CLIMATE-SMART Agriculture 2015

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Towards a Metrics for CSA

Jan Verhagen, Huib Hengsdijk, Sjaak Conijn, Annemarie Groot, Nico Polman, Theun Vellinga, Eddy Moors

Wageningen UR

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Why metrics?

To **inform decision-makers** about the **impacts** (including trade off and synergies) of climate smart agricultural activities and allow learning and evaluating.

Key criteria:

- Relevance for the decision maker
- Concise
- Quantifiable
- Link to or use existing monitoring systems
- Allowing monitoring of progress
- Easy to communicate
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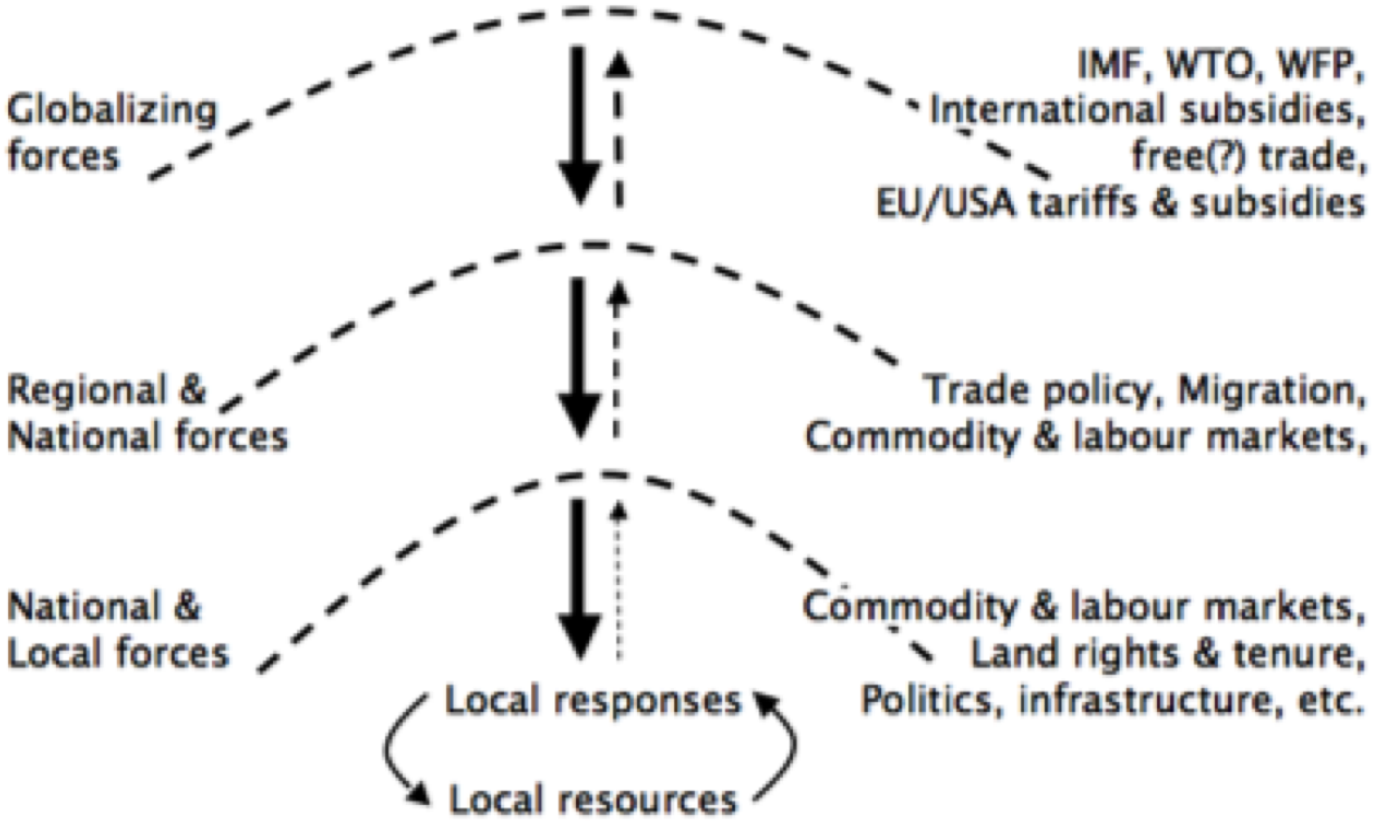
Nestedness of the decision makers



Giller, K. E., C. Leeuwis, J. A. Andersson, W. Andriesse, A. Brouwer, P. Frost, P. Hebinck, I. Heitkönig, M. K. van Ittersum, N. Koning, R. Ruben, M. Slingerland, H. Udo, T. Veldkamp, C. van de Vijver, M. T. van Wijk, and P. Windmeijer. 2008. Competing claims on natural resources: What role for science? Ecology and Society 13(2): 34. [online] URL: http://www.ecologyandsociety.org/vol13/iss2/art34/

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Metrics framework objectives:

- insight in the effects of activities applied by the decision maker to reach their goals;
- insight in the connections and interdependencies between different decision makers;
- insight in the trade-offs between food productivity, climate resilience and GHG emissions;
- a basis for discussions with decision makers and stakeholders around trade-offs and thresholds.

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Scales

Spatial scale	Jurisdiction scale	Main stakeholders
Global	Global	Governments
	National	Consumer
Macro(basin)	District	Weatherboard/ Retailer
Landscape	Community	Commodity processor
Farm/Household	Household level/farm	Farmer

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Steps

1. Identify the decision maker and understand the objectives and activities the decision maker;
2. Understand the context (social, financial, technical, natural, human) of the decision maker;
3. Map activities undertaken by the decision maker to reach the objectives
4. Understand the impacts of the activities (trade-offs and synergies)

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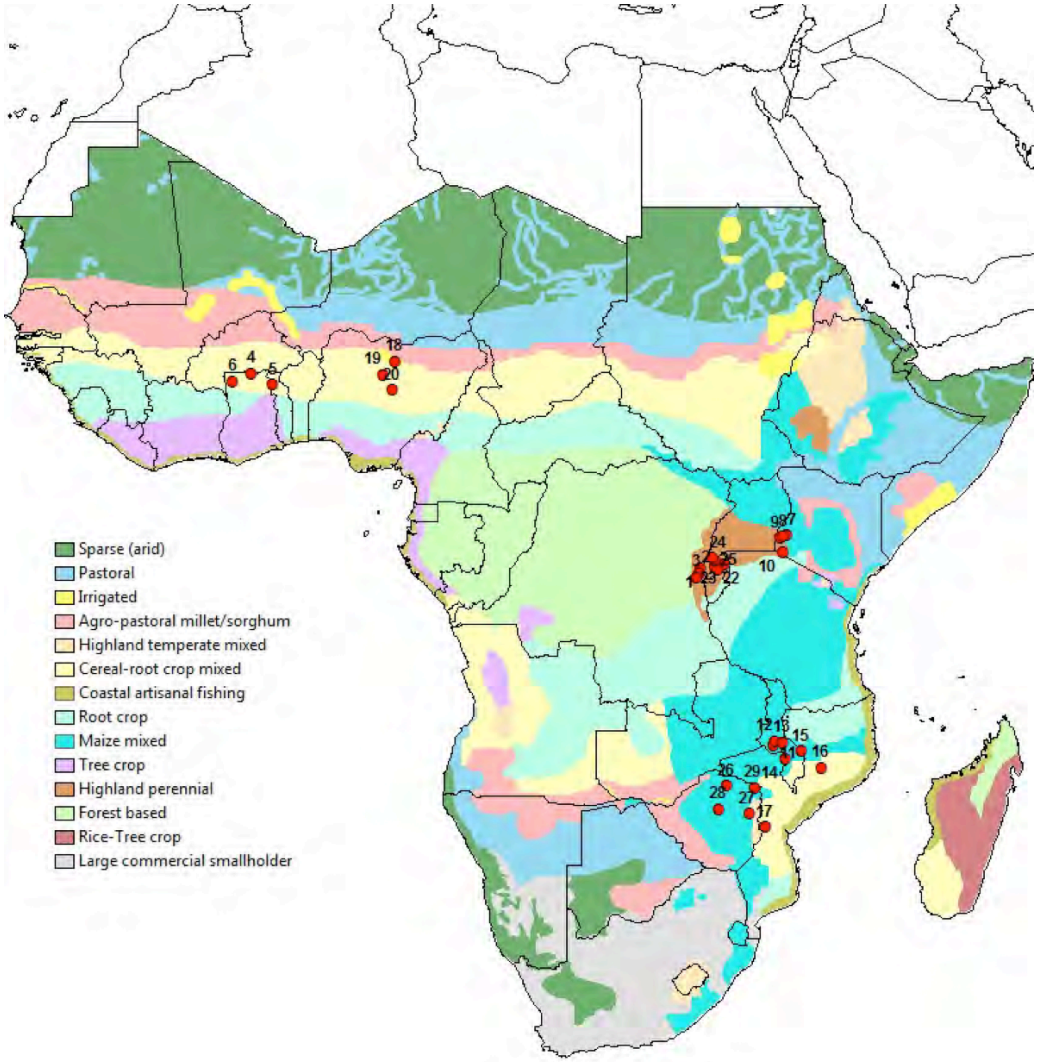
Context & Assets



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Context & Assets

	Ghana Northern region	Kenya Wamaluma	Zimbabwe Makoni
Sample size (#FHH)	104	97	98
Number of growing seasons	1	2	1
Average annual rainfall 1981-2010 (mm)	984	1754	863
Agro-ecological zone	Tropical warm/subhumid	Tropical cool, humid	Tropical warm/semi-arid
Population density (per km2)	61-70	1200	30
Average land holding size (ha)	3.1	0.6	1.6
Average FHH size (capita)	5.1	4.2	3.8
Land availability (ha/cap)	0.61	0.14	0.42
Tropical Livestock Units per FHH (#)	4.4	1.4	1.9
% female household heads	6	47	40
% FHH with income > 75% from farming	85	58	47
Number of cultivated crop types	4.4	3.5	2.9

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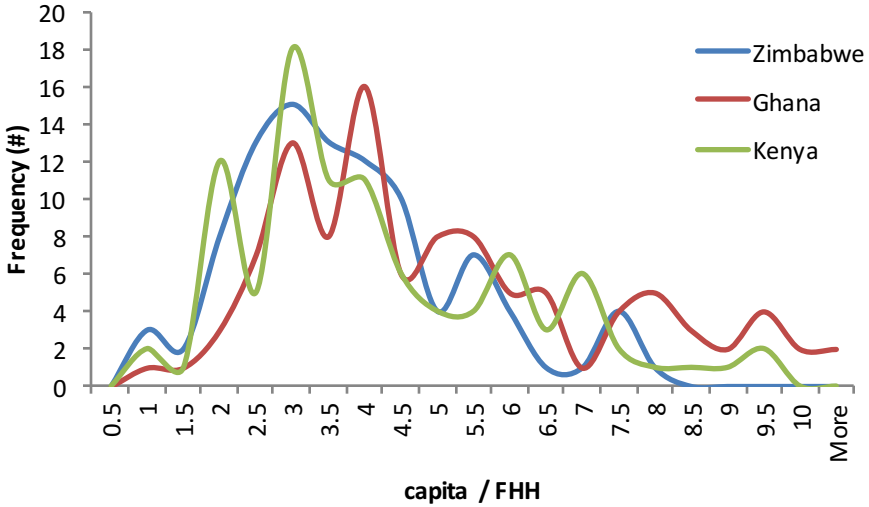
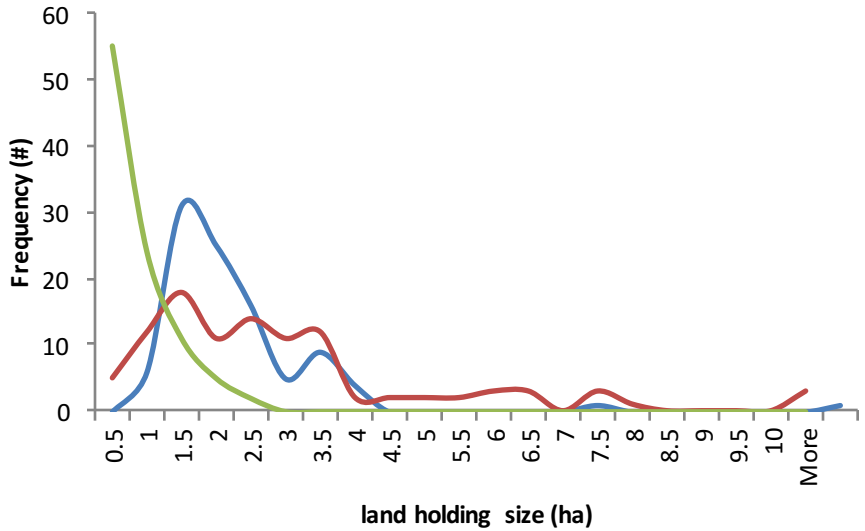
Hengsdijk, H., Franke, A. C., van Wijk, M. T., & Giller, K. E. (2014). *How small is beautiful?: food self-sufficiency and land gap analysis of smallholders in humid and semi-arid sub Saharan Africa*.

Variation in FHHs





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Objectives: Farm Household

1. food self-sufficiency
2. income above the poverty level;

Objectives CSA

1. Food security
2. Resilience
3. Low emission pathway

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Methods

- Food self-sufficiency:
  - Crop model to calculate: land requirements to satisfy own household food requirements with maize: 'land gap' for those households that cannot produce sufficient food, or a 'land surplus' for those households that are able to produce a surplus. The surplus can be used for a cash crop (soy).
- Income:
  - The net revenue is defined as the difference between the production times the price and the costs of production. For maize the costs consists of the costs for N fertilizer (based on long-term monthly average IFDC prices for urea) and for soya bean the costs consists of seed and P fertilizers (with or without inoculum). Production costs for soya bean have been collected in the N2AFRICA project.
- GHG emissions
  - Associated with the different production levels we estimate greenhouse gas (GHG) emissions, which in our case relate to external N fertilizer input (100% urea) and N contained in crop residues, which remain in the field after crop harvest. We use default methods (Tier one, IPCC)

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Climate baseline: 2000; future 2035.

Looked at:

1. Food self-sufficiency analysis: At what maize yields small farm households become self-sufficient in food
2. Income effects of growing cash crops: To what extent small farm households in the case study areas can participate in market-led developments and what are the income effects?
3. Effects of climate change on maize yields: how do future climate conditions affect maize yields and to what extent can climate smart variety choices alleviate yield reductions under future climate conditions?

And:

1. Food supply analysis: To what extent small farm households in the three case study areas are able to feed a rapidly growing urban population in sub Saharan Africa?
2. Effects of climate change on household income.
3. GHG emissions related to N application
4. Minimum household land holding to allow gaining more than poverty benchmark

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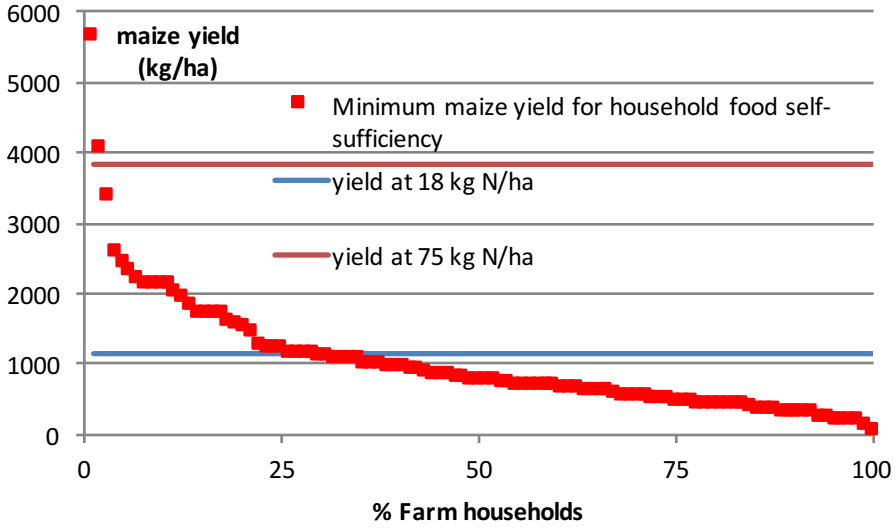
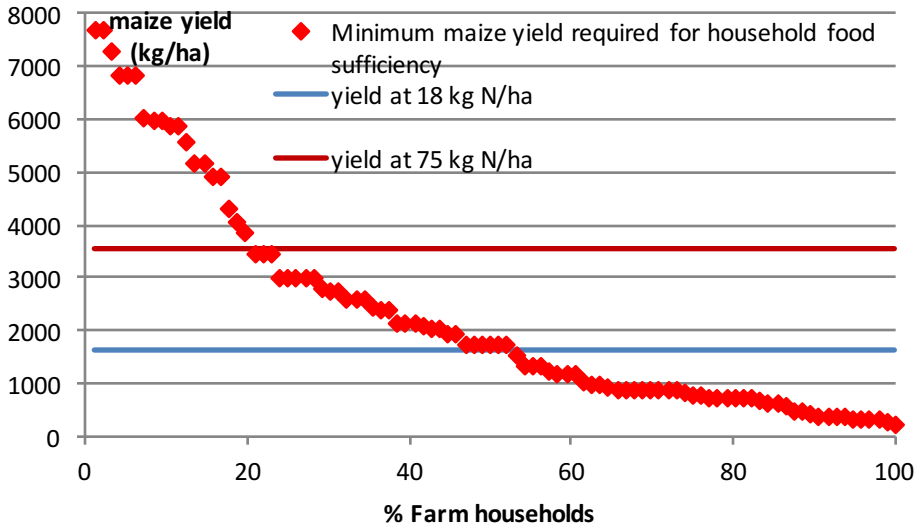
Minimum required maize yield

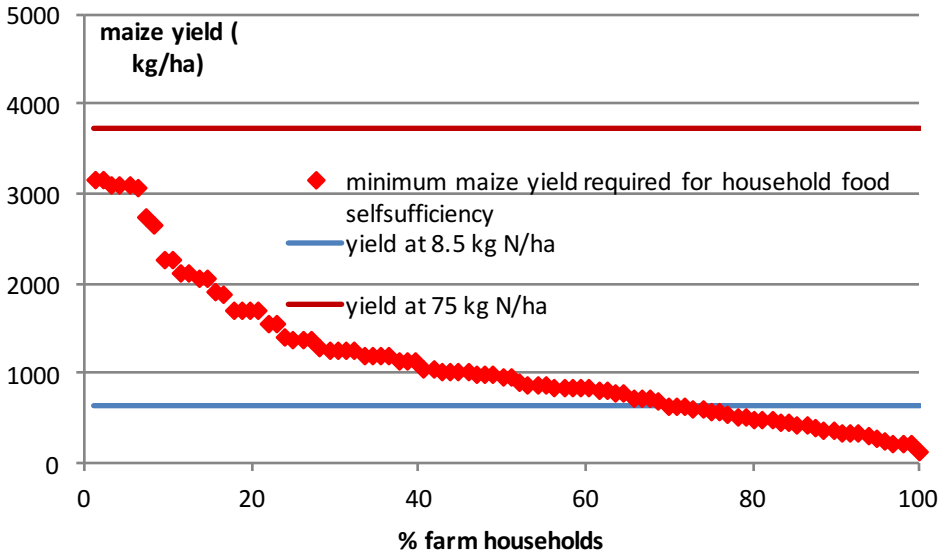
Ghana



Kenya



Zimbabwe



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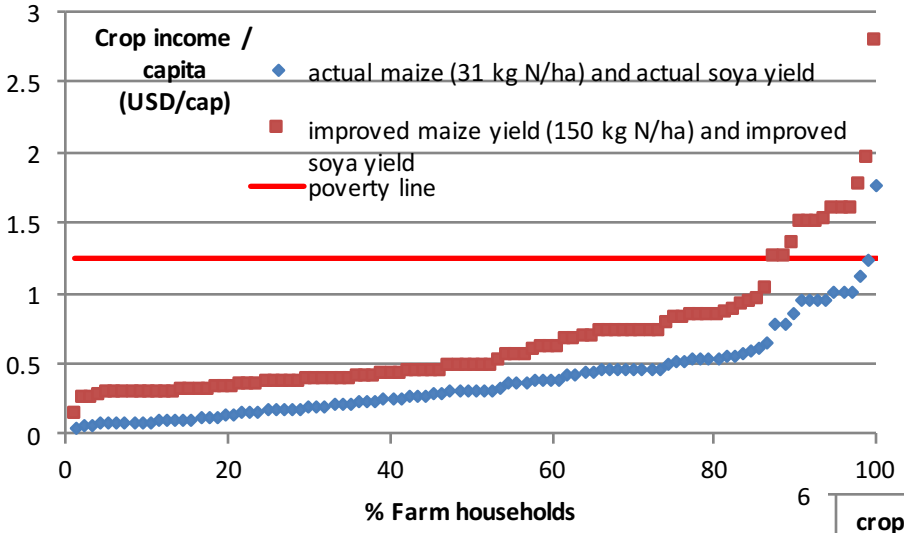
Income effects



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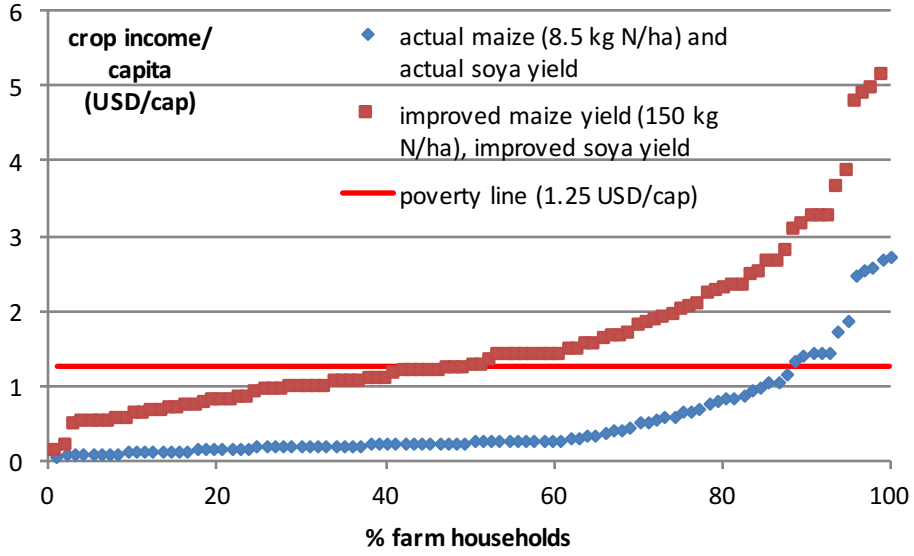

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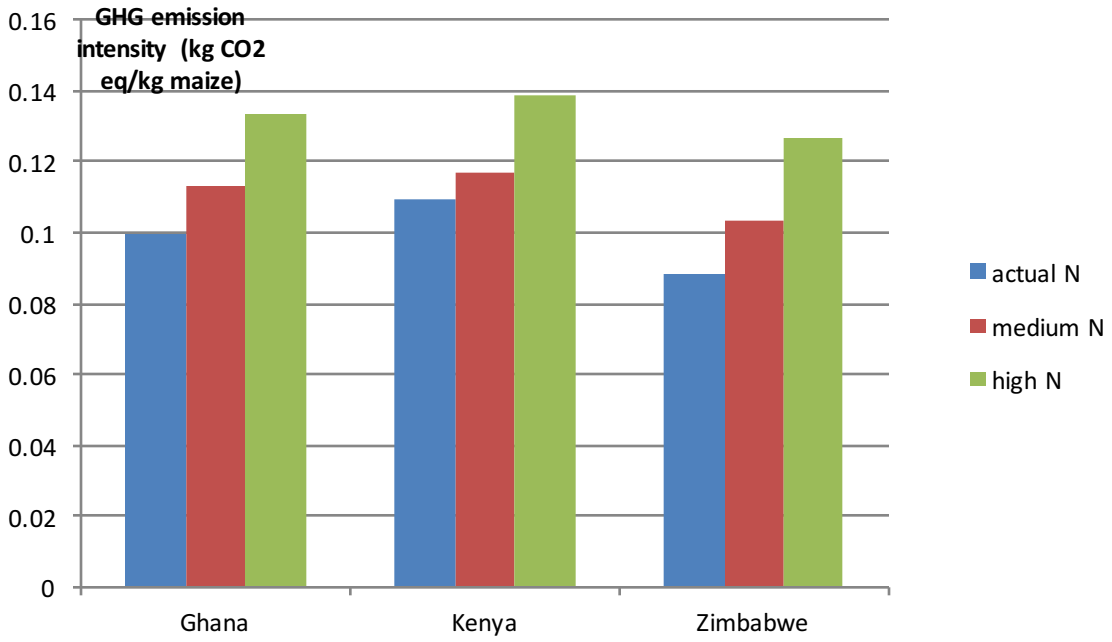
GHGi



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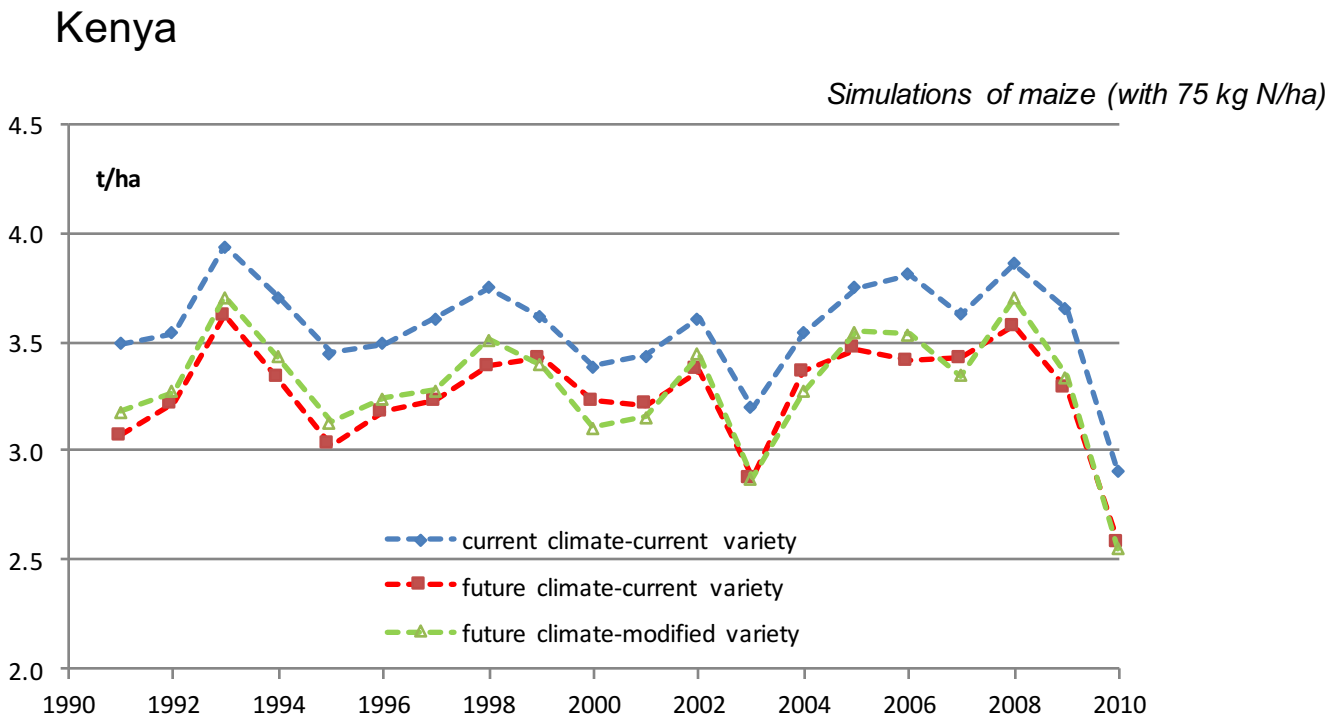
Impact of CC

- Negative in all regions: outcomes are worse than for baseline period (mainly related to increased temperature): will have a negative affect the other indicators



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Final remarks

- Indicators based on relevance for stakeholder.
- Need to work at different scales esp markets and water (not shown in this presentation)
- Models to quantify effects are available
- Resilience is now linked to variability
- No clear smart picture emerges -> development priorities may link to adaptation (N application & farm size), GHG emissions/GHGi increase.

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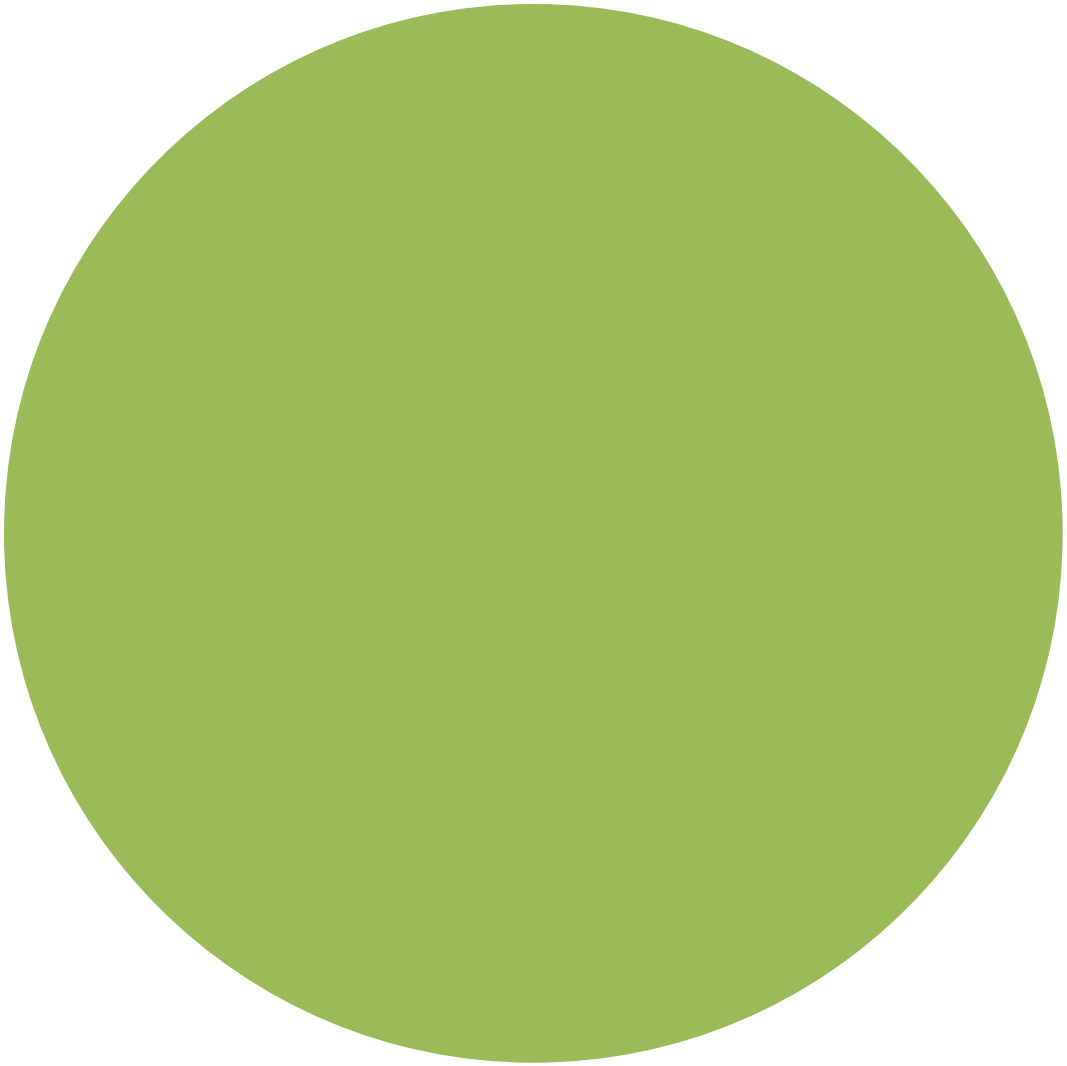
Thanks



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