Chain

Keynote: Veronica Doerr, ACIAR

Keynote: Bruno Basso, Michigan State University

Panel:

Hermann Lotze-Campen, PIK (Moderator)
Apurbo Chaki, BARI

Mariana Rufino, Technical University Munich

Francesco Tubiello, FAO

To begin this plenary session, moderator Dr. Hermann Lotze-Campen introduced its two keynote speakers, Drs. Veronica Doerr and Bruno Basso. Dr. Doerr joined virtually from Australia and presented about co-benefits along the research value chain. She began by describing a typical agricultural value chain and potential actions of mitigation and adaptation along it—for example, shortening supply chains, which would both lower transportation emissions and allow for less disruption from unexpected disastrous events.

Dr. Doerr then shifted from the overall agricultural value chain and towards the research value chain, which she outlined as such:

1. Input: data
2. Research
3. Processing: papers, reports, and databases
4. Distribution: platforms and libraries
5. Marketing: engagement and brokering
6. Consumption: policy and management

Dr. Doerr emphasized that while mitigation in the research stage is often quantitative, adaptation in this phase of the value chain tends to be qualitative. Because of this difference in research modality, there is a clear difference in

their data requirements—mitigation data is often large-scale and collected with the ability to reach measurable goals, whereas adaptation data is often locally contextual and helpful to reaching more subjective goals. Dr. Doerr went on to also describe the differences between mitigation and adaptation in each stage of the research value chain.

To finish her keynote, Dr. Doerr reiterated that the research value chains surrounding adaptation and mitigation inherently look and work very differently. Because of this, “it is critical,” she said, “to pursue actions that achieve both adaptation and mitigation.” A gap has formed between these two goals, and it will require active and intentional work to bridge it – Dr. Doerr’s suggestions for these actions include:

1. Read papers you wouldn’t normally read
2. Talk deeply with someone different than you
3. “Yes, and...” rather than “no...” or “but...”
4. Focus on the consumers—help them build shared visions; find and support those who have an ability to cross the divide
5. Develop new blended research, engagement, and policy approaches—don’t force adaptation into mitigation ways of working, or vice versa

The second keynote speaker, Dr. Bruno Basso, took the podium after this advice from Dr. Doerr. He began by pointing out some of the necessary trade offs present when attempting to solve food systems challenges: growing nutritious food in a changing climate; protecting soils, water, air quality and biodiversity; reaching negative greenhouse gas emissions; and

providing reliable revenue streams to farmers and other agriculture producers. In addition, Dr. Basso pointed out that each day, 10,000 hectares of agricultural land are lost to urbanization.

He then showed figures detailing how much greenhouse gasses are emitted from food and agricultural systems, emphasizing that “agriculture is both a victim and a cause of climate change.” So, Dr. Basso asked, how can researchers help farmers to both mitigate and adapt to climate change? He said that farmers are already used to adaptation, both on the seasonal and immediate scales, and that the strategy now should be changing agricultural management in order to decrease emissions. He then provided some examples of these potential changes in management, including conservation tillage, use of synthetic fertilizer, and precision agriculture.

Dr. Basso described the economic realities of these management changes from the perspective of farmers and other agricultural producers. Using the change from conventional tilling to no tilling as an example, he shared that it would take 16 years in order for a farmer making this change to see a benefit of \$100 per hectare per year. Because of this lag, there is low immediate incentive for farmers to make such a management change.

It is the responsibility of the government and other organizations to further incentivize these changes, if greenhouse gas emissions from agriculture are to be reduced. One method currently being used to do this is carbon credits. Dr. Basso closed his keynote with the idea that digital agriculture can be used to design and complement climate-friendly practices at farm and landscape scales.

After the keynotes, Dr. Lotze-Campen returned to moderate the panel section of this plenary session. He introduced the first panelist, Dr. Apurbo Chaki, who shared some lessons learned from his recent MAC-B Project, which evaluated the dry season rice production systems in Bangladesh under current and future climate conditions, with a focus on sustainable mitigation and adaptation practices. Amongst Dr. Chaki's key findings were that climate change reduces net returns in most farm sites, as well as increases greenhouse gas emissions. Importantly, he additionally found that both SRI (System of Rice Intensification) and conventional AWD (Alternate Wetting and Drying) "show potential co-benefits in reducing GHG emissions and increasing income."

The next panelist to present was Dr. Mariana Rufino, who shifted the panel from adaptation and mitigation synergies of rice to that of the livestock sector. She began her talk by acknowledging that the livestock sector emits a large portion of greenhouse gasses, and that much work needs to be done in order to decrease these emissions. Dr. Rufino then described the results of a recent study that shows how beneficial grazing is on species diversity in temperate grasslands. This finding is of note because diverse grasslands allow for the storage of more carbon.

Following Rufino was Dr. Francesco Tubiello, who joined the panel virtually. Dr. Tubiello focused on the urgency of finding synergies between climate change adaptation and mitigation. The world is currently seeing the negative effects of climate change that were once existent only in models; the effects must be taken into account in current mitigation mod-

eling strategies, in order for them to be most accurate and effective.

Dr. Lotze-Campen then asked each of the panelists, what are the priorities that the modeling research and AgMIP communities should be working on? Dr. Basso responded first, saying "bring the rigorous science in selecting sampling for dynamic systems" and "bring the possibility of running multiple models to capture the system and work in a synergy with the measurements." Dr. Chaki was next, emphasizing the potential applications of modeling outputs for policymakers specifically. Dr. Rufino answered next, saying that "we should do a better job promoting collaboration in livestock system modeling," and that models need to focus not just on mitigation, adaptation, or biodiversity, but to integrate all of these ideas and more. Dr. Doerr provided the final answer of the session, saying that because adaptation will happen inevitably, we need to better understand how a combination of adaptation and mitigation can emphasize mitigation surrounding climate change.

DAY 3, JUNE 29

Plenary: Deepening Collaborations for the Future of Food, Land, and Health

Keynote: Mario Herrero, Cornell University

Panel:

Anthony Whitbread, ILRI (Moderator)
Ruth DeFries, Columbia Climate School
Matthew Hayek, New York University
Marco Springmann, University of Oxford
Jessica Fanzo, Columbia Climate School

Moderator Dr. Anthony Whitbread began the first plenary session of the last day of AgMIP9 by introducing the topic and

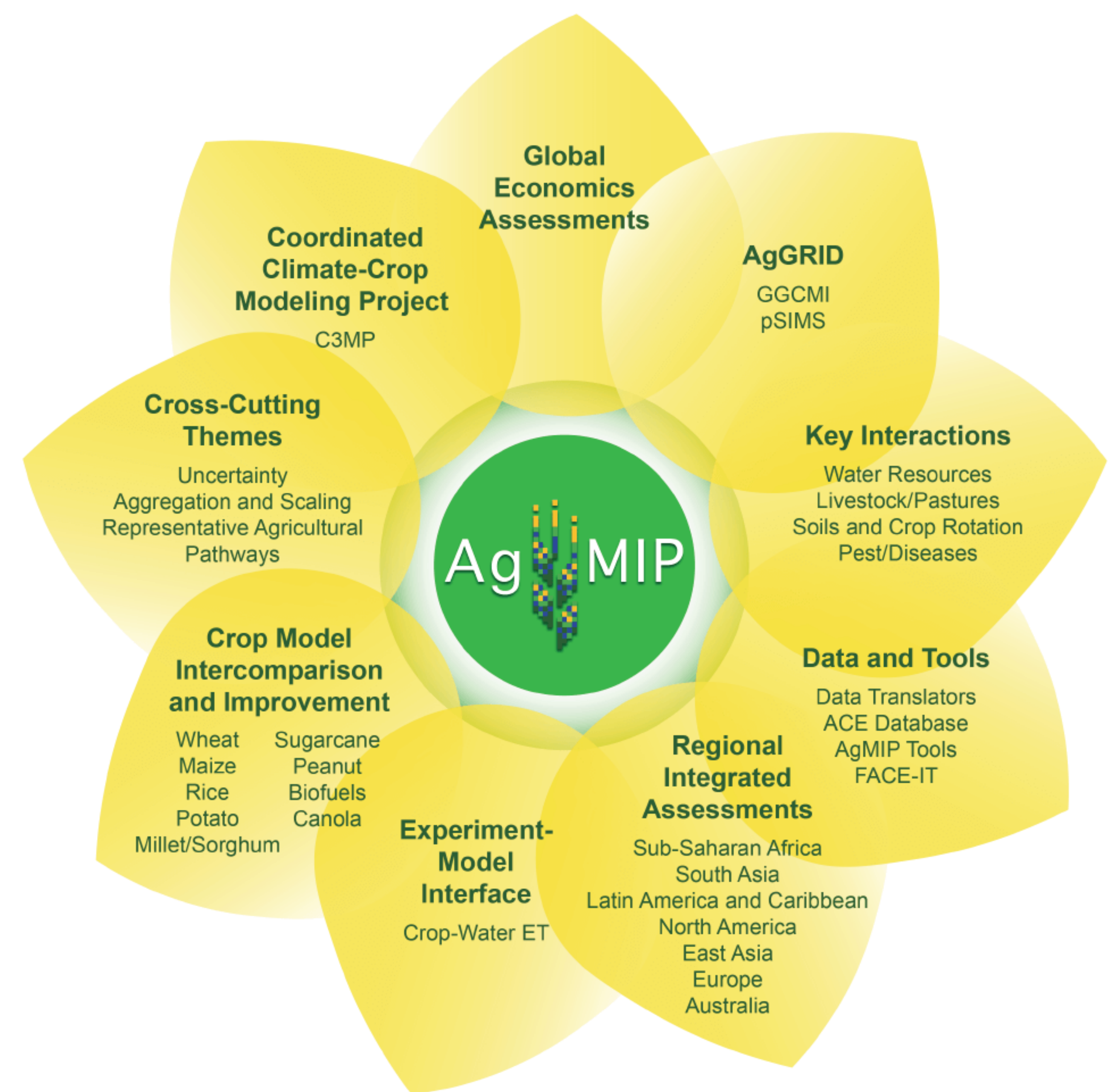
keynote speaker, Dr. Herrero. Dr. Herrero put forth the idea that research will not magically solve the world's food systems, and that we need to think more about how research can be applied as change. He then displayed four critical concepts to improve upon, if the research and modeling communities want to have more impact:

- Theories of change
- New partnerships
- Communication and engagement strategy
- Policy translation

Dr. Herrero next discussed the “AgMIP Flower,” and how the petals are not as integrated as the figure might make them out to be. He also explained the importance of AgMIP's collaboration with “additional flowers,” or research communities, in order to increase its impact. Additionally, there is a need for “bees” to spread AgMIP's message to other communities and organizations.

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Dr. Herrero shifted to discuss specific accelerators of food system transformations, from building community trust to transforming individual mindsets. He also urged the audience to “think beyond the obvious.” Using an alternative protein as an example, he showed the importance of working through



The AgMIP Flower

traditional roadblocks and ramifications.

In order to transform the global food system, he said, we must be willing to let some things go. To make room for new research areas, crops, and partnerships, some aspects of the food systems portfolio must be left in the past. Dr. Herrero closed his keynote with some brief additional comments, including that funding will come if we can convince others of the impact our work will have.

Following Dr. Herrero's keynote address was the panel portion of the session. Dr. Whitbread introduced each of the speakers, beginning with Dr. Ruth De-Fries, who spoke about the current competition over land—whether it is for food production, biodiversity conservation, energy from biomass, carbon sequestration, and human habitation. “We will continue to see a massive increase in competition for land,” she said.

shock prediction for pearl millet production in North-West India – Priyanka Swami (Virtual)

- Capturing production technologies and field practices in regional economic models: the examples of REAP and USARM – Siwa Msangi
- Science with participatory approach on assessment of climate change impact on farm production under Sustainable Agricultural Pathway – Subash Nataraja Pillai
- Regional Integrated Assessment of Climate Change Impact on Cotton Production in a Semi-arid Environment – Shakeel Ahmad (Virtual)

PS10B: Projections of future crop productivity

Leaders: Florian Zabel and Julia Schneider

- Impact of projected climate on processing tomato production – Davide Cammarano
- Change of negative year-to-year agricultural yield extremes under global warming – Leonard Borchert
- Projecting Maize Yield in the US Corn Belt and Ethiopia Using Process-Based Model and Machine Learning Models – Meijian Yang
- Climate change impacts on cocoa production in the major producing countries of West and Central Africa by mid-century – Paulina Ansa Asante
- Observation-based sowing dates and cultivars significantly affect yield and irrigation for some crops in the Community Land Model (CLM5) – Sam Rabin (Virtual)

PS13B: Modeling mitigation and adaptation

Leaders: Roberto Valdivia and Sonali McDermid

- Modeling global integrative land-use adaptation – Florian Zabel
- Hydrologic and agricultural impacts of climate change and management practices in a Mediterranean catchment – Lorenzo Villani (Virtual)

- Co-benefits and tradeoffs of agricultural mitigation and adaptation in rice based cropping systems – Sonali Shukla McDermid
- Predicting the inputs – Sotirios Archontoulis
- Simulating climate-smart rice production system in south India: DSSAT model improvement – Vellingiri Geethalakshmi
- Quantifying Biogeochemical Footprints of Conservation Tillage at Multiple Scales: Perspectives from Climate-Smart Agriculture – Wei Ren

PS14: Machine learning for agricultural applications

Leaders: Ron Van Bree and Andres Castellano

- Machine learning emulators and empirical models combining climate and global crop models for seasonal agricultural production – Andres Castellano
- Deep Learning Models for Crop Yield Prediction and Comparison with a Process-Based Model – Guiling Wang
- Knowledge-guided machine learning for modeling crop growth dynamics – Jingye Han
- Using interpretable machine learning to identify meteorological drivers of crop yield failure – Lily-belle Sweet
- Application of Machine learning in crop yield prediction – Oumnia Ennaji

PS15: Modeling soils and carbon

Leaders: Erik Mencos and Apurbo Chaki

- Modeling maize yield affected by underground Pipeline installation and tillage practices – Elnaz Ebrahimi
- Representing waterlogging and its effects in crop models: Where are we now and where do we need to go? – Margarita Garcia-Vila (Virtual)
- Assessing the long-term impact of conservation agriculture on rice-maize systems in Bangladesh under climate change using the APSIM model – Mohammad Mamunur Rasid Sarker (Virtual)
- Simulating the Long-term Impact of

Cover Crops on Soil organic Carbon on Semi-Arid Southwestern USA – Prakriti Bista (Virtual)

PS16: New crop species models

Leaders: Louise Busschaert and Jose Guarin

- Assessing the Climate Change Impacts on Rye Production in Europe and Canada – Ashifur Rahman Shawon
- FAO crop growth model AquaCrop v7.0 for regional simulations: new advances and opportunities – Louise Busschaert
- Hierarchical calibration of a crop growth model of intermediate complexity – Monique Pires Gravina de Oliveira (Virtual)
- How to develop vegetable versions based on originally designed-for-cereals models? Take WOFOST-Chili as an example – Ruoling Tang
- Modeling food-water system in high-resolution convection-permitting regional climate models – Zhe Zhang

PS17: Calibration and crop model improvement

Leaders: Daniel Wallach and Phil Alderman

- Cloud-Hosting of Agricultural Crop Simulator and Optimizer for Calibration and Management Decision Support Systems – Balaji Sessa Srikanth Pokuri
- How to calibrate crop models? – Daniel Wallach
- Optimizing agronomic practices for closing chickpea yield gaps in rainfed agroecosystems – Seyedreza Amiri (Virtual)

Day 3 Lunch – Women in AgMIP

For the final group lunch of AgMIP9, the workshop participants were tasked with eating lunch at a gender-diverse table.

The following questions were posed:

- Have you seen or experienced challenges associated with gender imbalance in your research or applications?
- How can we achieve a strong gender balance in AgMIP and beyond?
- How can AgMIP empower women in the

technical, creative, stakeholder engagement, funding, and leadership spheres?

- How can AgMIP products better recognize societal gender inequities in the results of our assessments of agricultural risks?

Radical Collaboration Sessions

For the final breakout session of the main workshop programming, participants divided up and were encouraged to discuss how they can more effectively collaborate across research expertise. They were tasked with answering the following questions:

- What challenges need new partnerships in this area?
- How can we overcome barriers to progress?
- What new AgMIP activities are needed to enable progress?

Session titles and leaders:

- RCS1: Use of new remote sensing resources & machine learning across AgMIP
Leaders: Alex Ruane and Amy McNally
- RCS2: Modeling food shocks at local, national, and global scales
Leaders: Jonas Jägermeyr and Kyle Poorman
- RCS3: Supporting global and national policy processes
Leaders: Bruno Basso and Terry Nipp
- RCS4: Modeling mixed crop-livestock systems
Leaders: Greg Kiker and Walter Baethgen
- RCS5: Cross-scale interactions between agriculture and biodiversity
Leaders: Sieg Snapp and Matthew Hayek

Plenary: Strengthening Science-Stakeholder-Policy Linkages for Future Systems

Keynote: Cary Fowler, U.S. Department of State

Keynote: Bill Hohenstein, U.S. Department of Agriculture

Panel:

Barbara Stinson, BLS LLC (Moderator)

Lance Lillibridge, Iowa Corn Growers

Hayden Montgomery, Global Methane Hub

Pauline Scheelbeek, London School of Hygiene & Tropical Medicine

Allison Thompson, Foundation for Food & Agriculture Research

Moderator Barbara Stinson gave a brief introduction to the keynote speakers of AgMIP9's final plenary session, Dr. Cary Fowler from the U.S. Department of State and William Hohenstein from the U.S. Department of Agriculture. She also noted the diversity of this session, with a policymaker and policy analyst presenting keynote addresses and the panelists including a farmer, a representative of a methane hub, a researcher, and a food systems donor.



Ms. Barbara Stinson

Dr. Fowler opened his speech by drawing attention to the number 591. “We’ve had 591 consecutive months in which the global average temperature for the month exceeded the 20th century average for that month,” he said. Based on this statistic, Dr. Fowler ensured that the climate has changed, that the climate continues to change, and that climate change denial has surely decreased. Climate change, he said, has had a profound impact on agriculture—it has affected all aspects of plant growth, and there is no true way to rush crop adaptation to climate change.

Dr. Fowler took some time to describe the history of the agriculture system in the United States. Not many of the crops currently grown in the U.S. are native, largely due to large scale seed imports in the 1800s by the U.S. Patent and Trademark Office. Those imports and the subsequent agricultural experiments have provided us with a vast diversity of crops that can now flourish throughout the various climates of the United States. Fowler pondered, can we spur the same sort of crop adaptation today?

He then outlined eleven primary challenges that are historically unique in combination:

1. Climate change
2. COVID-19
3. Conflict
4. Water crises
5. Interdependent trade patterns
6. Historically low stockpiles of grain
7. Dramatic soil loss
8. Overreliance on a few crops
9. Historically high food prices
10. Lagging funding for agriculture research and development
11. Decrease media attention on the food crisis

In the face of these challenges, Dr. Fowler emphasized that the food systems research community has completed transformational work. He commended the AgMIP community for their modeling work and the impact it has had and will continue to have on the global food system.

Dr. Hohenstein next took the podium. He spoke of the importance of the AgMIP and agricultural modeling in supporting decisions by the USDA, specifically as they work towards Paris Agreement deadlines. The USDA, he said, will be investing in improvements to their climate change mitigation modeling and analysis; surely, the modeling community will contribute their ideas and experience.

The USDA is working to create “climate-smart production systems” to integrate into the economic models used in their decision-making process. Additionally, the department is trying to take innovation into account, beyond just current and upcoming technologies. “What will future technologies look like? What will that potential be?” Dr. Hohenstein asked, “And what are the policies and systems that can actually drive and influence the direction that those policies take?” By integrating potential future technologies into their models, the USDA can avoid overestimating the cost of climate solutions.

Dr. Hohenstein then presented two private sector initiatives to promote climate mitigation. The first, Partnerships for Climate-Smart Commodities, allows consumers to pay extra for food items produced with a lower carbon footprint; this extra cost then goes back to the farmers, supporting their transition to

lower carbon production methods. The second initiative, the voluntary carbon offset market, similarly connects private sector demand to farmers’ abilities to offset carbon emissions. However, Dr. Hohenstein said, “both of those strategies rely on one thing: confidence. If a consumer is going to purchase a low-carbon gallon of milk, they want to be assured that they’re buying a low-carbon gallon of milk. If a company is going to buy a voluntary carbon offset credit, they want to be confident that it’s a real credit, and it means something.”

In order to provide this confidence, Dr. Hohenstein explained that it is critical to “reliable, quantitative, confident numbers.” To provide these essential statistics, money from the Inflation Reduction Act has been allotted specifically to improve greenhouse gas emission quantification systems—much new data will thus be collected, and used to improve modeling techniques. To finish his talk, Hohenstein commended the collaborative nature of the AgMIP community and noted its necessity moving forward towards solutions.

Following a short Q&A session was the panel section of the final plenary. Ms. Stinson introduced the panelists: Lance Lillibridge, Hayden Montgomery, Dr. Pauline Scheelbeek, and Allison Thomson. Mr. Lillibridge, an Iowa farmer and the chairman of the Iowa Corn Growers Association, spoke first. He talked largely about the average producer state of mind, which he described as not overly trustworthy, and stressed the importance of providing quantitative data and results to farmers. Mr. Lillibridge also expressed a strong interest in helping farmers access cutting-edge observations and modeling tools that would help them in

their day-to-day operations as well as in considering shifts to alternative systems that may be more resilient.

Dr. Montgomery spoke next, virtually representing the Global Methane Hub. He structured his talk around four themes: data, communication, capability, and relevance. He emphasized the importance of communities like AgMIP to effectively communicate the progress they have made and continue to make. Additionally, Dr. Montgomery stressed the necessity of keeping models relevant and helpful to producers.

Dr. Scheelbeek followed, sharing observations from her work in the world of nutrition, diets, and health, specifically regarding connections to shareholders and policymakers. One key point she stressed was that research regarding diets and nutrition needs to be “done with and not to/for consumers.”

Dr. Thompson was the final panelist to present and shared her perspective working for a non-profit organization that operates across the value chain. She specifically noted one of the hardest challenges in the private sector is the

mismatch between corporate timelines and scientific climate action timelines—while companies want fast, instant solutions, often the most scientifically valid solutions take time to develop and implement. She also urged researchers to collaborate with farming communities to create new climate solutions, in order to build trust and familiarity between the two communities.

Closing Remarks and Way Forward

*Morven McLean, AgMIP Steering Council Co-Chair
AgMIP Coordination Unit and Executive Committee*

To close the final plenary session of AgMIP9, Dr. Rosenzweig gave an overview of the AgMIP steering council meetings that took place throughout the week. Notably, she introduced the idea of AgMIP 2.0 – a new version of AgMIP that seeks to maintain the core tenets of the community while digging deeper into stakeholder engagement and policymaker communication. In order to achieve this, the AgMIP coordination unit will be restructured and funding streams will be further developed. Additionally, steering council members will begin to engage more with individual AgMIP teams. Members of the AgMIP community then provided closing remarks, including suggestions for AgMIP10 and beyond.



AgMIP9 Participants

Side Session Team Meetings

Side Session Team Meetings occurred on Monday, June 26 and Friday, June 30 and took place outside of the main workshop programming and venue. Participants were encouraged to RSVP to the side session they wanted to attend. Further, some side sessions were closed to the public and were invite-only.

Monday, June 26:

- Co-Creating Models with Stakeholders
Leader: Pauline Scheelbeek
- Vision for Adapted Crops and Soils
Leader: Kevin Karl
- AgMIP Ozone
Leaders: Jose Guarin and Lisa Emberson
- AgMIP Soybean
Leaders: Montse Salmeron and Ken Boote
- AgMIP Wheat
Leaders: Senthold Asseng and Pierre Martre
- AgMIP Maize-ET
Leaders: Bruce Kimball and Kelly Thorp
- AgMIP Low-Input Cropping Systems
Leader: Antoine Couedel
- AgMIP Global Gridded Crop Model Intercomparison 1
Leaders: Jonas Jägermeyr and Christoph Müller
- Anticipating Futures of Alternative Proteins
Leader: Matthew Hayek
- AgMIP Residues
Leaders: Sotirios Archontoulis and Bruno Basso

Friday, June 30:

- AgMIP C+GHG-MIP
Leaders: Terry Nipp and Bruno Basso
- Food System Emissions
Leaders: Francesco Tubiello and Kevin Karl
- Detection & Attribution in Low-Input Systems
Leaders: Audrey Brouillet and Benjamin Sultan
- AgMIP Global Gridded Crop Model Intercomparison 2
Leaders: Jonas Jägermeyr and Christoph Müller
- Global Economics
Leaders: Herman Lotze-Campen and Dominique van der Mensbrugghe
- Calibration
Leaders: Daniel Wallach and Taru Palosou

Poster Presentation Sessions

AgMIP9 featured poster presentations, which were hung and available for viewing throughout the workshop's main programming. For virtual presenters, posters were added to the AgMIP9 webpage, which can be found [here](#).

- Improving the wheat crop models under extreme low-temperature stress at jointing and booting stages – Bing Liu
- Evolution of extreme Agroclimatic Indicators in Senegal Using CMIP6 Simulations – Cheikh Modou Noreyni Fall (Virtual)
- Emergent constraint on crop yield response to warmer temperature from field experiments – Chenzhi Wang
- WheatDryFACE: Scaling up from leaf to canopy and the field the interactive drought-CO₂ effects on wheat in a dryland FACE setting with remote sensing and a numerical model – David Helman
- Simulating IWIN historical phenological data with the DSSAT wheat models – Diego Noleto Luz Pequeno
- Production vulnerability to wheat blast disease under climate change – Diego Noleto Luz Pequeno
- Modeling automated mow features in the CROPGRO Perennial Forage Model – Diego Noleto Luz Pequeno
- Water stress changes the relationship between photosynthesis and stomatal conductance in rice – Fekremariam Asargew Mihretie (Virtual)
- Modeling phenology combining Data Assimilation techniques and Bioclimatic Indices in a Cabernet Sauvignon vineyard (*Vitis vinifera* L.) in Central Chile – Francisco Meza
- Development of a cereal-legume intercrop Model for DSSAT Version 4.8 – Jacques Fils Pierre
- Agroclimatic Seasonal Constraints by 2100 Around the World and in North Dakota – Kaela Lucke
- Modeling on rice growth and development under short-term heat stress – Liang Tang
- A novel machine learning-based method for quantifying parameter uncertainty of crop growth models – Liya Zhao
- BreedGym: A reinforcement learning environment for plant breeding programs optimization – Luca Corinzia
- Seasonal cover mapping in the Oueme-Beterou catchment using a machine learning algorithm on the google earth engine cloud-based platform – Maforikan Ella Sèdé (Virtual)
- Sensitivity of Crops to Ultraviolet Radiation from Stratospheric Aerosol Intervention – Mahjabeen Rahman
- High uncertainty in soybean models for simulation of crop N dynamics under variable CO₂, precipitation, and Nitrogen fertilization – Mariely Lopes dos Santos
- Discovering optimal and feasible nitrogen management policies with reinforcement learning – Matteo Turchetta
- Optimizing Nitrogen Management in Winter Wheat: A Reinforcement Learning Approach with Crop Growth Models – Michiel Kallenberg
- Simulating the effects of low-temperature stress during flowering stage on leaf-level photosynthesis with current rice models – Min Kang
- Modelling long-term effect of combined hill-placed manure and chemical fertilizer on maize yield, water- and N- use efficiencies in Sudan Savanna of West Africa – Mouiz W. I. A. Yessoufou (Virtual)
- Calibration and Validation of DSSAT Models Ensemble for Winter Wheat in Oklahoma – Muhammad Zeeshan Mehmood
- Biology-inspired machine learning for cherry blossom day-of-year prediction – Ron van Bree
- CROptimizR and CroPlotR: generic R packages for parameter estimation and evaluation of Crop Models – Samuel Buis (Virtual)
- Parameterization of APSIM mungbean model for different water-management options in semi-arid conditions – Seyedreza Amiri (Virtual)
- Cropland Estimation in Algeria – Walid Ouaret
- Impacts of climate change on soybean growth and potential expansion in Canada – Ward Smith
- N-ALLYzer: From Nitrogen to ALL other nutrients – Willingthon Pavan
- GSSAT2: A Next-Generation Decision Support Tool for Precision Agriculture and Spatial Crop Modeling – Willingthon Pavan

CONCLUSIONS

As the first major gathering of AgMIP post-COVID, AgMIP9 reinvigorated its community members through the various presentations and sessions that took place throughout the week. The workshop also demonstrated that there remains tremendous potential for the AgMIP community to develop and apply agricultural models to address some of the world's biggest challenges.

AgMIP9 felt to be a turning point in the group's history. AgMIP has solidified its foundational tenets, but will continue to push forward and establish new approaches to how the future of food can be modeled in the unprecedented times of climate extremes and post-global pandemic. A key focus going forward will be refining and empowering its approach to stakeholder engagement and research communication.

In the spirit of radical collaboration and the continued improvement of stakeholder engagement, the AgMIP Steering Council and individual research teams stated their intent to collaborate more frequently across research foci and disciplines. To aid in achieving this goal, an AgMIP newsletter will be launched to establish a foundation for increasing the community's internal communication and cross-team collaboration.

The workshop ended with a shared sense of excitement looking towards the future of AgMIP and the next Global Workshop: AgMIP10, which is under discussion to take place in late 2024 or early 2025.

APPENDIX 1: Agenda



Workshop Objectives

1. Improve Models and Integrated Assessments
2. Utilize New Tools to Address Food System Challenges
3. Enhance Inclusion, Equity, and Justice in Food System Modeling
4. Synergize Adaptation and Mitigation Along the Value Chain
5. Deepen Collaborations for the Future of Food, Land, and Health
6. Strengthen Science-Stakeholder-Policy Linkages for Future Systems

Monday, June 26th, 2023: Team Meetings

If you would like to attend a side-session, please contact the session Leader(s) for more information.

Time	Session	Leaders
09:00-12:00	Co-Creating Models with Stakeholders	Pauline Scheelbeek – pauline.scheelbeek@lshtm.ac.uk
	Vision for Adapted Crops and Soils	Kevin Karl – kevin.karl@columbia.edu
	AgMIP Ozone	Jose Guarin – jrg2230@columbia.edu Lisa Emberson – l.emberson@york.ac.uk
	AgMIP Soybean	Montse Salmeron – msalmeron@uky.edu Ken Boote – kjboote@ufl.edu
	AgMIP Wheat	Senthold Asseng – senthold.asseng@tum.de Pierre Martre – pierre.martre@inrae.fr
13:00-16:00	AgMIP Maize-ET	Bruce Kimball – bruce.kimball@usda.gov Kelly Thorp – kelly.thorp@ars.usda.gov
	AgMIP Low-Input Cropping Systems	Antoine Couëdel – antoine.couedel@cirad.fr
	AgMIP Global Gridded Crop Model Intercomparison 1	Christoph Müller – cmueller@pik-potsdam.de Jonas Jaegermeyr – jonas.jaegermeyr@columbia.edu
	Anticipating Futures of Alternative Proteins	Matthew Hayek – matthew.hayek@nyu.edu
	AgMIP Residues	Sotirios Archontoulis – sarchont@iastate.edu Bruno Basso – basso@msu.edu
18:00-20:00	Steering Council Meeting	

APPENDIX 1: Agenda

Day 1: Tuesday, June 27th, 2023			— 2 —
Time	Session	Location	
08:00-09:00	Arrival & Registration		
09:00-11:00	Welcome and Introductory Remarks AgMIP Executive Committee Morven McLean, <i>Gates AgOne</i> World Food Prize Foundation AgMIP9 Keynote: Jessica Fanzo, Columbia Climate School Plenary: Improving Models and Integrated Assessments Keynote: Cynthia Rosenzweig, <i>NASA GISS/Columbia Climate School</i> Panel: Gerrit Hoogenboom, <i>University of Florida (Moderator)</i> Minpeng Chen, <i>Renmin University of China</i> Madina Diancoumba, <i>ZALF</i> Christoph Müller, <i>PIK</i> Marco Sanchez-Cantillo, <i>FAO</i>	Presidential Level (3 rd Floor)	
11:00-11:30	Coffee Break & Posters	Skyline (4 th Floor)	
11:30-12:30	Plenary: Utilizing New Tools to Address Food System Challenges Report Back from June 26th Team Meetings Keynote: Sibiry Traore, <i>ICRISAT</i> Panel: Alex Ruane, <i>NASA GISS/Columbia Climate School (Moderator)</i> Ioannis Athanasiadis, <i>Wageningen University and Research</i> Medha Devare, <i>International Institute for Tropical Agriculture</i>	Presidential Level (3 rd Floor)	
12:30-14:00	Lunch & Posters (Theme: Regions)	Skyline (4 th Floor)	
	Steering Council Meeting	1754 Board Room (3 rd Floor)	
14:00-15:30	Paper Presentation Sessions <i>What are the latest research results and key findings for applications?</i> Presentation details		
	PS1A: Improving crop models to capture extreme climate responses <i>Leaders: Gerrit Hoogenboom and Montse Salmeron</i>	Presidential Level (3 rd Floor)	
	PS2A: Regional integrated assessments <i>Leaders: Laure Tall and Sabine Homann-Kee Tui</i>	Seminar 1 (2 nd Floor)	

APPENDIX 1: Agenda

Day 1: Tuesday, June 27th, 2023 (cont.)			— 3 —
Time	Session	Location	
14:00-15:30	Paper Presentation Sessions (cont.) <i>What are the latest research results and key findings for applications?</i> Presentation details		
	PS3: Global assessments of food systems, trade & diets in a changing world <i>Leaders: Dominique van der Mensbrugghe and Daniel Mason-D'Croz</i>	Seminar 3 & 4 (2 nd Floor)	
	PS4: Modeling nutrition, food security and crop losses <i>Leaders: Lew Ziska and Jose Guarin</i>	Garden Room 1 (1 st Floor)	
	PS5: Seasonal forecasting and food shocks <i>Leaders: Phil Alderman and Kaela Lucke</i>	Presidential 1 (3 rd Floor)	
	PS6: Data assimilation and remote sensing <i>Leaders: Meijian Yang and Luke Monhollon</i>	Seminar 2 (2 nd Floor)	
	PS7: Data and information technologies advances for Ag modeling <i>Leaders: Pierre Martre and Walter Baethgen</i>	Garden Room 2 (1 st Floor)	
15:30-16:00	Coffee Break & Posters	Skyline (4 th Floor)	
16:00-17:30	AgMIP Team Working Sessions <i>What are main AgMIP activities in this area?</i> <i>How can new participants get involved?</i> <i>What are plans and priorities for the next year?</i>		
	WS1: Crop model intercomparison and improvement <i>Leaders: Senthod Asseng and Jean-Louis Durand</i>	Presidential Level (3 rd Floor)	
	WS2: Modeling the global food system <i>Leaders: Hermann Lotze-Campen and Ron Sands</i>	Seminar 3 & 4 (2 nd Floor)	
	WS3: Regional integrated assessments for policy planning <i>Leaders: Roberto Valdivia, Dilys MacCarthy, and Geethalakshmi Vellingiri</i>	Garden Room 2 (1 st Floor)	
	WS4: Seasonal forecasting and data assimilation <i>Leader: Phil Alderman</i>	Garden Room 1 (1 st Floor)	
	WS5: Mitigation models and food system emissions <i>Leaders: Francesco Tubiello and Kevin Karl</i>	Seminar 1 (2 nd Floor)	
	WS6: Linking models for diets and nutrition <i>Leaders: Pauline Scheelbeek and Tony Carr</i>	Seminar 2 (2 nd Floor)	
18:00-20:00	Evening Reception Speakers: Jeff Shaman, <i>Columbia Climate School</i> Gavin Schmidt, <i>NASA GISS</i> Science and Art Exhibition by Kate Doyle	Skyline (4 th Floor)	

APPENDIX 1: Agenda

Day 2: Wednesday, June 28th, 2023		— 4 —
Time	Session	Location
09:00-10:00	Plenary: Enhancing Inclusion, Equity, and Justice in Food System Modeling Keynote: Kate MacKenzie, NYC Mayor’s Office of Food Policy Panel: Laure Tall, <i>IPAR (Moderator)</i> Malgosia Madajewicz, <i>Columbia Climate School</i> Sithembile Mwamakamba, <i>FANRPAN</i> Carolina Saavedra, <i>Stone Barns Center for Food & Agriculture</i> Roberto Valdivia, <i>Oregon State University</i>	Presidential Level (3 rd Floor)
	Plenary: NASA Perspectives on Agriculture from Field to Space Keynote: Karen St. Germain, <i>NASA Headquarters</i> Report Back from Day 1 Working Sessions	
10:30-11:00	Group Photo & Hats	
11:00-11:15	Coffee Break & Posters	Skyline (4 th Floor)
11:15-12:30	Paper Presentation Sessions <i>What are the latest research results and key findings for applications?</i> Presentation details	
	PS1B: Improving crop models to capture extreme climate responses <i>Leaders: Gerrit Hoogenboom and Montse Salmeron</i>	Presidential Level (3 rd Floor)
	PS8: Livestock, grasslands and multi-cropping <i>Leaders: Katrien Descheemaeker and Kevin Karl</i>	Seminar 2 (2 nd Floor)
	PS9: Crop model products in practical application <i>Leaders: Willingthon Pavan and Naresh Kumar</i>	Garden Room 2 (1 st Floor)
	PS10A: Projections of future crop productivity <i>Leaders: Florian Zabel and Julia Schneider</i>	Garden Room 1 (1 st Floor)
	PS11: Land and climate modeling <i>Leaders: Audrey Brouillet and Kaela Lucke</i>	Presidential 1 (3 rd Floor)
	PS12: Water resources <i>Leaders: Shichao Chen and Christopher Jung</i>	Seminar 3 & 4 (2 nd Floor)
	PS13A: Modeling mitigation and adaptation <i>Leaders: Roberto Valdivia and Sonali McDermid</i>	Seminar 1 (2 nd Floor)

APPENDIX 1: Agenda

Day 2: Wednesday, June 28th, 2023 (cont.) — 5 —		
Time	Session	Location
12:30-14:00	Lunch & Posters (Theme: Early-Career Researchers)	Skyline (4 th Floor)
14:00-15:30	AgMIP Team Working Sessions <i>What are main AgMIP activities in this area?</i> <i>How can new participants get involved?</i> <i>What are plans and priorities for the next year?</i>	
	WS7: Soils, water, and carbon <i>Leaders: Bruno Basso and Claudio Stockle</i>	Garden Room 1 (1 st Floor)
	WS8: Machine learning for agricultural models <i>Leaders: Ioannis Athanasiadis and Lily-Belle Sweet</i>	Seminar 2 (2 nd Floor)
	WS9: Pests, diseases, weeds and pollution losses <i>Leaders: Lisa Emberson, Jose Guarin, and Simone Bregaglio</i>	Garden Room 2 (1 st Floor)
	WS10: Priorities for AgMIP climate inputs and products <i>Leaders: Alex Ruane and Sonali McDermid</i>	Seminar 1 (2 nd Floor)
	WS11: Global and regional gridded modeling <i>Leaders: Jonas Jägermeyr and Christoph Müller</i>	Presidential Level (3 rd Floor)
	WS12: Finance for food systems solutions to climate change <i>Leaders: Philippe Benoit and Kevin Karl</i>	Seminar 3 & 4 (2 nd Floor)
15:30-16:00	Coffee Break & Posters	Skyline (4 th Floor)
16:00-17:30	Plenary: Synergizing Adaptation and Mitigation Along the Value Chain Keynote: Veronica Doerr, ACIAR Keynote: Bruno Basso, Michigan State University Panel: Hermann Lotze-Campen, PIK (Moderator) Apurbo Chaki, BARI Mariana Rufino, Technical University Munich Francesco Tubiello, FAO	Presidential Level (3 rd Floor)

APPENDIX 1: Agenda

Day 3: Thursday, June 29th, 2023			— 6 —
Time	Session	Location	
08:00-09:00	Steering Council Meeting	Garden Room 1 (1 st Floor)	
09:00-10:30	Plenary: Deepening Collaborations for the Future of Food, Land, and Health Report Back from Day 2 Working Sessions Keynote: Mario Herrero, <i>Cornell University</i> Panel: Anthony Whitbread, <i>ILRI (Moderator)</i> Ruth DeFries, <i>Columbia Climate School</i> Matthew Hayek, <i>New York University</i> Marco Springmann, <i>University of Oxford</i> Jess Fanzo, <i>Columbia Climate School</i>	Presidential Level (3 rd Floor)	
10:30-11:00	Coffee Break & Posters	Skyline (4 th Floor)	
11:00-12:30	Paper Presentation Sessions <i>What are the latest research results and key findings for applications?</i> Presentation details		
	PS2B: Regional integrated assessments <i>Leaders: Sabine Homann-Kee Tui and Laure Tall</i>	Presidential Level (3 rd Floor)	
	PS10B: Projections of future crop productivity <i>Leaders: Florian Zabel and Julia Schneider</i>	Seminar 1 (2 nd Floor)	
	PS13B: Modeling mitigation and adaptation <i>Leaders: Roberto Valdivia and Sonali McDermid</i>	Garden Room 2 (1 st Floor)	
	PS14: Machine learning for agricultural applications <i>Leaders: Ron Van Bree and Andres Castellano</i>	Garden Room 1 (1 st Floor)	
	PS15: Modeling soils and carbon <i>Leaders: Erik Mencos and Apurbo Chaki</i>	Presidential 1 (3 rd Floor)	
	PS16: New crop species models <i>Leaders: Louise Busschaert and Jose Guarin</i>	Seminar 3 & 4 (2 nd Floor)	
	PS17: Calibration and crop model improvement <i>Leaders: Daniel Wallach and Phil Alderman</i>	Seminar 2 (2 nd Floor)	
12:30-14:00	Lunch & Posters (Theme: Women in AgMIP)	Skyline (4 th Floor)	

APPENDIX 1: Agenda

Day 3: Thursday, June 29th, 2023 (cont.)			— 7 —
Time	Session	Location	
14:00-15:30	Radical Collaboration Sessions <i>What challenges need new partnerships in this area?</i> <i>How can we overcome barriers to progress?</i> <i>What new AgMIP activities are needed to enable progress?</i>		
	RCS1: Use of new remote sensing resources & machine learning across AgMIP <i>Leaders: Alex Ruane and Amy McNally</i>	Garden Room 1 (1 st Floor)	
	RCS2: Modeling food shocks at local, national, and global scales <i>Leaders: Jonas Jägermeyr and Kyle Poorman</i>	Seminar 1 (2 nd Floor)	
	RCS3: Supporting global and national policy processes <i>Leaders: Bruno Basso and Terry Nipp</i>	Garden Room 2 (1 st Floor)	
	RCS4: Modeling mixed crop-livestock systems <i>Leaders: Greg Kiker and Walter Baethgen</i>	Presidential Level (3 rd Floor)	
	RCS5: Cross-scale interactions between agriculture and biodiversity <i>Leaders: Sieg Snapp and Matthew Hayek</i>	Seminar 2 (2 nd Floor)	
15:30-16:00	Coffee Break & Posters	Skyline (4 th Floor)	
16:00-18:00	Plenary: Strengthening Science-Stakeholder-Policy Linkages for Future Systems Report Back from Radical Collaboration Sessions Keynote: Cary Fowler, U.S. Department of State Keynote: Bill Hohenstein, U.S. Department of Agriculture Panel: Barbara Stinson, BLS LLC (Moderator) Lance Lillibridge, Iowa Corn Growers Hayden Montgomery, Global Methane Hub Pauline Scheelbeek, London School of Hygiene & Tropical Medicine Allison Thompson, Foundation for Food & Agriculture Research Closing Remarks and Way Forward: Morven McLean, AgMIP Steering Council Co-Chair AgMIP Coordination Unit and Executive Committee	Presidential Level (3 rd Floor)	

APPENDIX 1: Agenda

Friday, June 30th, 2023: Team Meetings

— 8 —

If you would like to attend a side-session, please contact the session Leader(s) for more information.

Time	Session	Leaders
09:00-12:00	AgMIP C+GHG-MIP	Terry Nipp – tnipp.aegis@gmail.com Bruno Basso – basso@msu.edu
	Food System Emissions	Francesco Tubiello – francesco.tubiello@fao.org Kevin Karl – kevin.karl@columbia.edu
	Detection & Attribution in Low-Input Systems	Audrey Brouillet – audrey.brouillet@ird.fr Benjamin Sultan – benjamin.sultan@ird.fr
	AgMIP Global Gridded Crop Model Intercomparison 2	Christoph Müller – cmueller@pik-potsdam.de Jonas Jaegermeyr – jonas.jaegermeyr@columbia.edu
	Global Economics	Hermann Lotze-Campen – lotze-campen@pik-potsdam.de Dominique van der Mensbrugghe – vandermd@purdue.edu
	Calibration	Daniel Wallach – dwallach@uni-bonn.de Taru Palosou – Taru.Palosuo@Luke.Fi

The AgMIP9 workshop agenda is subject to change.**Thank You to Our Sponsors:****Cornell University****POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH**

APPENDIX 2: Participants

First Name	Last Name	Institution
Ligalem	Agegn Asres	Arba Minch University
Shakeel	Ahmad	Bahauddin Zakariya University Multan
Lisa	Ainsworth	USDA ARS
Phillip	Alderman	Oklahoma State University
Seyedreza	Amiri	Higher Education Complex of Saravan
John	Antle	Oregon State University
Sotirios	Archontoulis	Iowa State University
Paulina Ansaa	Asante	Wageningen University and Research
Senthold	Asseng	Technical University Munich
Rachel	Atcheson	NYC Mayors Office of Food Policy
Ioannis	Athanasiadis	Wageningen University and Research
Walter	Baethgen	Columbia University
Sharon	Bard	Terra Economics, LLC
Bruno	Basso	Michigan State University
Lauren	Benavidez Hernandez	GTAP Center - Purdue University
Fabiani	Bender	University of Campinas (UNICAMP)
Philippe	Benoit	Center on Global Energy Policy (Columbia- SIPA)
Anupam	Bhar	Iowa State University
Prakriti	Bista	New Mexico State University
Kenneth J.	Boote	University of Florida
Nathan	Booth	University of York
Leonard	Borchert	University of Hamburg
Melody	Braun	Columbia Climate School IRI
Simone	Bregaglio	CREA
AUDREY	BROUILLET	IRD
Samuel	Buis	INRAE
Louise	Busschaert	KU Leuven
Martin	Bwalya	NEPAD
Davide	Cammarano	Aarhus University
Bianca	Carducci	Berman Institute of Bioethics
Tony	Carr	London School of Hygiene and Tropical Medicine
Andres	Castellano	NASA
Apurbo	Chaki	BARI
Ashfaq	Chatta	University of Agriculture Faisalabad, Punjab Pakistan
Shichao	Chen	Columbia University
Minpeng	Chen	Renmin University of China
Meklit	Chernet	CIAT Bioversity Alliance
Nicolas	Choquette Levy	Boston University

APPENDIX 2: Participants

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Luca	Corinzia	ETH zurich
Antoine	Couedel	CIRAD
Claire	Cvitanovich	USDA
Brian	Davies	BriCASFR
Milagros	de Hoz	NYC Office of Food Policy
Rogério	de Souza Nóia Júnior	Technical University of Munich
Ruth	DeFries	Columbia University
Ruth	Delzeit	University of Basel
Katrien	Descheemaeker	Wageningen University
Medha	Devare	International Institute for Tropical Agriculture
Rajkumar	Dhakar	Indian Council of Agricultural Research
Madina	Diancoumba	ZALF
Chunyuan	Diao	University of Illinois
Henrique	Dias	University of Florida
Luleka	Dlamini	Environmental and Geographical Science
Veronica	Doerr	ACIAR
Zhanshan	Dong	Indigo AG
Jean-Louis	Durand	INRAE
Gibson	Durnford	Watershed Agricultural Council
Elnaz	Ebrahimi	Iowa State University
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Lisa	Emberson	University of York
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Gatien	Falconnier	CIRAD
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Jessica	Fanzo	Johns Hopkins University
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Robert	Grant	University of Alberta
Nina	Grant	Rutgers University
Brian	Grant	Agriculture and AgriFood Canada
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Jingye	Han	Wuhan University
James	Hansen	International Research Institute for Climate and Society (IRI)
Ben	Harris	Sustainable Food Lab
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Mario	Herrero	Cornell University
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Bill	Hohenstein	USDA OCE
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Malissa	Ifill	NYC Mayors Office of Food Policy
Toshichika	Iizumi	National Agriculture and Food Research Organization
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Natalie	Kozlowski	Columbia University
Huey-Lin	Lee	National Chengchi University and Tohoku University
Lance	Lillibridge	Iowa Corn Growers Association
Raphael	Linker	Technion - Israel Institute of Technology
Bing	Liu	Nanjing Agricultural University
Leilei	Liu	Nanjing Agricultural University
Ke	Liu	University of Tasmania
Wenfeng	Liu	China Agricultural University
Mariely	Lopes dos Santos	University of Kentucky
Hermann	Lotze-Campen	Potsdam Institute for Climate Impact Research (PIK)
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Greg	Lyons	Farm Credit Administration
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Kate	MacKenzie	NYC Mayors Office of Food Policy
Malgosia	Madajewicz	Center for Climate Systems Research, Climate School, Columbia University
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Pragati Pramanik	Maity	Indian Agricultural Research Institute
Liz	Marshall	USDA
Pierre	Martre	INRAE
Daniel	Mason-DCroz	Cornell University
Fidel	Maureira	Michigan State University
Shelby	McClelland	Cornell University
Sonali	McDermid	New York University
Morven	McLean	Bill and Melinda Gates Agricultural Innovations
Amy	McNally	NASA
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Elena	Mendez-Leal	Columbia University
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Fekremariam	Mihretie	CSIRO

APPENDIX 2: Participants

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Christoph	Müller	Potsdam Institute for Climate Impact Research
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Stefanos	Mystakidis	Swiss Re
Vinay	Nangia	ICARDA: International Center for Agricultural Research in the Dry Areas
Soora	Naresh Kumar	Indian Agricultural Research Institute
Wajid	Nasim Jatoi	International Center for Climate Change, Food Security Sustainability (ICCFSS), The Islamia University Bahawalpur (IUB), Pakistan
Subash	Nataraja Pillai	ICAR-Indian Institute of Farming Systems Research
Enquye	Negash	Columbia University
Gerald	Nelson	University of Illinois, Urbana-Champaign
Claas	Nendel	Leibniz Centre for Agricultural Landscape Research (ZALF)
Thuy Huu	Nguyen	INRES (University of Bonn)
Terry	Nipp	AgMIP
Ibrahim	Njouenwet	University of Yaounde I
Diego	Noletto Luz Pequeno	CIMMYT
Garry	OLeary	Agriculture Victoria
Monique	Oliveira	Brazilian Agricultural Research Corporation (Embrapa)
Patrick	Orenstein	Fu School of Engineering and Applied Science, Columbia University
Walid	Ouaret	University of Maryland
Marlene	Palka	Department of Crop Sciences, Institute of Agronomy
Taru	Palosuo	Natural Resources Institute Finland (Luke)
Bella	Palumbi	NASA
Suranjan	Panigrahi	Purdue University
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Jeffrey	Potent	Columbia SIPA
Pratishtha	Poudel	Purdue University
Valentin	Pret	Cirad

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Laure	Tall	IPAR
Liang	Tang	Nanjing Agricultural University
Ruoling	Tang	Wageningen University and Research
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Allison	Thomson	Foundation for Food and Agriculture Research
Peter	Thorburn	CSIRO
Pierre C. Sibiry	Traore	ICRISAT
Francesco	Tubiello	FAO
Matteo	Turchetta	ETH Zurich
Roberto	Valdivia	Oregon State University
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Michael	van der Laan	University of Pretoria
Dominique	van der Mensbrugghe	Purdue University
Murilo	Vianna	University of Bonn
Lorenzo	Villani	University of Florence
Katharina	Waha	University Augsburg
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Daniel	Wallach	University of Bonn
Margaret	Walsh	USDA Office of Energy and Environmental Programs
Guiling	Wang	University of Connecticut
Xuhui	Wang	Peking University
Chenzhi	Wang	Leibniz Centre for Agricultural Landscape Research (ZALF)
Qing	Wang	Bill & Melinda Gates Agricultural Innovations
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Anthony	Whitbread	International Livestock Research Institute
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Hossein	Zare	University of Hohenheim
Liangliang	Zhang	Peking University
Zhe	Zhang	National Center for Atmospheric Research
Yan	Zhu	National Engineering and Technology Center for Information Agriculture
Lew	Ziska	Columbia University
Alex	Zizinga	Makerere Univ

APPENDIX 3: Abstracts, Presentations, and Report Backs

Paper Presentation Abstracts: [link](#)

Paper Presentation Slides:

PS1A	PS10A
PS1B	PS10B
PS2A	PS11
PS2B	PS12
PS3	PS13A
PS4	PS13B
PS5	PS14
PS6	PS15
PS7	PS16
PS8	PS17
PS9	

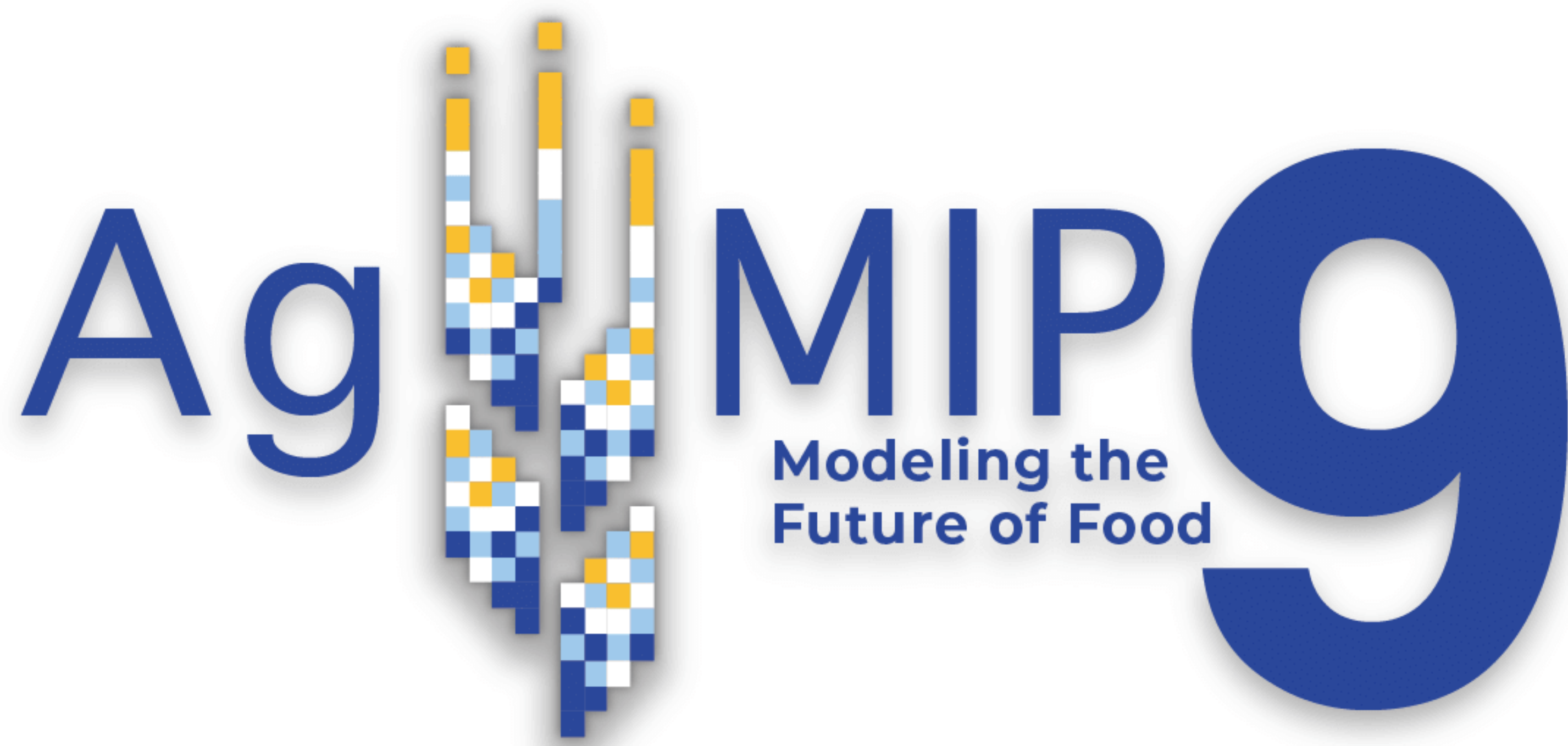
Poster Presentation Abstracts: [link](#)

Side Session Meeting Proposals: [link](#)

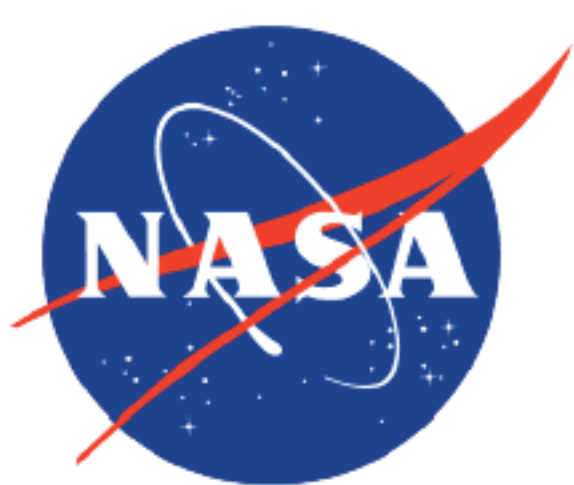
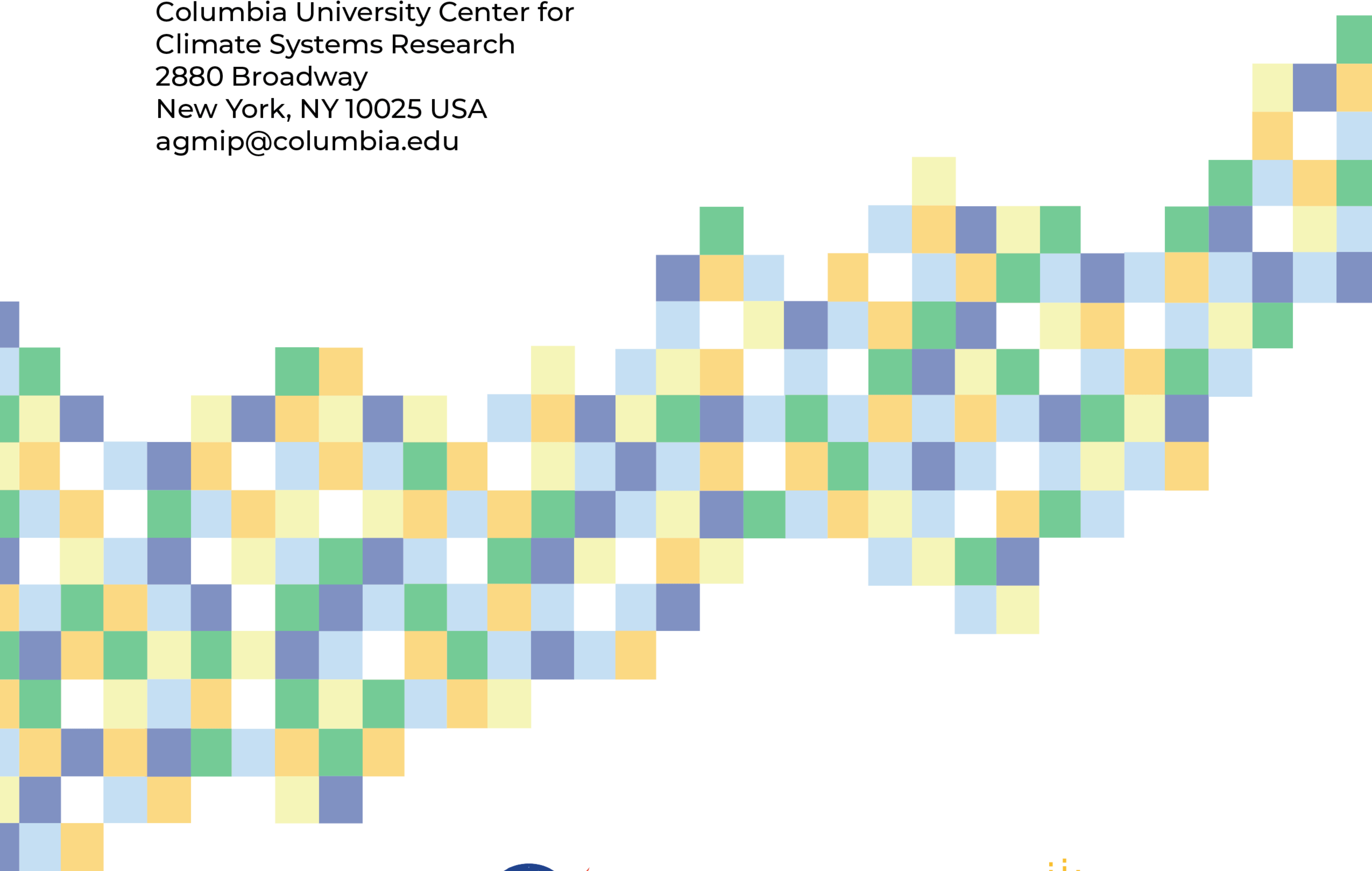
Working Session Report Backs: [link](#)


Plenary Videos:

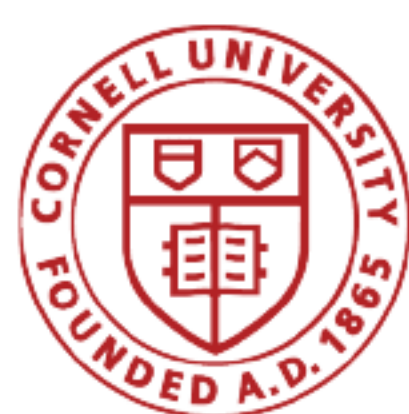
[Improving Models and Integrated Assessments](#)
[Utilizing New Tools to Address Food System Challenges](#)
[Enhancing Inclusion, Equity, and Justice in Food System Modeling](#)
[NASA Perspectives on Agriculture from Field to Space](#)
[Synergizing Adaptation and Mitigation Along the Value Chain](#)
[Deepening Collaborations for the Future of Food, Land, and Health](#)
[Strengthening Science-Stakeholder-Policy Linkages for Future Systems](#)



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U.S. DEPARTMENT OF AGRICULTURE



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U.S. DEPARTMENT OF AGRICULTURE



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