University of Basel

Analyzing possible pathways to align biodiversity conservation with agricultural development in Tanzania

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Cambridge Global Food Security - Coffee Break Seminar

Agenda.

1	Background
2	Methods
3	Preliminary results
4	Way forward

Background: Trade-offs in future land uses

- Challenge to meet future biomass needs while protecting remaining ecosystems and biodiversity (IPBES, 2018)

- Land scarcity: Areas suitable to increase agricultural production are also valuable for biodiversity conservation (Zabel et al., 2019)

Intensification: Produce more efficiently on existing agricultural land

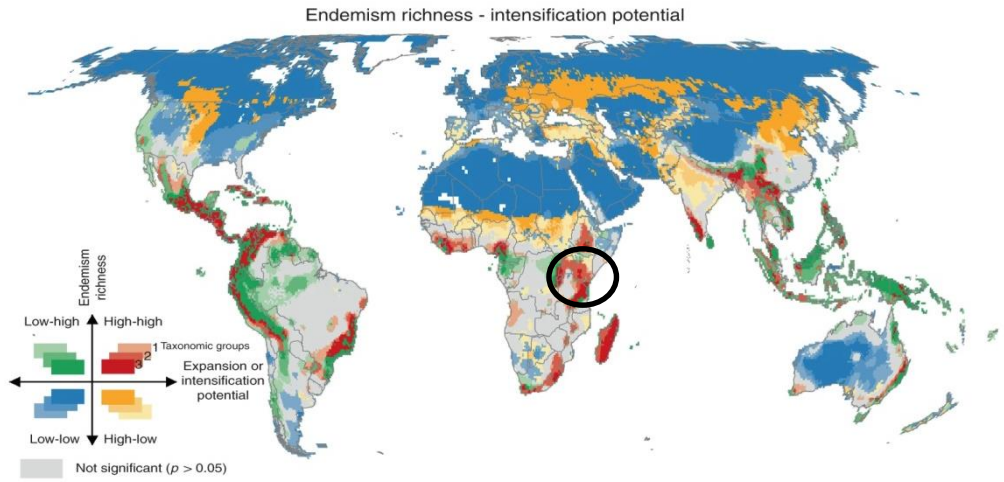
- Homogenization of habitats (Benton, et al., 2003)
- Irrigation (De Frutos, 2015)
- High agricultural input such as fertilizers and pesticides (Kleijn, et al., 2009; Gibbs et., 2009).

Expansion: Expand the agricultural land area

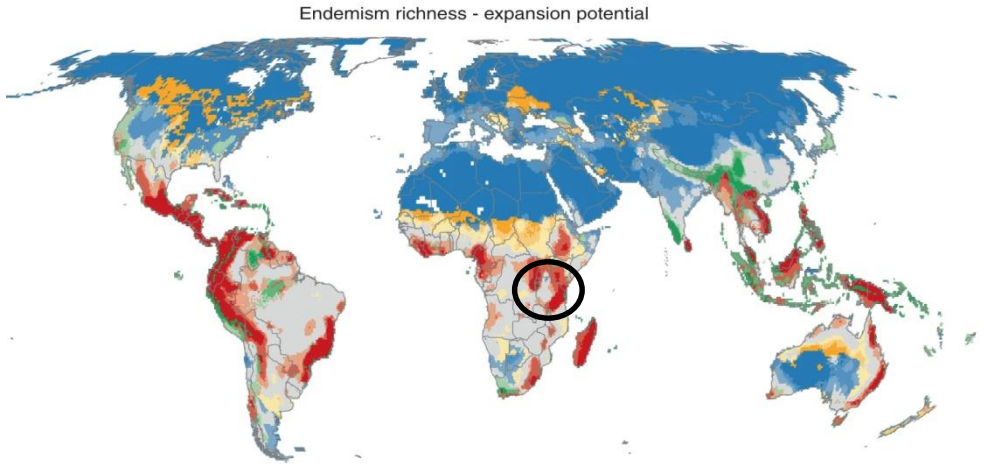
- Habitat loss and fragmentation (Beckmann et al., 2019)

Intensification vs. Expansion

Intensification potential



Expansion potential



Zabel, *et al.,* 2019

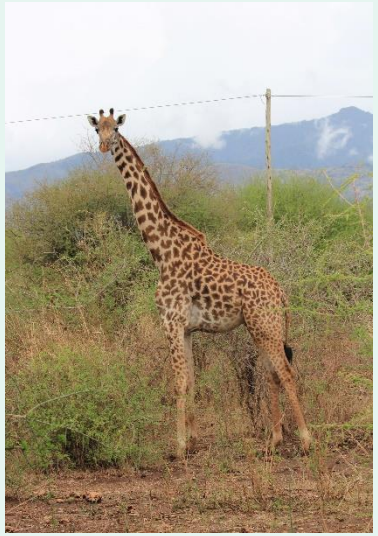
Research Project: Pathways to align biodiversity conservation with agricultural development in Tanzania

Background

Study region - Tanzania

- Hosts 6 out of 25 global biodiversity hotspots and is home to globally endangered species
  - Most wildlife found outside existing protected areas (CBD, 2021)

- Increasing demand for food (FAO, 2020)
  - Most farms are small-scale and rainfed
  - High potential for agricultural intensification and high ongoing agricultural expansion (Mkonda and He, 2018)



Research questions

1. **How and to which degree can the current cropland in Tanzania be expanded or intensified ignoring and taking biodiversity objectives into account?**

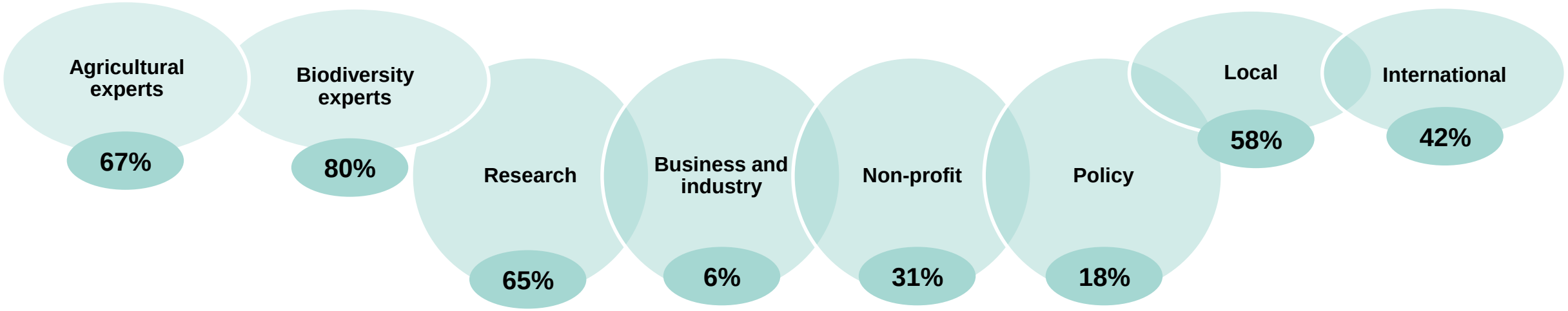
2. **How would the agricultural markets in Tanzania be impacted by such an increase in crop production?**

Methods: Expert questionnaires and interviews

1st round of questionnaires

- 72 responses collected

Methods: Stakeholder groups



Methods: Expert questionnaires and interviews

1st round of questionnaires

- 72 responses collected

Follow-up interviews

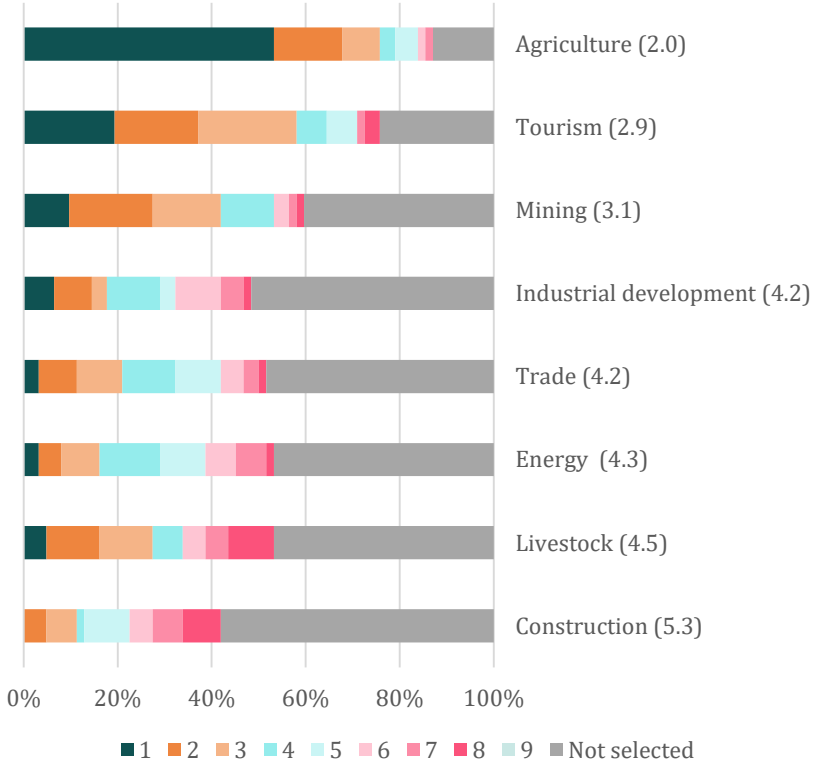
- 17 interviews carried out

Preliminary results

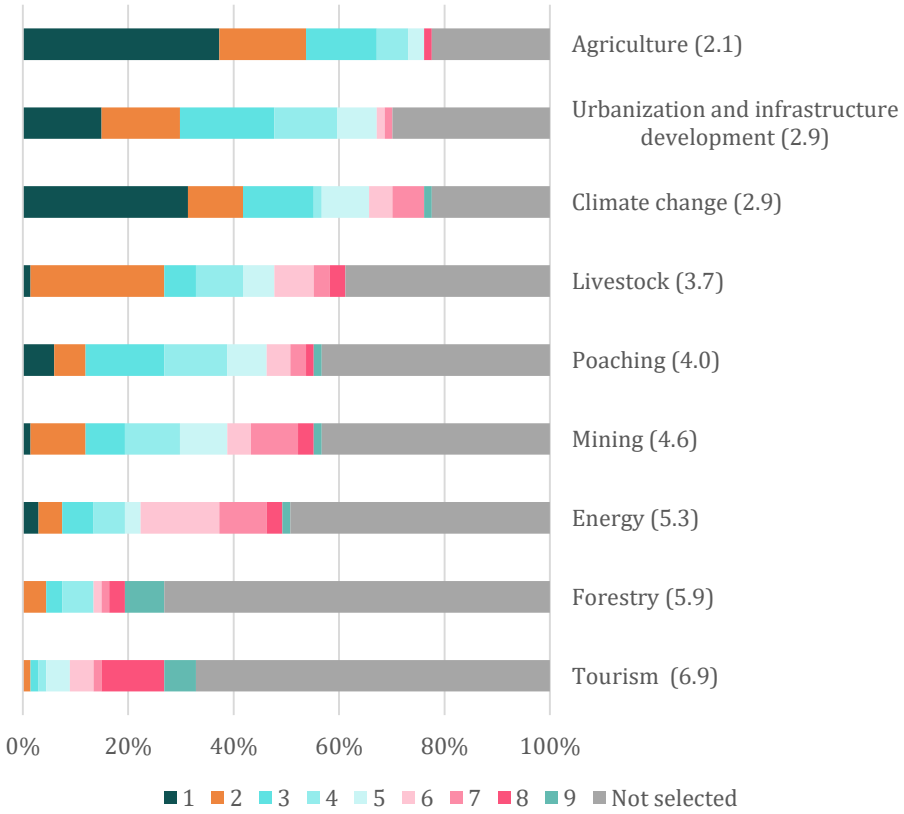
In what sectors do you see the largest economic growth potential for Tanzania?

In your opinion, what are the major threats to biodiversity in Tanzania?

Growth potential



Biodiversity threat

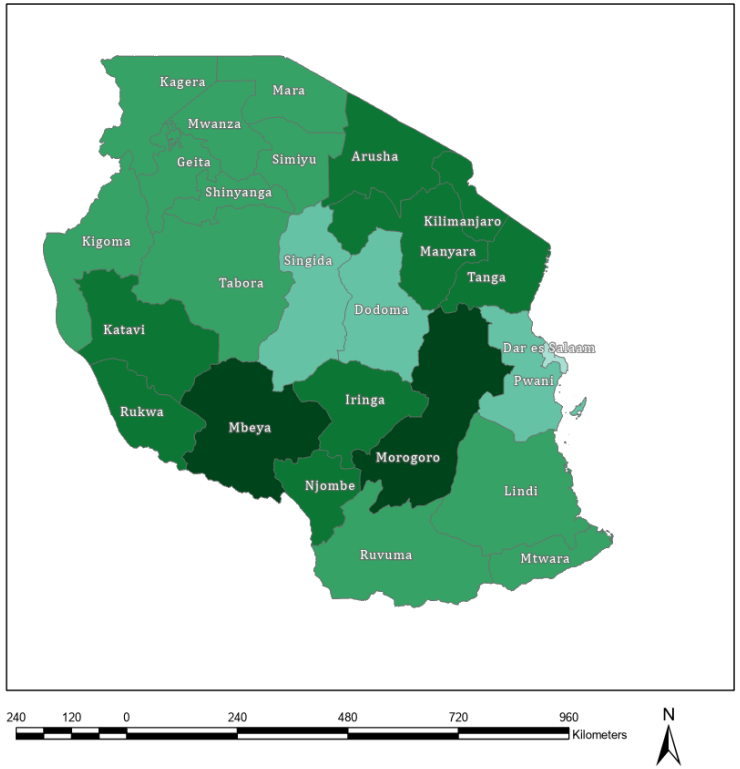


Agriculture highest ranking both growth potential and as biodiversity threat

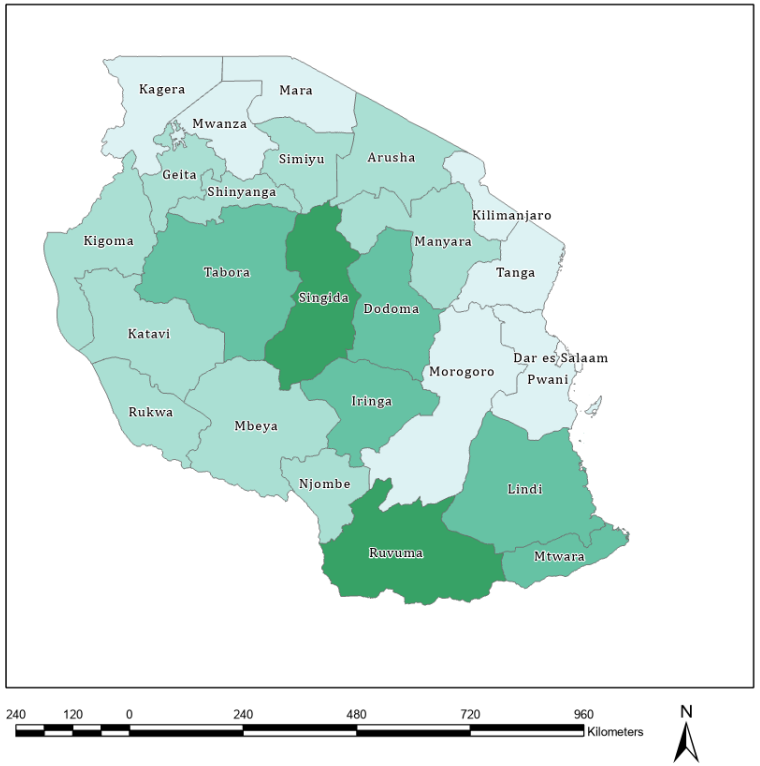
Preliminary results

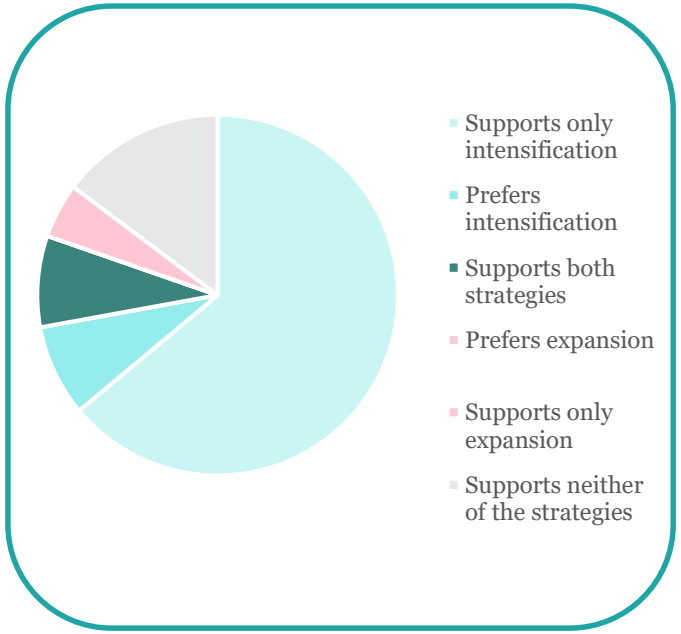
Which Region(s) have the most potential for aligning biodiversity conservation and increased agricultural crop production?

Regions suitable for intensification



Regions suitable for expansion





More regions suitable for cropland intensification compared to cropland expansion

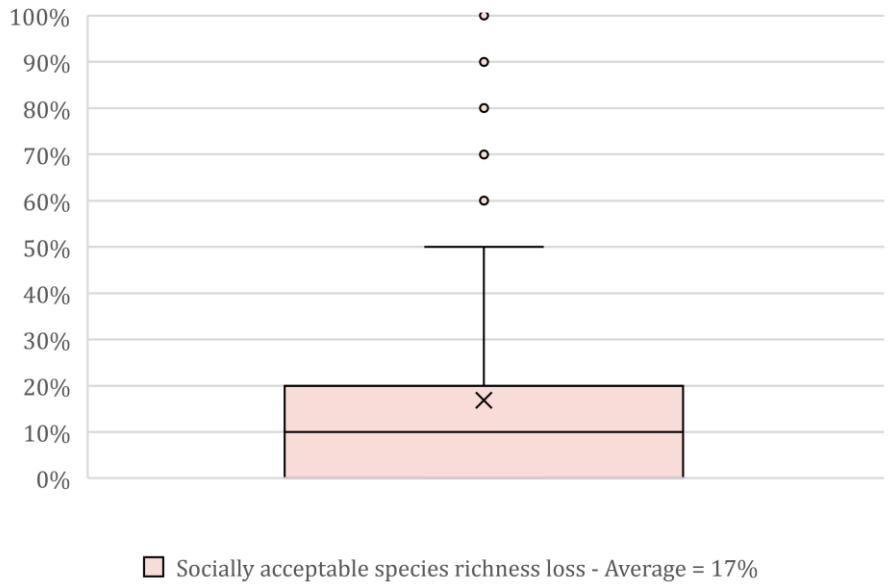
* Less impact * Smallholder farmers *

Preliminary results – defining scenarios

Scenario 1:
Environmental concerns disregarded

Scenario 2:
Biodiversity taken into account

Impact on biodiversity limited to a socially acceptable loss of species richness

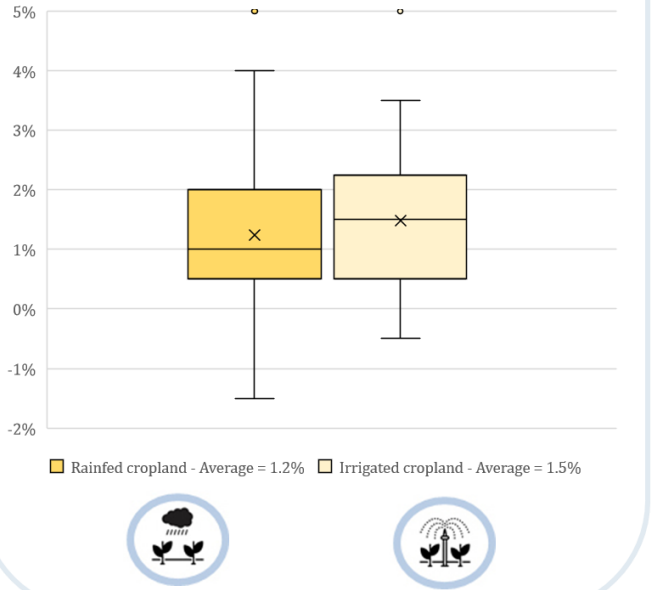


Preliminary results

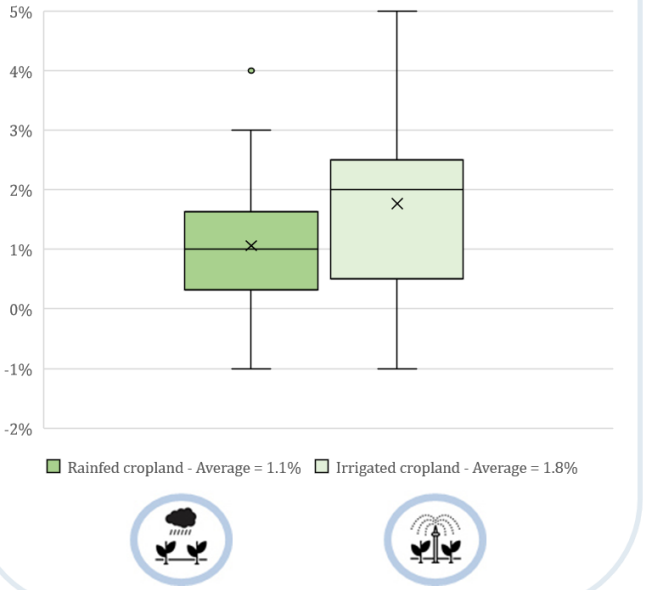
How much can the cropland in Tanzania be expanded until 2050?

Average annual change in area (ha) from now until 2050

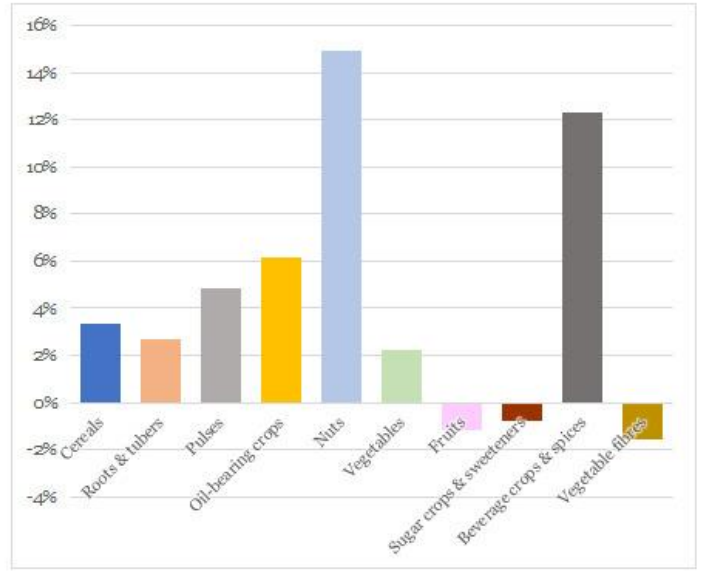
Scenario 1:
Environmental concerns disregarded



Scenario 2:
Biodiversity taken into account



Average yearly growth cropland area (ha) 2011-2020 for different groups of crops in Tanzania (source: FAOSTAT)



Share of total cropland area (ha) 2020 for the different groups of crops in Tanzania (source: FAOSTAT)

Higher annual increase in cropland area if environmental concerns are disregarded

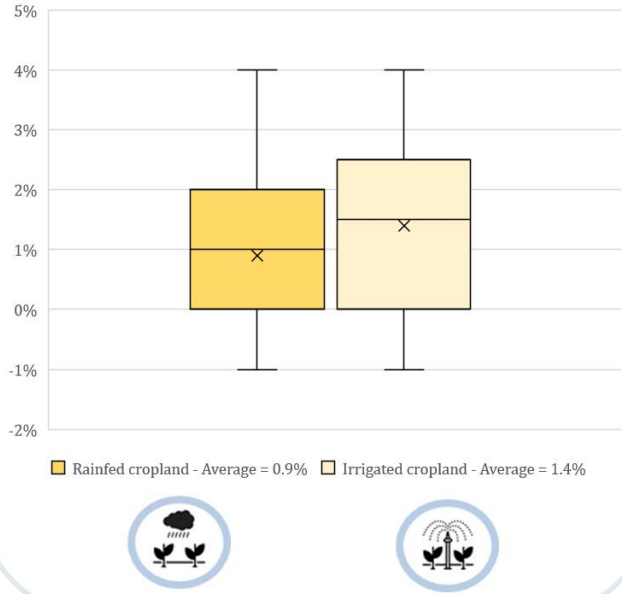
* Do not have to take habitat loss into consideration when expanding *

Preliminary results

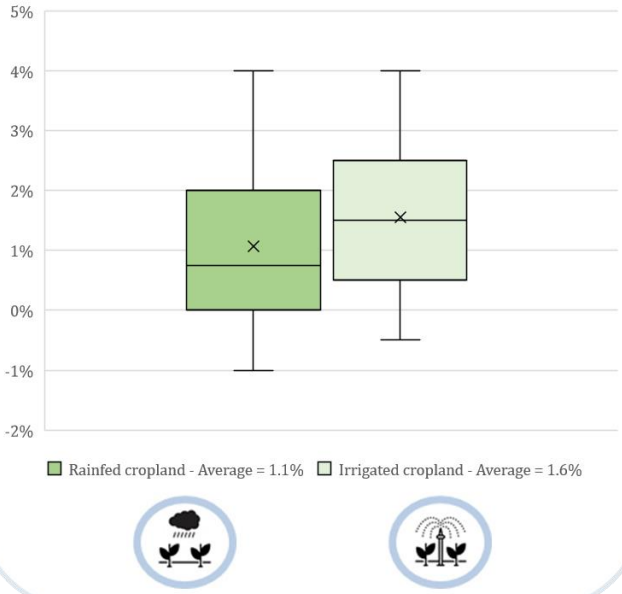
How much can the cropland in Tanzania be intensified until 2050?

Average annual change in yield (hg/ha) from now until 2050

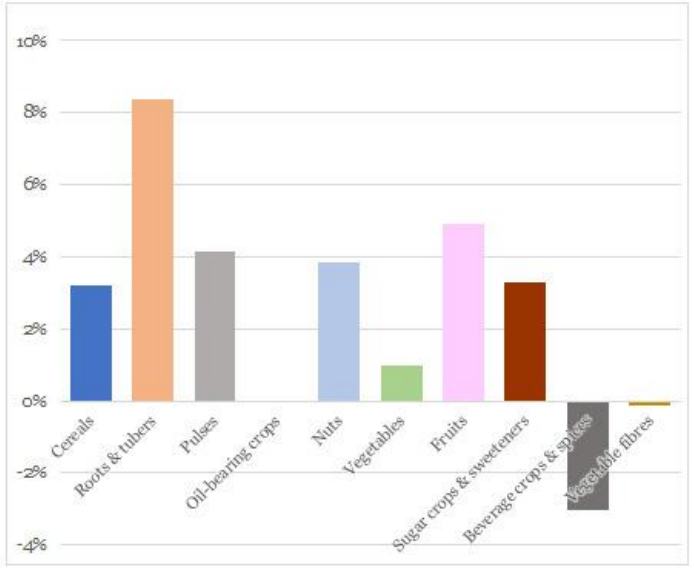
Scenario 1:
Environmental concerns disregarded



Scenario 2:
Biodiversity taken into account



Average yearly growth yield (hg/ha) 2011-2020 for different groups of crops in Tanzania (source: FAOSTAT)



Share of total cropland area (ha) 2020 for the different groups of crops in Tanzania (source: FAOSTAT)

Higher annual increase in yield if biodiversity is taken into consideration

* Long term perspective – Biodiversity important for crop production *

Way forward

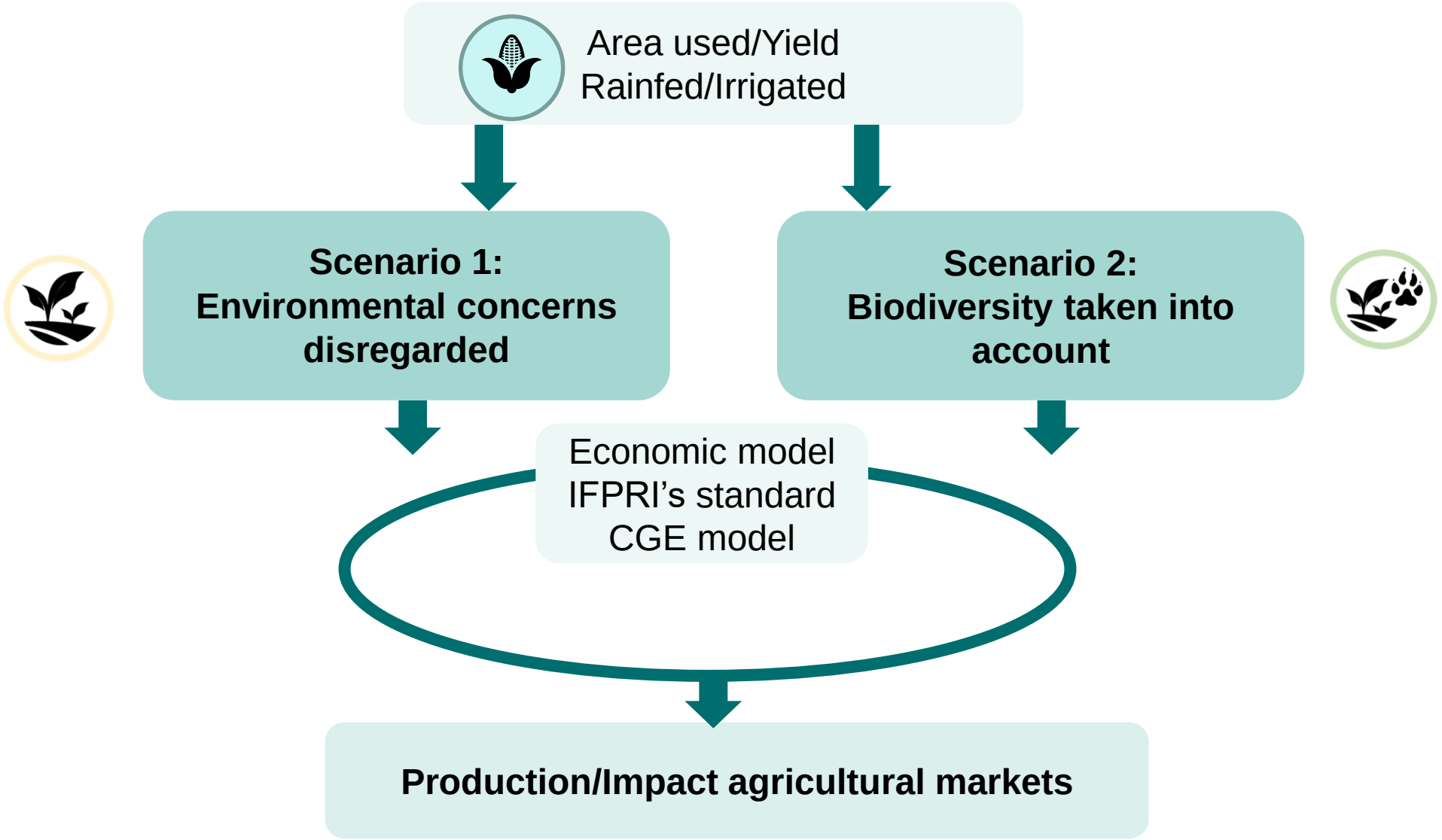
Reduce spread of results

Impact change of crop production on agricultural markets and trade

2nd round of questionnaire according to Delphi method (Okoli and Pawlowski, 2004).

Simulate scenarios in IFPR's standard CGE model (Lofgren et al., 2002)

Way forward


Area used/Yield
Rainfed/Irrigated
Scenario 1:
Environmental concerns disregarded
Scenario 2:
Biodiversity taken into account
Economic model
IFPRI's standard
CGE model
Production/Impact agricultural markets

Way forward

Reduce spread of results

Impact change of crop production on agricultural markets and trade

For different agricultural practices:

- Decide impact on productivity and land use of including biodiversity objectives
- Decide impact on biodiversity

Define additional sectors and justify results

2nd round of questionnaire according to Delphi method (Okoli and Pawlowski, 2004).

Simulate scenarios in IFPRI standard CGE model (Lofgren et al., 2002)

Further analyse existing dataset

Stakeholder workshops

Thank you for your attention

Questions or inputs?

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Research group: Land-Use Change

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