Agriculture

Food & Nutrient Security

August 9, 2014, Jan Verhagen

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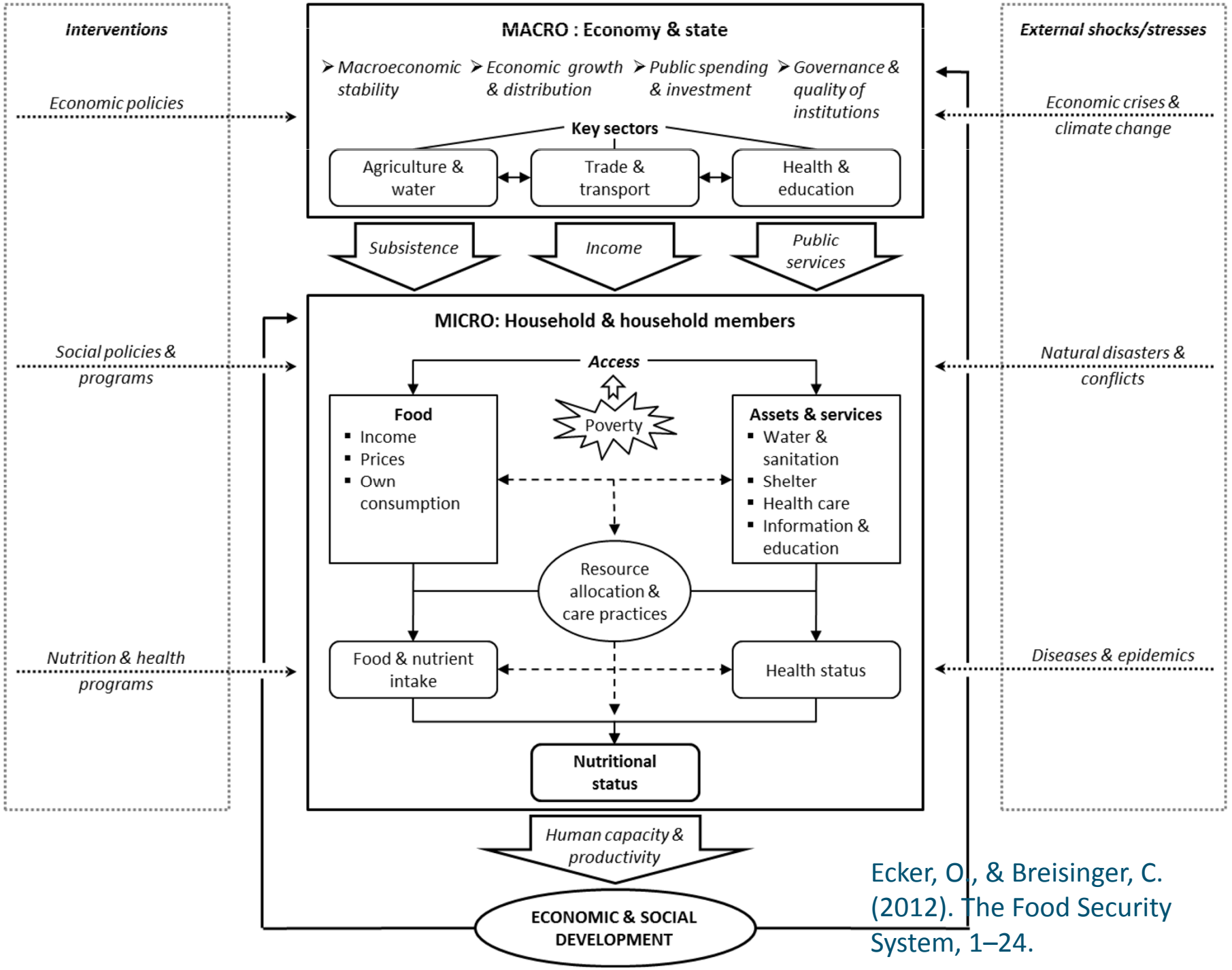
Take home messages

1. Food and Nutrient Security is complex, production is 1 important element.
2. Climate change is not the only driver of change.
3. Methods and international networks are available to work on interventions to enhance production at different scales.



Ecker, O., & Breisinger, C. (2012). The Food Security System, 1–24.

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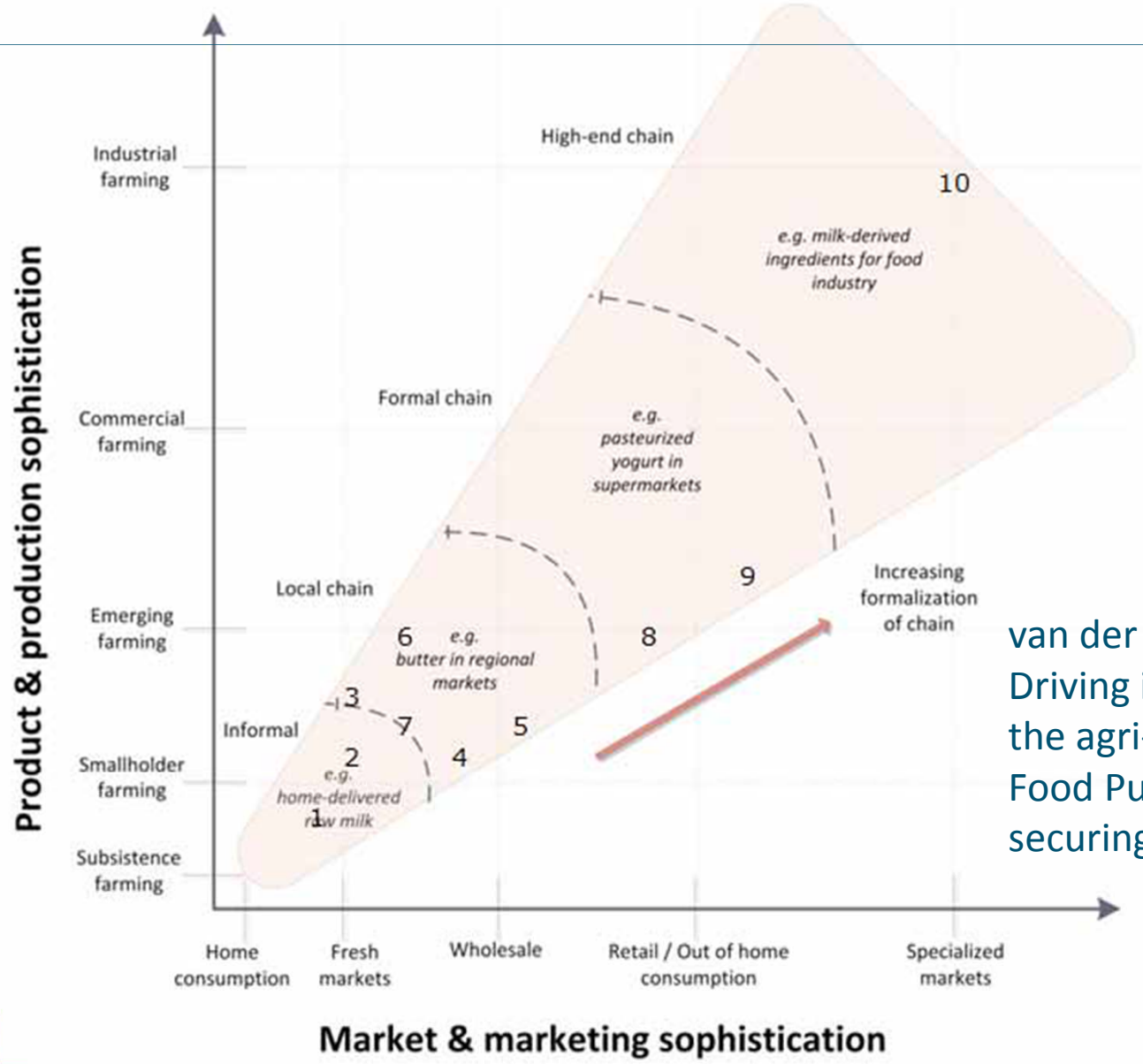
Markets are important



van der Lee et al. 2014
Driving innovations in the agri-food system. In: The Food Puzzle. Pathways to securing food for all.

Scales

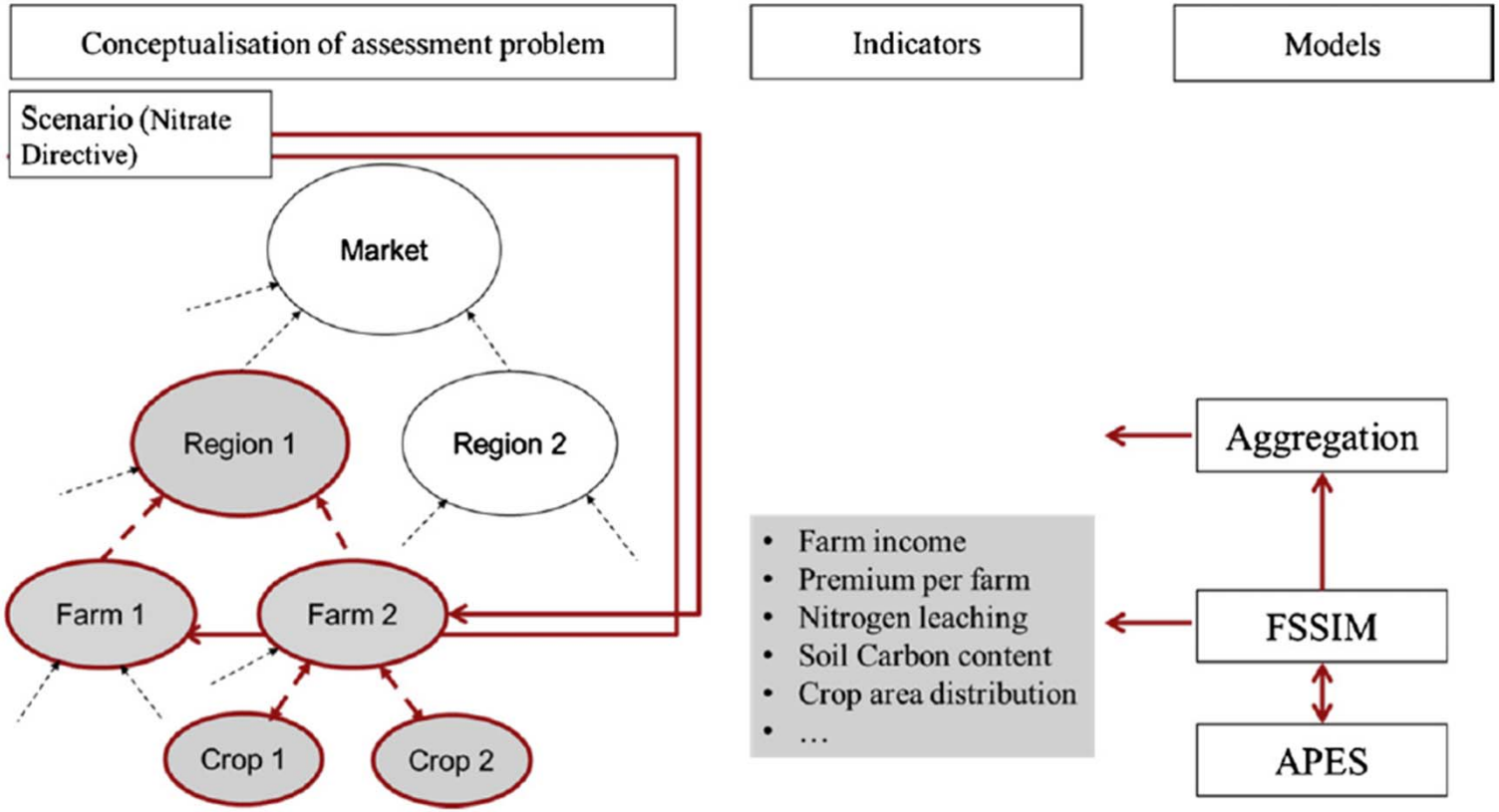


Fig. 3. Considered levels of organisation, indicators and models for test case 2 (see text for explanation). Note, a more extensive list of indicators is used in this test case. Aggregation refers to a model that scales up indicators from the farm type to the region.

Ewert, F., et al ,(2011). Scale changes and model linking methods for integrated assessment of agri-environmental systems. *Agriculture, Ecosystems and Environment*, *142*, 6–17. doi:10.1016/j.agee.2011.05.016

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Scales

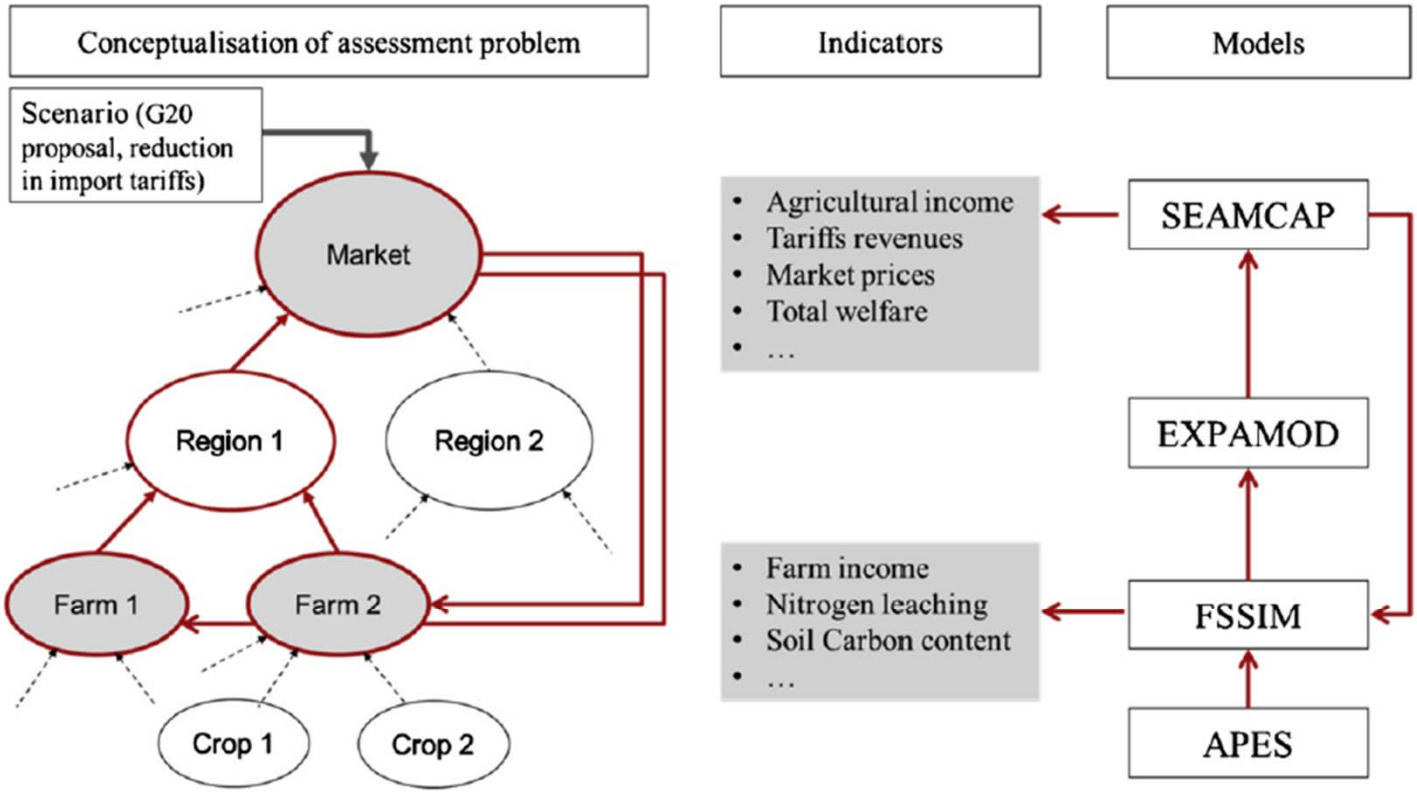

Fig. 2. Considered levels of organisation, indicators and models for test case 1 (see text for explanation). Note the market level is not only affected by the chain field-farm-region but also by other market factors (e.g. demand changes) not analysed in this study.

Ewert, F., et al ,(2011). Scale changes and model linking methods for integrated assessment of agri-environmental systems. *Agriculture, Ecosystems and Environment*, *142*, 6–17. doi:10.1016/j.agee.2011.05.016

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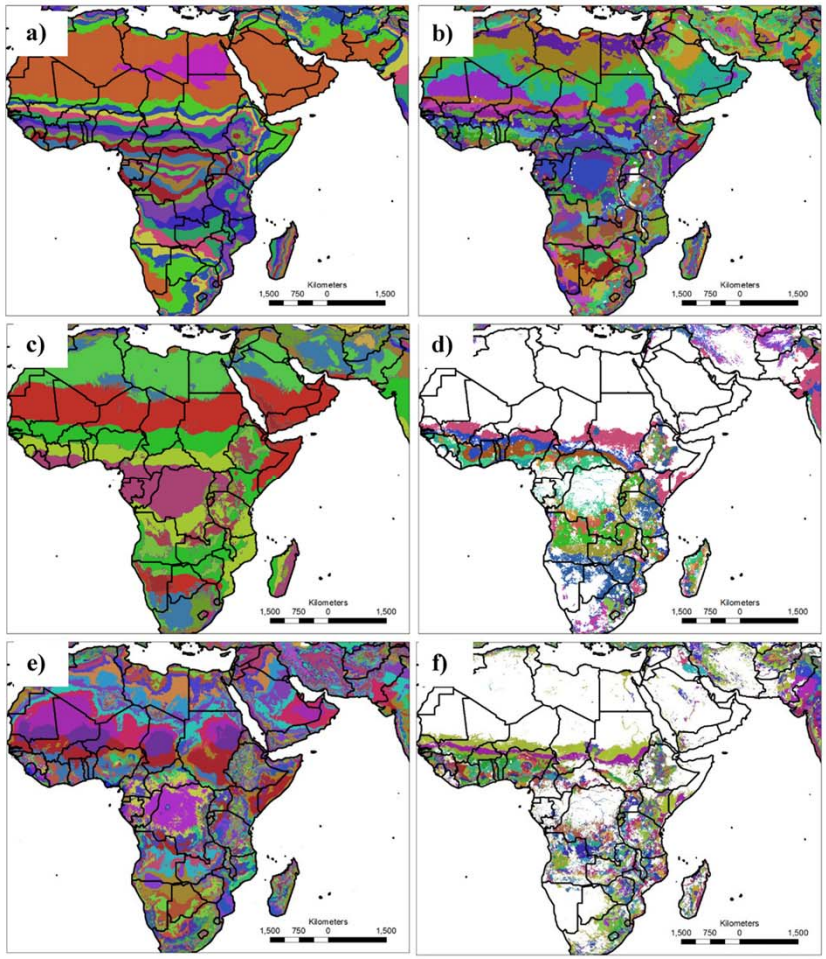
Upscaling via AEZ

Fig. 1. Zonation of Africa for (a) Global Agro-Ecological Zone for length of growing season (GAEZ-LGP), (b) Center for Sustainability and the Global Environment (SAGE) zonation scheme (crop-specific, derived using GDD with base temperature of 8 ◦C as used for maize), (c) HarvestChoice Agroecological Zone (HCAEZ, d) Global Landscapes Initiative (crop-specific, derived using GDD with base temperature of 8 ◦C as used for maize), (e) Global Environmental Stratification (GEnS), (f) Global Yield Gap Atlas Extrapolation Domain (GYGA-ED).



van Wart, J., et al. (2013). Use of agro-climatic zones to upscale simulated crop yield potential. *Field Crops Research*, *143*, 44–55. doi:10.1016/j.fcr.2012.11.023

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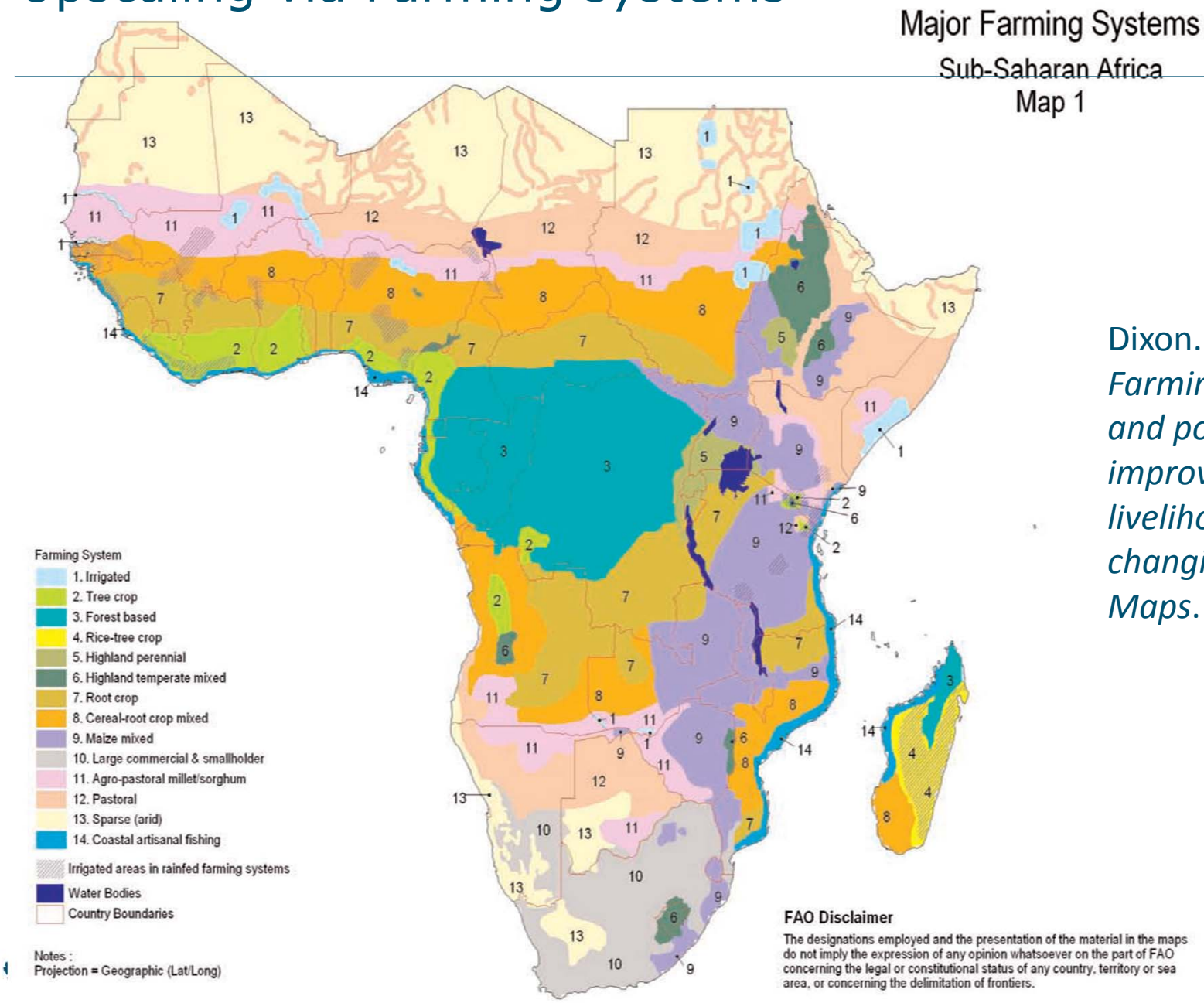
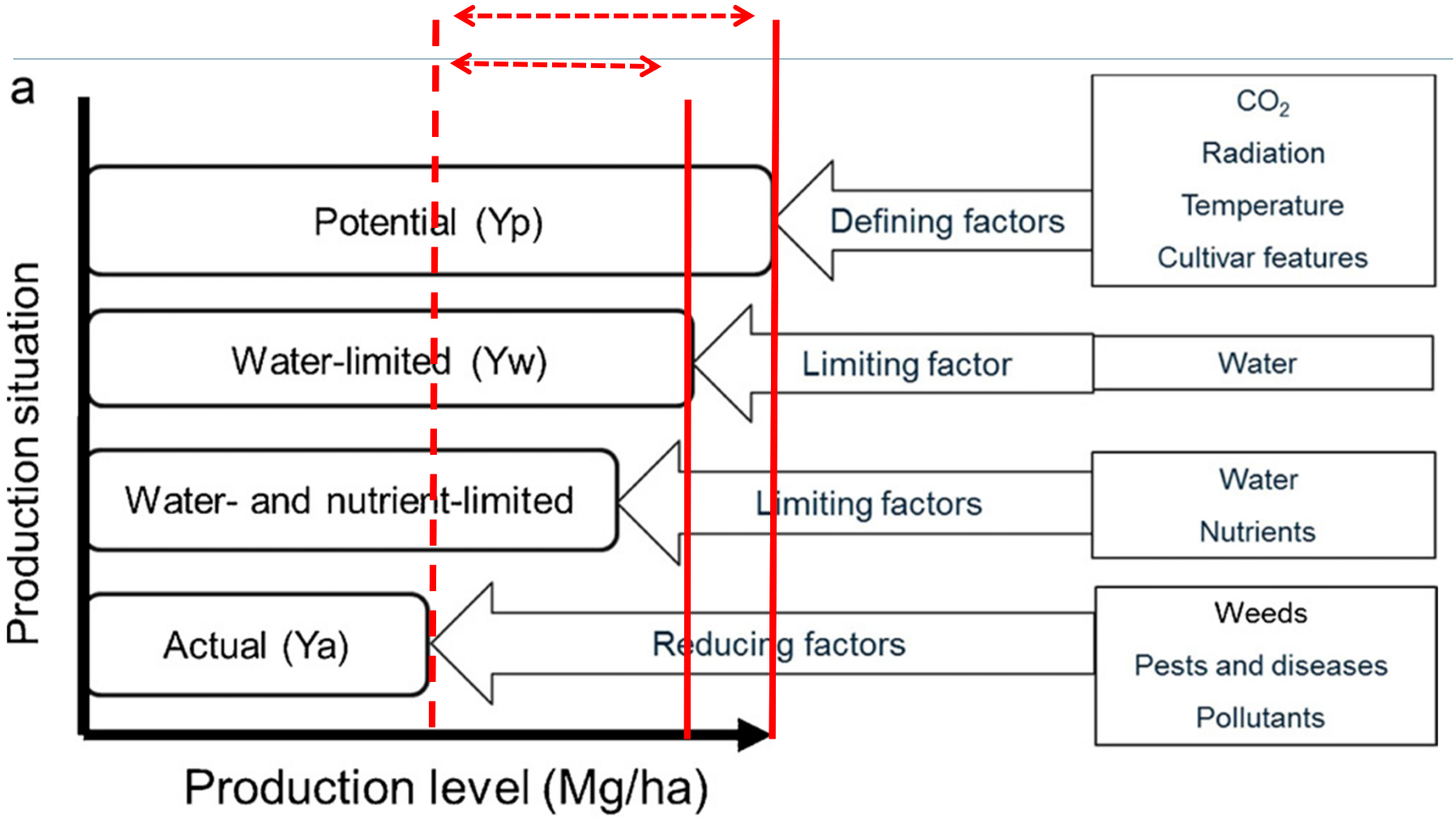
Upscaling via Farming systems



Dixon. (2001). *Farming systems and poverty: improving farmers' livelihoods in a changing world Maps*.

Yield Gap



van Ittersum, et al, Z. (2013). Yield gap analysis with local to global relevance—A review. *Field Crops Research*, *143*, 4–17. doi:10.1016/j.fcr.2012.09.009

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Two examples/approaches

Agricultural Model Intercomparison and Improvement Project (AGMIP)

- Top down modelling

Global Yield Gap Atlas

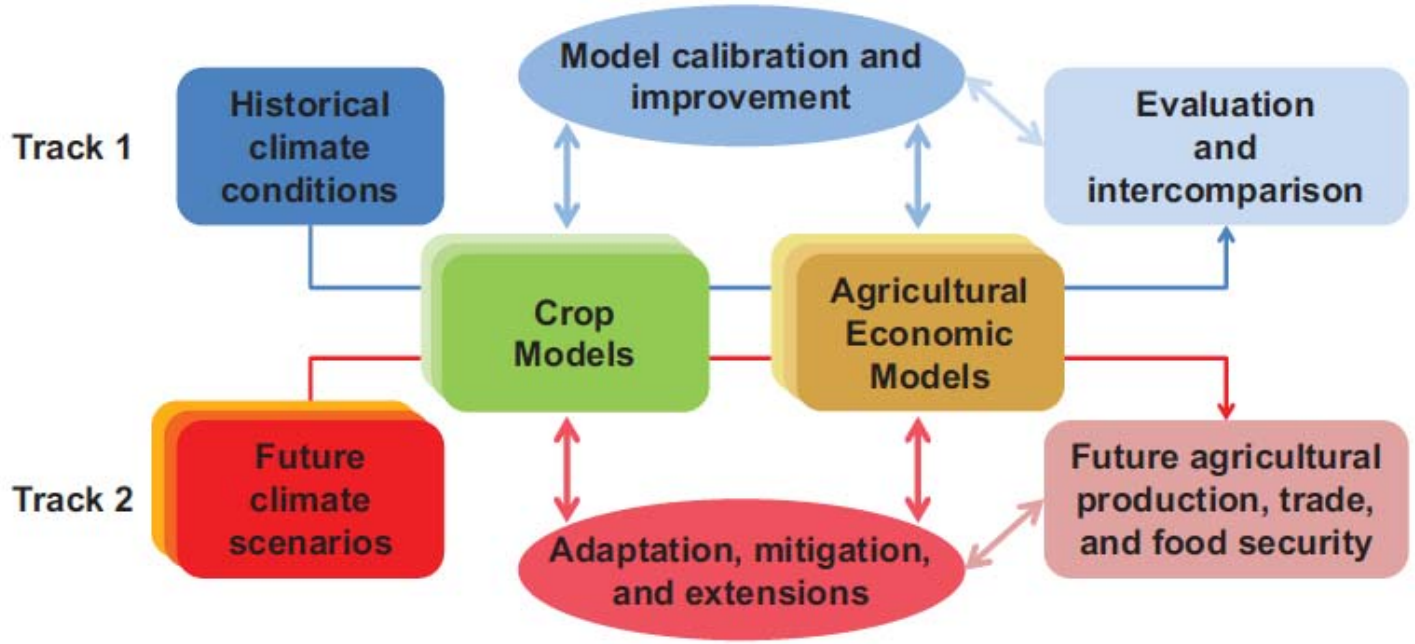
- Bottom-up approach based on actual data combined with models.

AGMIP

- **Incorporate state-of-the-art climate products as well as crop and agricultural trade model improvements** in coordinated regional and global assessments of future climate impacts
- **Include multiple models, scenarios, locations, crops and participants** to explore uncertainty and impact of data and methodological choices
- **Collaborate with regional experts** in agronomy, economics, and climate to build strong basis for applied simulations addressing key climate-related questions
- **Improve scientific and adaptive capacity** for major agricultural regions in the developing and developed world
- **Develop framework** to identify and prioritize adaptation strategies
- **Link to** key on-going efforts with partners including, CCAFS, Global Futures, MOSAICC, Yield Gap Analysis, SERVIR, MACSUR
- National Research Programs, National Adaptation Plans, IPCC, ISI-MIP

http://www.agmip.org/

AGMIP



. Two-track approach to AgMIP research activities. Track 1: Model Intercomparison and Improvement; Track 2: Climate Change Multi-Model Assessment.

Rosenzweig, C., et al. (2013). The Agricultural Model Intercomparison and Improvement Project (AgMIP): Protocols and pilot studies. *Agricultural and Forest Meteorology*, *170*, 166–182. doi:10.1016/j.agrformet.2012.09.011

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Global Yield Gap Atlas

- Estimating national and global food production capacity on existing farm land with available water supply, or need for additional land and water under different policy scenarios (e.g. biofuel or environmental policies);
- Interpreting yield trends (slow-downs, plateaus) of major food crops at regional to national scales;
- Prioritizing research and informing agricultural policies to ensure global food and water security through focus on regions with largest unexploited yield gaps and greatest potential to close them through ecological intensification and greater water productivity;
- Identifying causes of yield gaps and locations where new technologies or technology packages have greatest potential to close them.

Participating countries

- Argentina
- Australia
- Bangladesh
- Brazil
- Burkina Faso
- Denmark
- Ethiopia
- Germany
- Ghana
- India
- Jordan
- Kenya
- Mali
- Morocco
- Netherlands
- Niger
- Nigeria
- Poland
- Spain
- Tanzania
- Tunisia
- Uganda
- United States
- Zambia

http://www.yieldgap.org/

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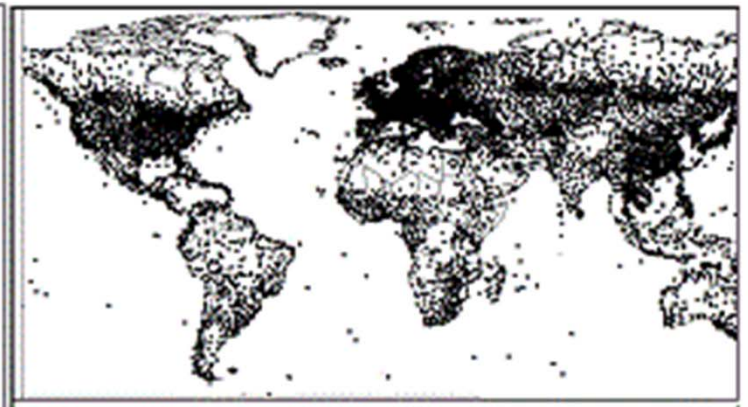
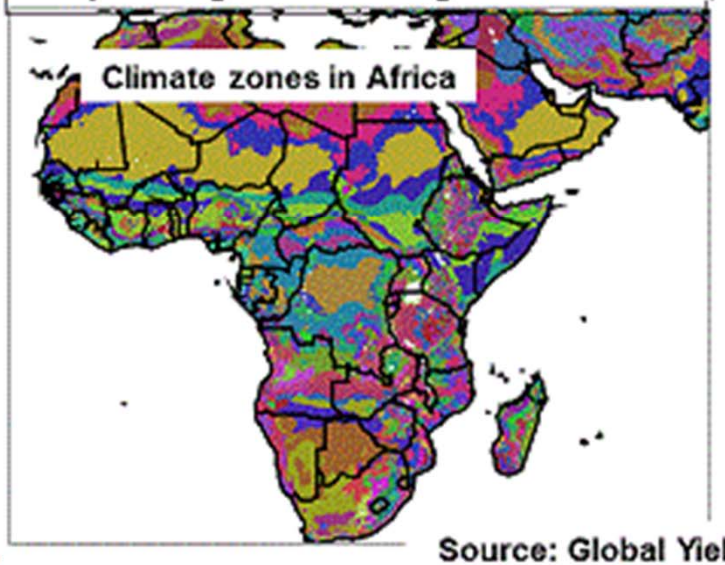
Data & upscaling

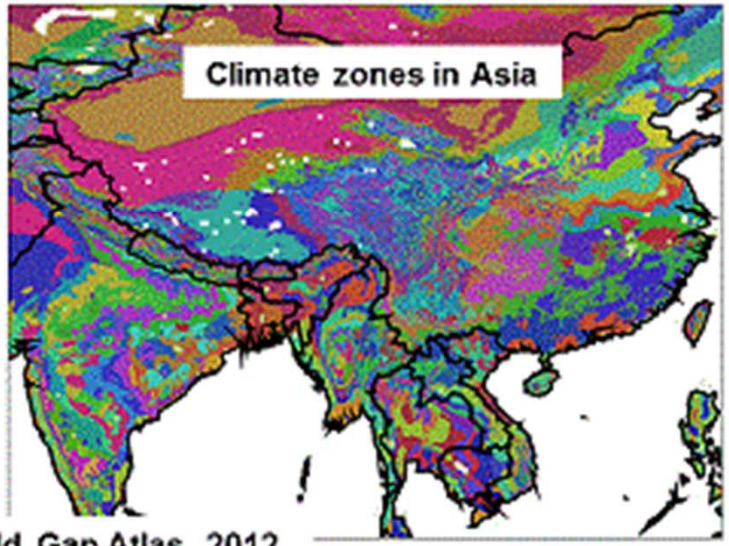
Data required for yield gap assessment:

- Quality, long-term weather data
- Quality soil and cropping systems data
- Geospatial distribution of crop area and cropping systems
- Robust crop simulation models
- Up-scaling method using climatic zones



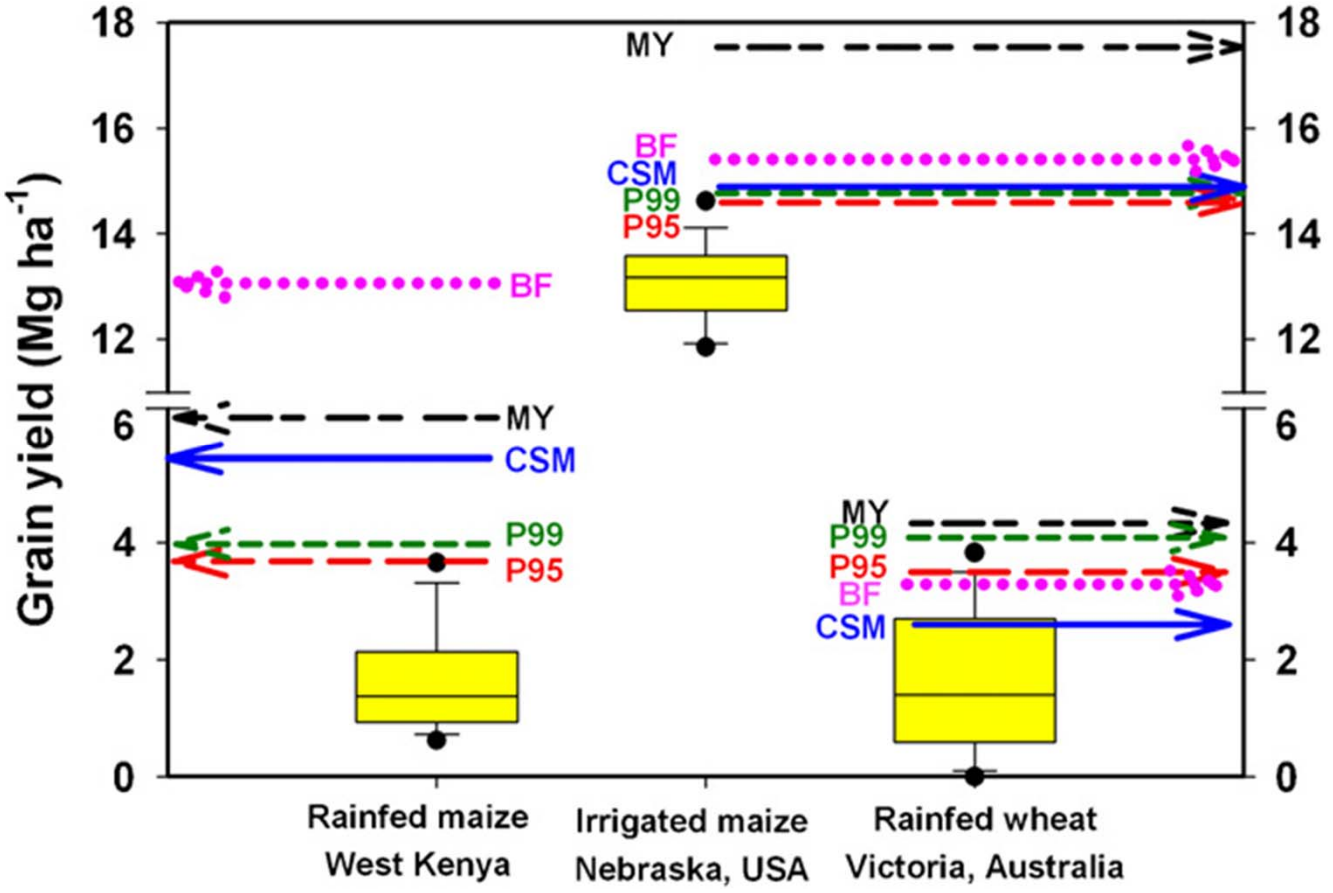
NOAA climate stations with >20 years of data





Source: Global Yield Gap Atlas, 2012

Yield levels



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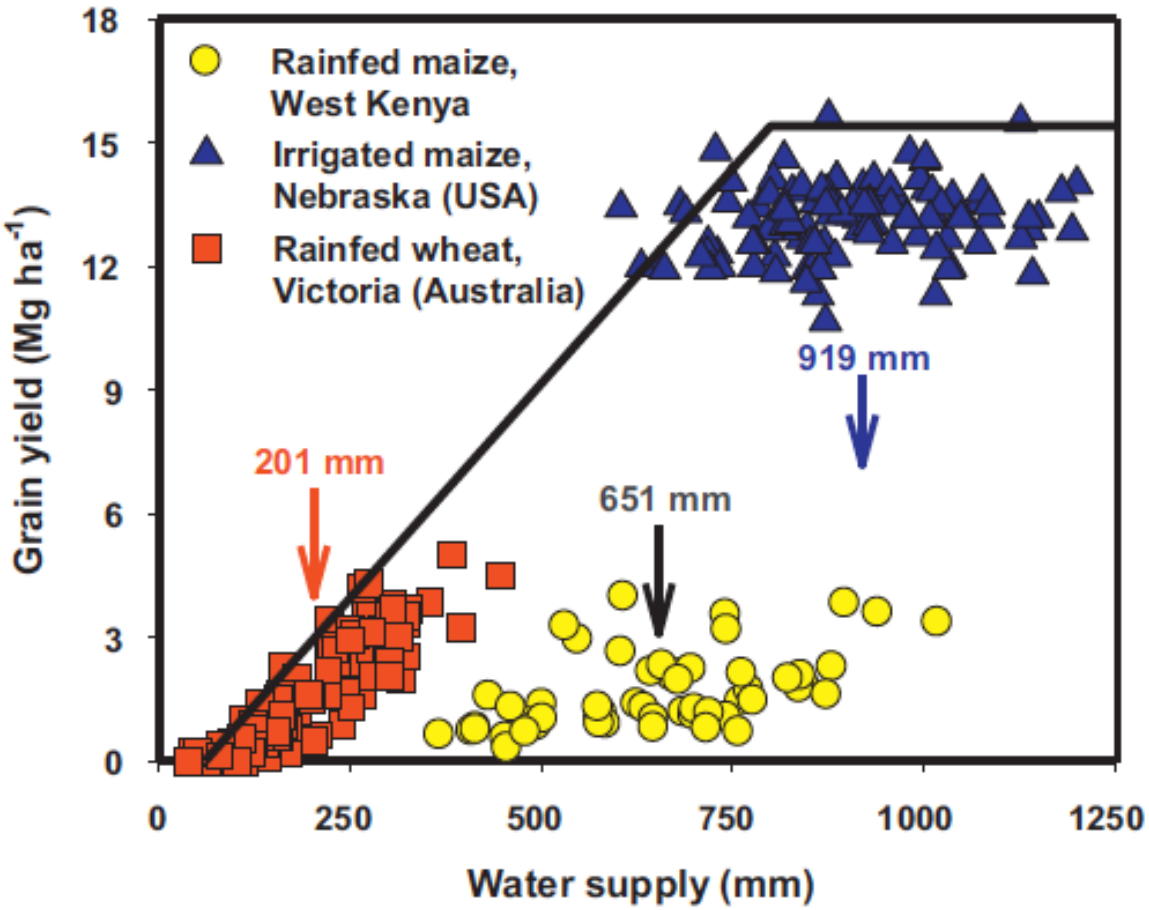
Water supply



van Ittersum, et al,. (2013). Yield gap analysis with local to global relevance—A review. *Field Crops Research*, *143*, 4–17. doi:10.1016/j.fcr.2012.09.009

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Thanks

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