S8: AgMIP and the SDGs: Simulating Multiple Demands on Agriculture

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Co-hosts: Alex Ruane *(NASA GISS, USA)*, Joshua Elliott *(University of Chicago, USA)*, Christoph Müller *(PIK, Germany)*

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Summary of themes covered in workshop

- <u>Cynthia</u>: How to use the modelling tools to support Paris Agreement-food security and SDGs. Focus on SDGc-zero hunger. Innovative methods, barriers, next steps, opportunities.

- <u>Joshua Elliott</u>: Weather-induced risk in crop production related to extremes likely to become more frequent. It can be managed by tools for monitoring and seasonal forecasting. Adaptation is possible but with more water.

- <u>Tomoko Hasegawa</u>: Mitigation policy has to be carefully designed to assure that it does not increase food insecurity. Vulnerable households may need some compensatory measures to protect them.

- <u>Senthold Asseng</u>: Grain protein is affected by CC, not just yield, and this is important for nutritional issues. Non linear relationships found when T, CO_2, N conditions change. Sometimes yield decreases and grain protein increases, sometimes the opposite: it is quite complex.

- <u>Mohammed Ly</u>: Agroclimatic analyses can help to support adaptation in West Africa. Longer cycle is an efficient adaptation option for maize and millet, but it is not for peanut. Drought- and heat-tolerant varieties are needed.

- Christoph Müller: Future spatial variability of maize yield at global scale will depend on water and N supply. Provided there is more water available, CV decreases (with or without N). N alone keeps drought years but the mean yield increases.

- David Leclere: Biodiversity, habitat quality, species richness are likely to decrease in the future. Impacts are worse for Sub-Saharan Africa, South Asia and Latin America, and especially for amphibians and reptiles. Uncertainty has to be explored better. Innovative strategies are needed.

- Alex Ruane: Circular system: Local farms as producers are elements from the global crop production, their production goes to global markets and then to supply regional markets and to determine regional prices. That is why we need linked models. Agricultural response varies regionally. CC impacts together with mitigation may increase prices. Rice, soy and wheat may increase under high precipitation, but not maize. Large uncertainties.

Most controversial question that came up in this workshop?

- Who has to pay for mitigation?

- What can be extracted from intercomparison exercises that is really useful for SDGs?

- Meaning and use of the terms nutrition, overnourishment, undernourishment.

Results of the discussion

We need to move from a narrow focus and consider the whole picture. For doing so, we have a lot of experiments running around the world, and this is new. In Europe there is a lot of info available online.
The models do not need to be more complex necessarily, but addressing neglected aspects (e.g. micronutrients) is important.
Carbon price vs negative emissions and extreme events are challenging issues for mitigation research.
We need to translate progress in forecasting into policy-relevant decisions.
Progress on extreme events: still understanding forecasting. We need to combine statistical and dynamical tools, remote sensing into operational forecasting. We need to network and link the progress on this around the world.
We can run the past to find out what a useful interventions could have been.
Working in emergency in Africa with remote sensing data works but at a different level of applicability than in Europe.
Burkina Faso: Cereal may help when cash crops fail.
CO_2 increase impacts grain protein content, but the market sets prices depending on weight for the moment.

Dietary pathways have to be considered.

Early warning systems, strategies for responding to extremes, and crop prediction allow adaptation throughout the season and the CV could be narrow.

What do stakeholders want? They have to be the main drivers of modelling.

We know the scenario we want to get (SDGs), but can't neglect the "bad" transformation we have to face (ref to last talk of the plenary, Dirk...)

Research gaps identified

New applications of modelling, at shorter timescales are useful for stakeholders (forecast).

Road map for the issues we need to address and use it as guidance for modelling.

Better understanding of extreme forecasting.

Use of forecasts in Africa.

We do not understand how nutrition is changing, and the link between yields and nutrition/health. Health research: beyond mortality and morbidity.

Fruit, vegetable crop projections.

Pest and diseases.

Dietary pathway transition.

Interactions with water/irrigation (SDG 6) are underestimated.

Next steps

Moving away from isolated analysis of impacts and integrating CO2, nutrition, social constraints in our adaptation analysis.

We should move from "what if" analysis to target the SDGs.

Higher resolution on crop types: fruit, vegetables to inform economic models.

Collaboration with nutrition scientists in the AgMIP case studies.

Proposal: All next steps and gaps could be structured into a road map to SDGs.

Other

We need a long-term development plan for improving process models.

AgMIP is a big, structured community.

3-5 keywords that characterize the session

Need for integration, extreme events, forecast, nutrition, road map.