



6th International Symposium for
Farming Systems Design

Identifying changes in agricultural practices and policy interventions for sustainable intensification of farm systems in southern Mali

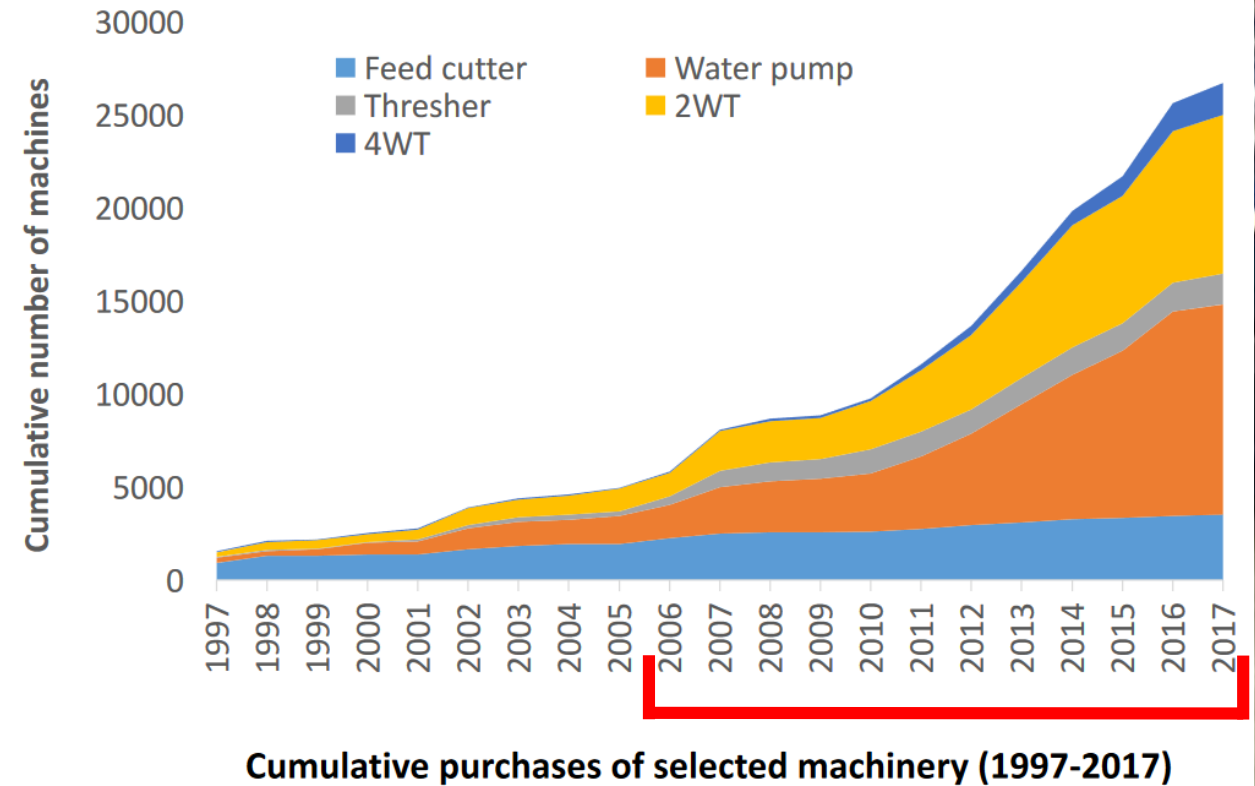
Gatien Falconnier, Jakob Hambüchen, Myriam Adam, Eva Huet, Ken Giller, Bouba Traoré, Louise Leroux, Katrien Descheemaeker



THE MCKNIGHT FOUNDATION

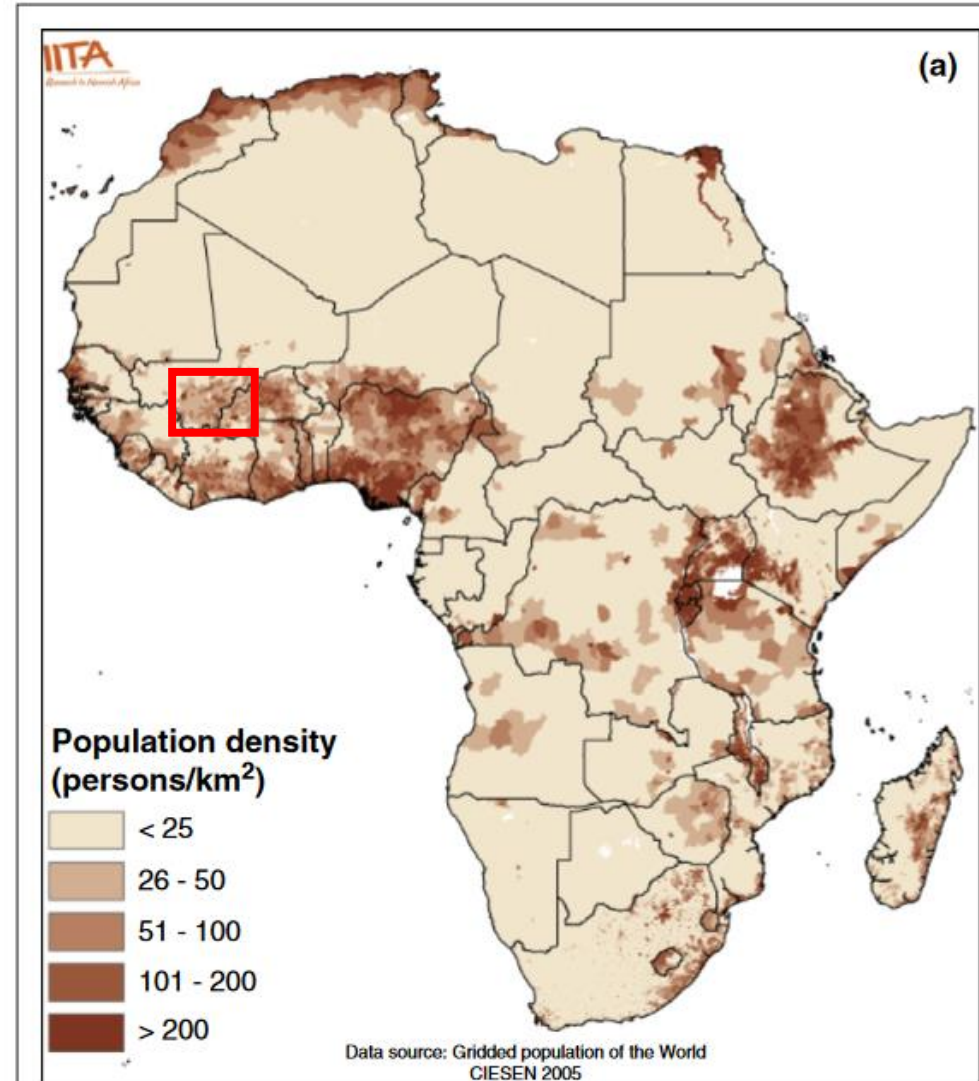


Increasing ownership of machines



Belton et al., 2017. *The Rapid Rise of Agricultural Mechanization in Myanmar*. South-South Knowledge Sharing on Agricultural Mechanization IFPRI, CIMMYT, Ethiopian Agricultural Mechanization Forum Addis Ababa, Ethiopia. https://www.canr.msu.edu/fsp/outreach/presentations/mechanization_in_myanmar_10-31-17.pdf

- Land constrained sub-saharan africa



Vanlauwe et al., 2014. *Sustainable intensification and the African smallholder farmer*. Current Opinion in Environmental Sustainability 8, 15–22.

Research questions

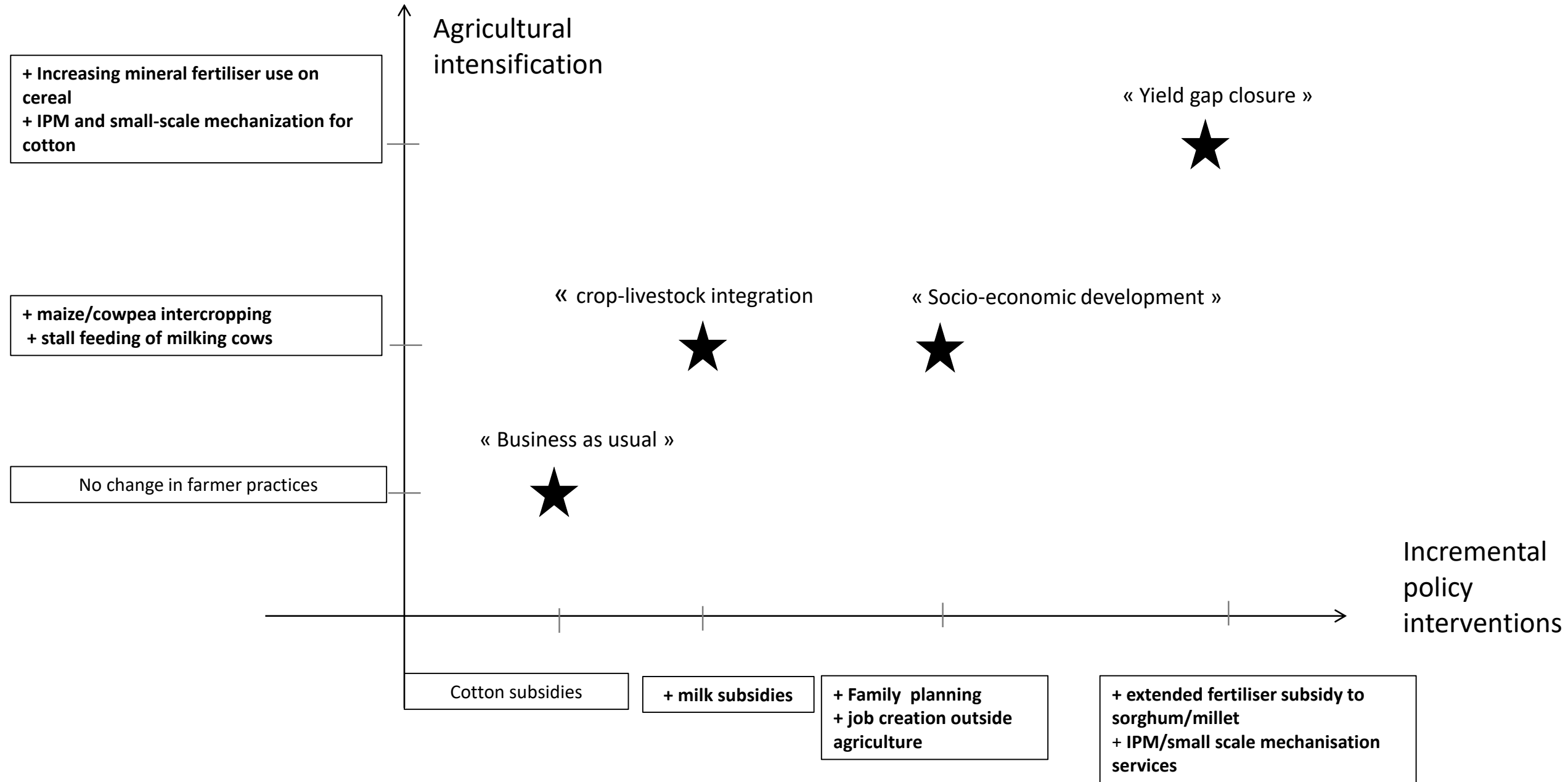
1. What is the potential of changes in farm practices to improve farming sustainability ? *Which policies are needed to support sustainable development ?*
2. Are there trade-offs between different sustainable intensification indicators ?
3. How different farms respond to different interventions ?

Options for sustainable intensification

- **Maize-cowpea intercropping :** extra fodder production (*Falconnier et al, 2016*).
- **Stall feeding of cows:** increase milk production (*De Ridder et al., 2015*)
- **Closing the yield gap:**
 - **Cotton :** Integrated pest management and small scale mechanization
 - **Cereals :** increased use of mineral fertilizer



Four scenarios towards 2030



FARM 1

Net fertility

rate

x

Household

Rural-urban
migration
rate

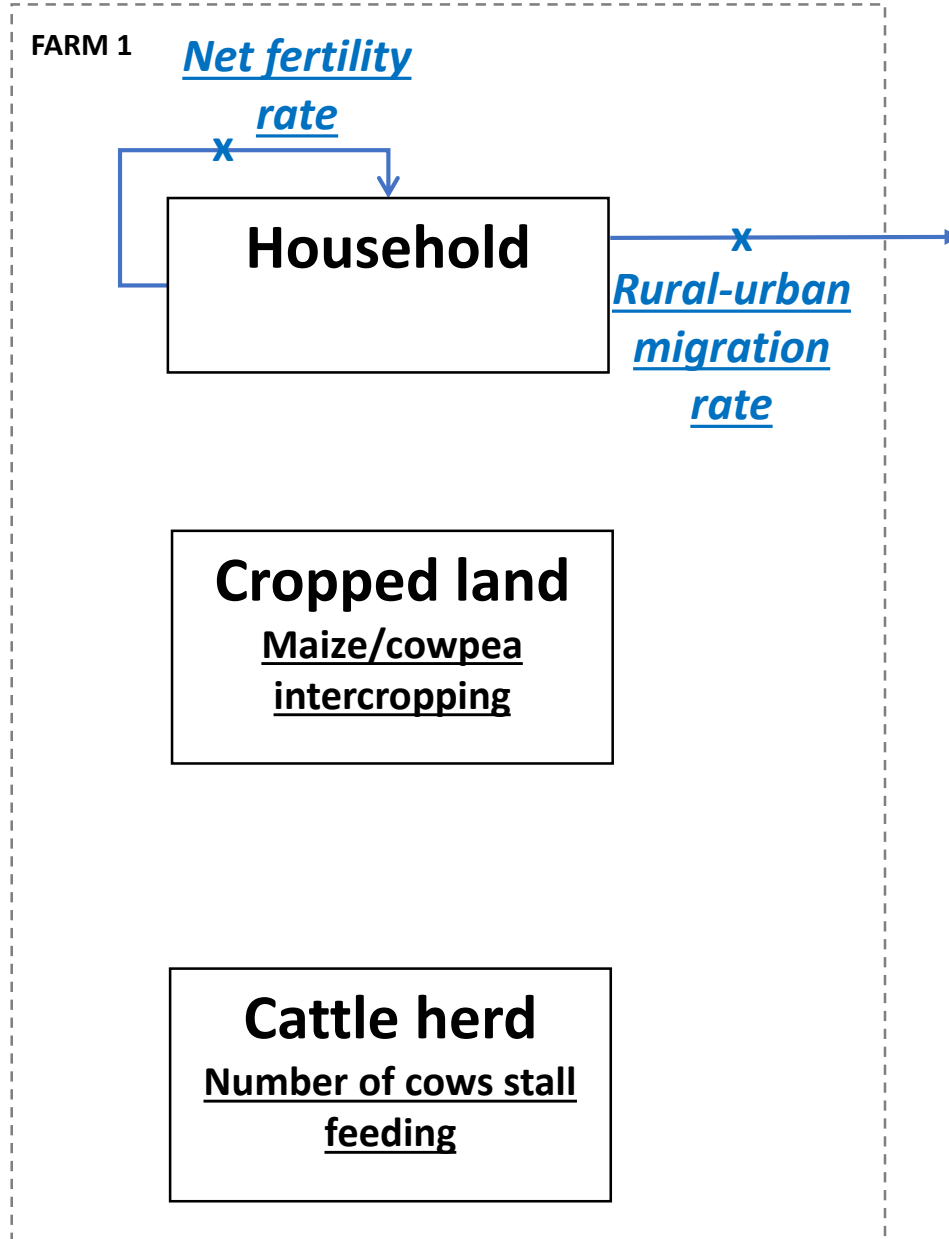
x

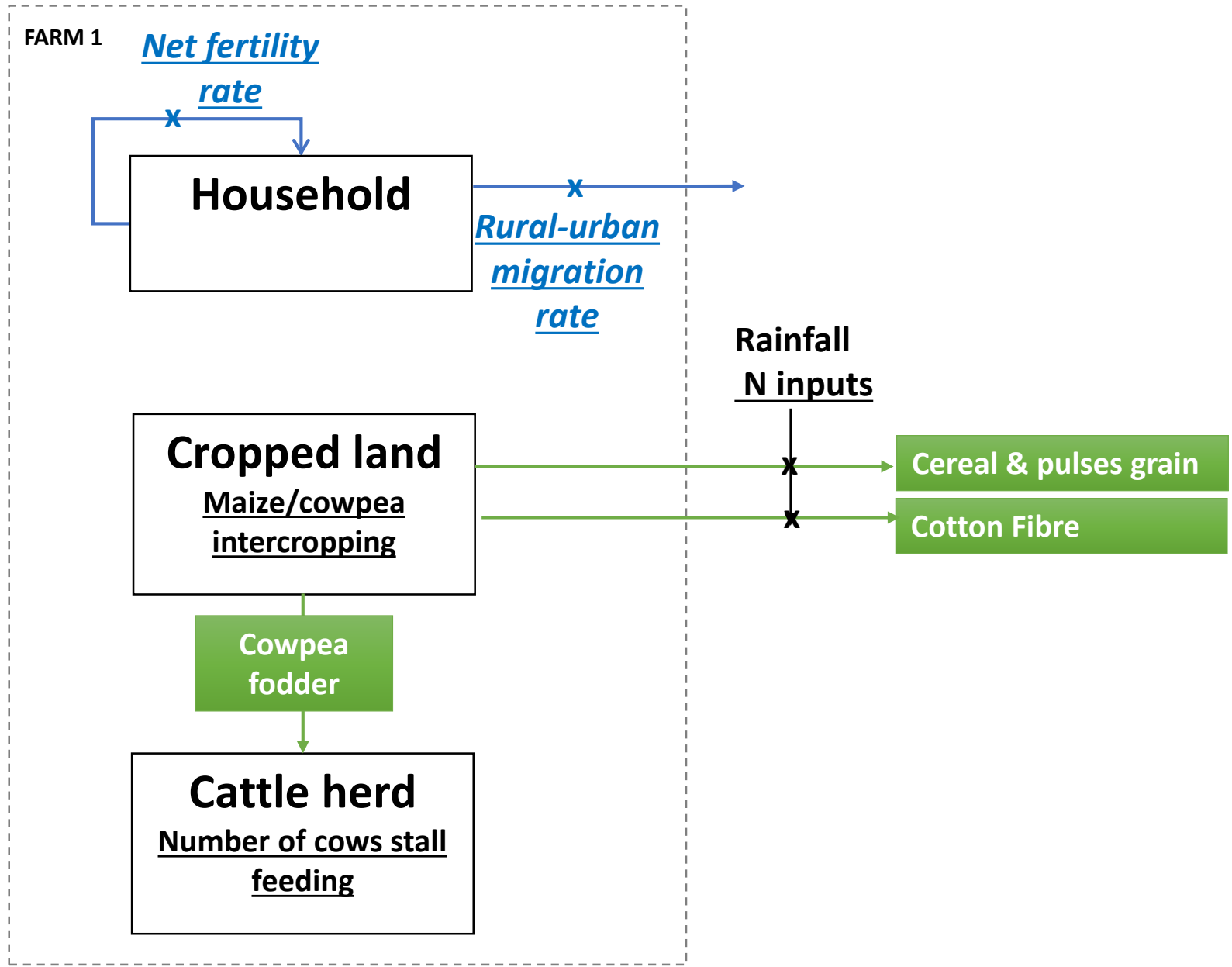
Cropped land

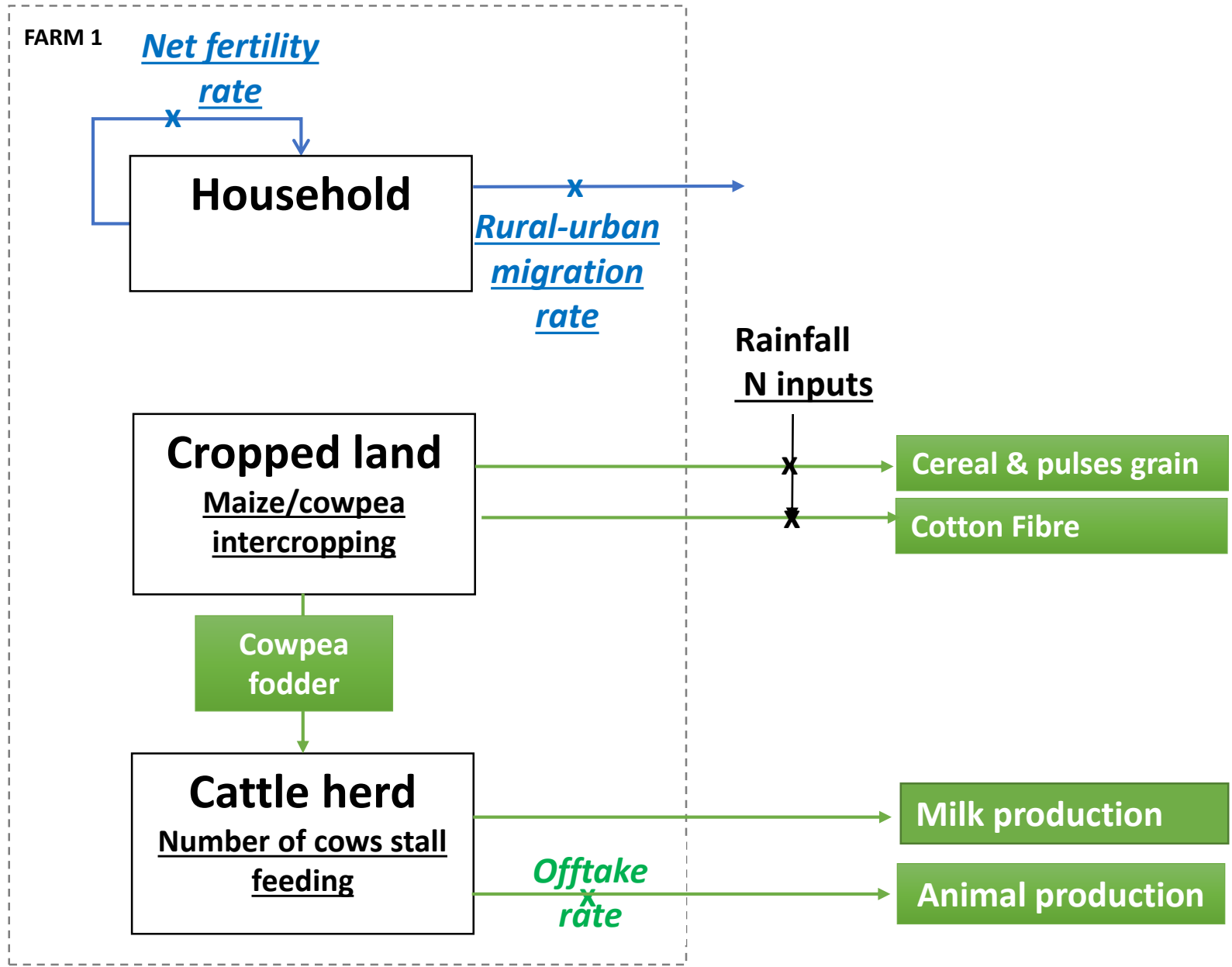
Maize/cowpea
intercropping

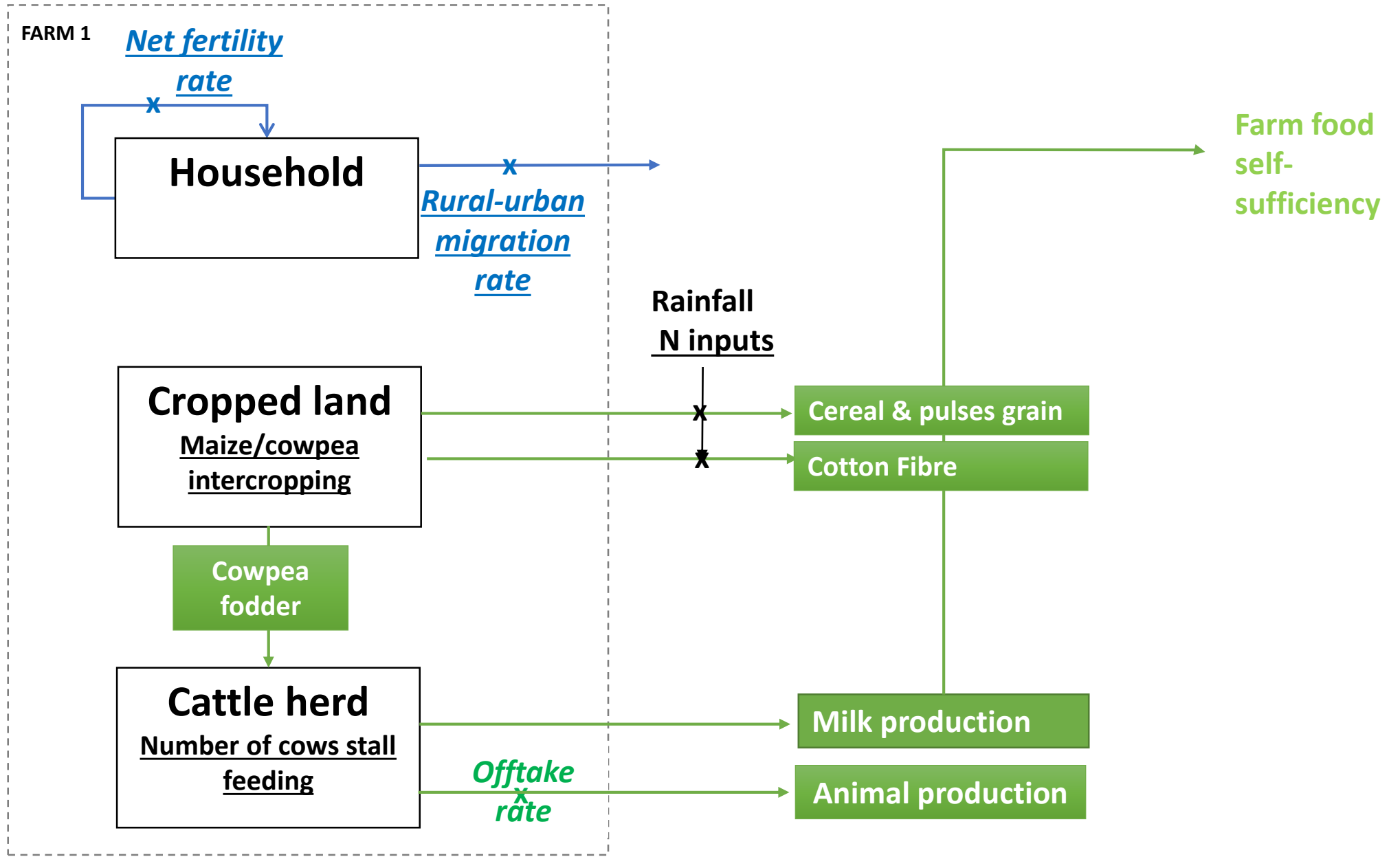
Cattle herd

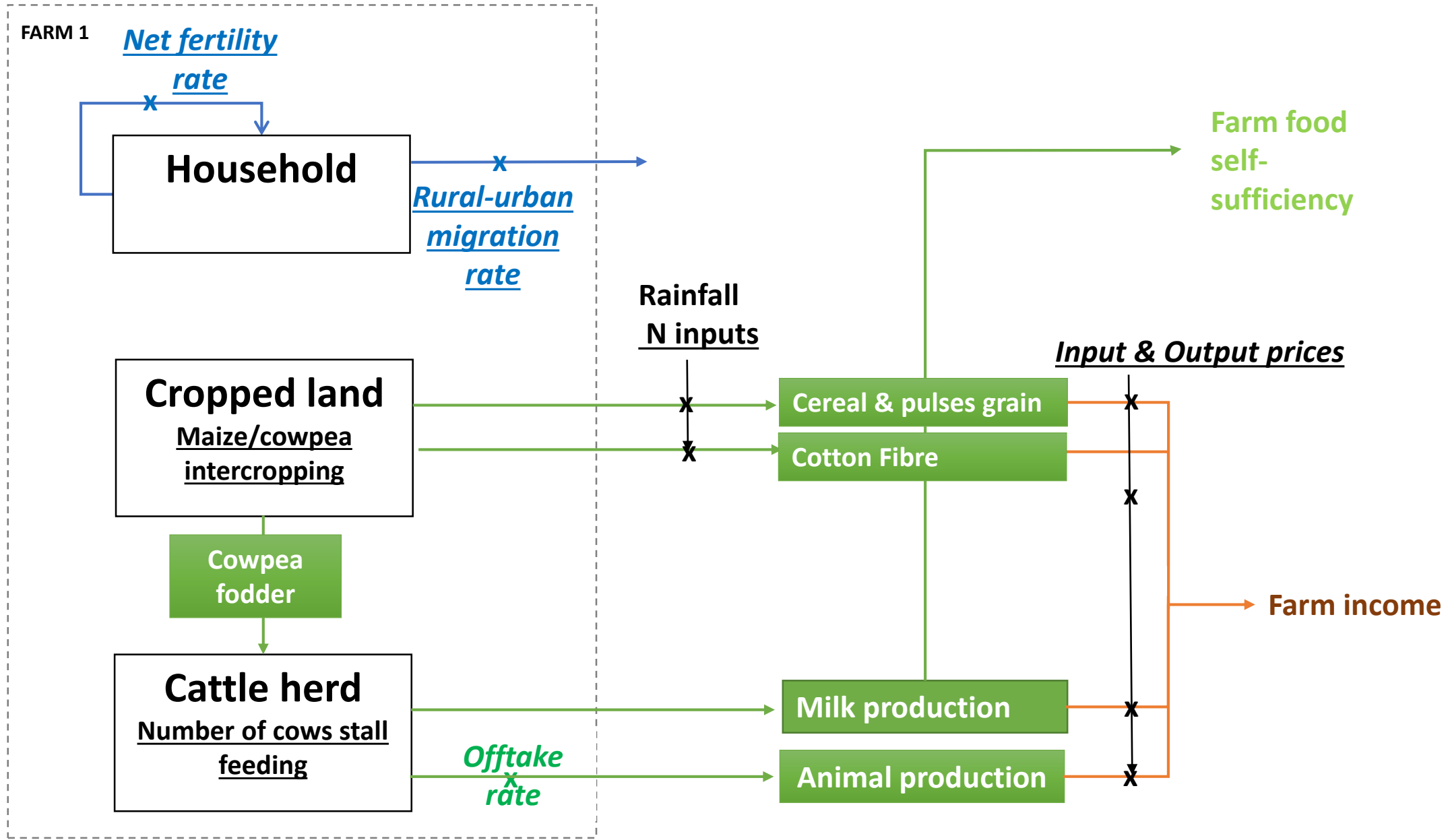
Number of cows stall
feeding











FARM 1

Household

Cropped land

Maize/cowpea
intercropping

Cattle herd

Number of cows stall
feeding

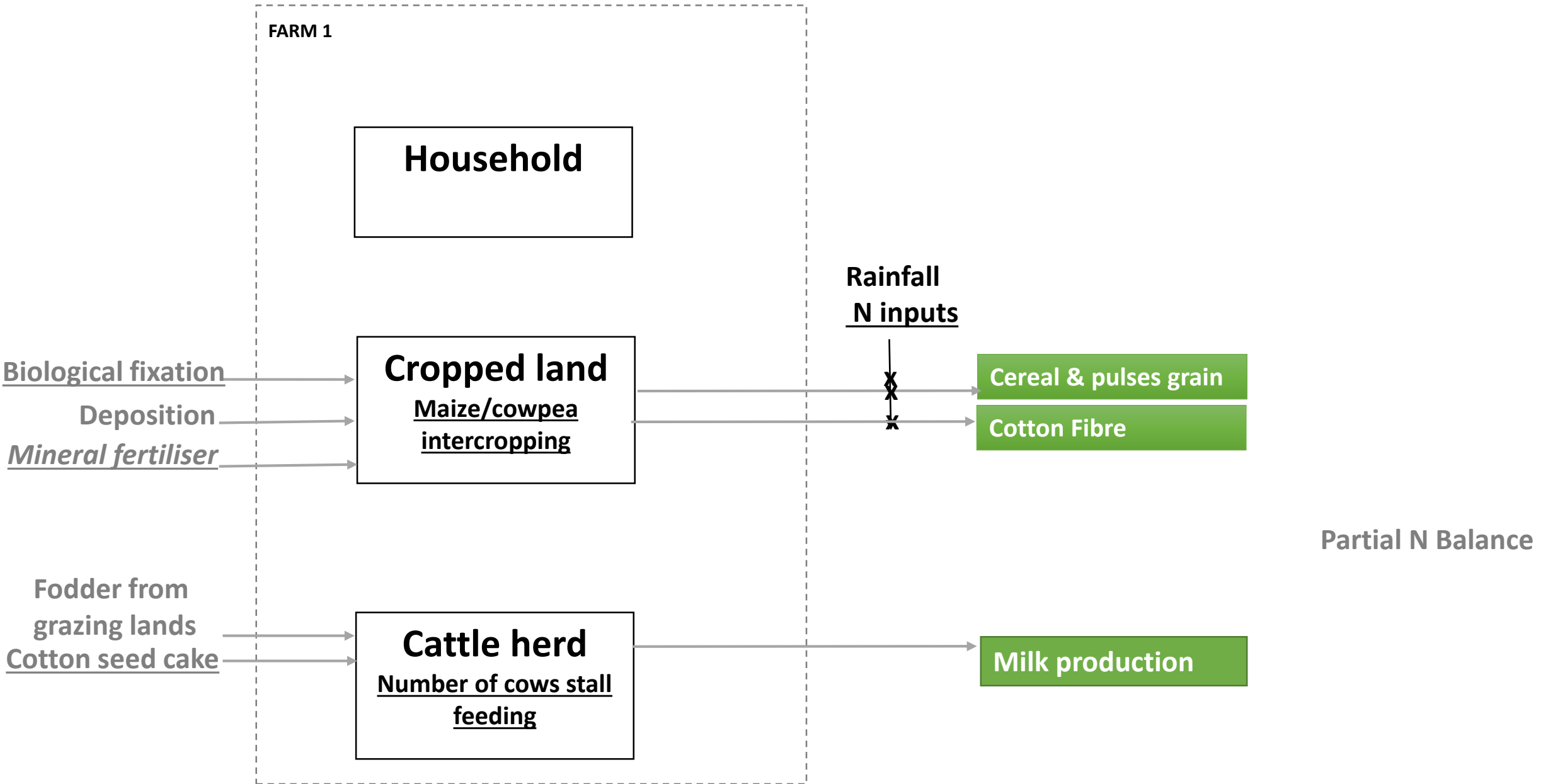
Biological fixation

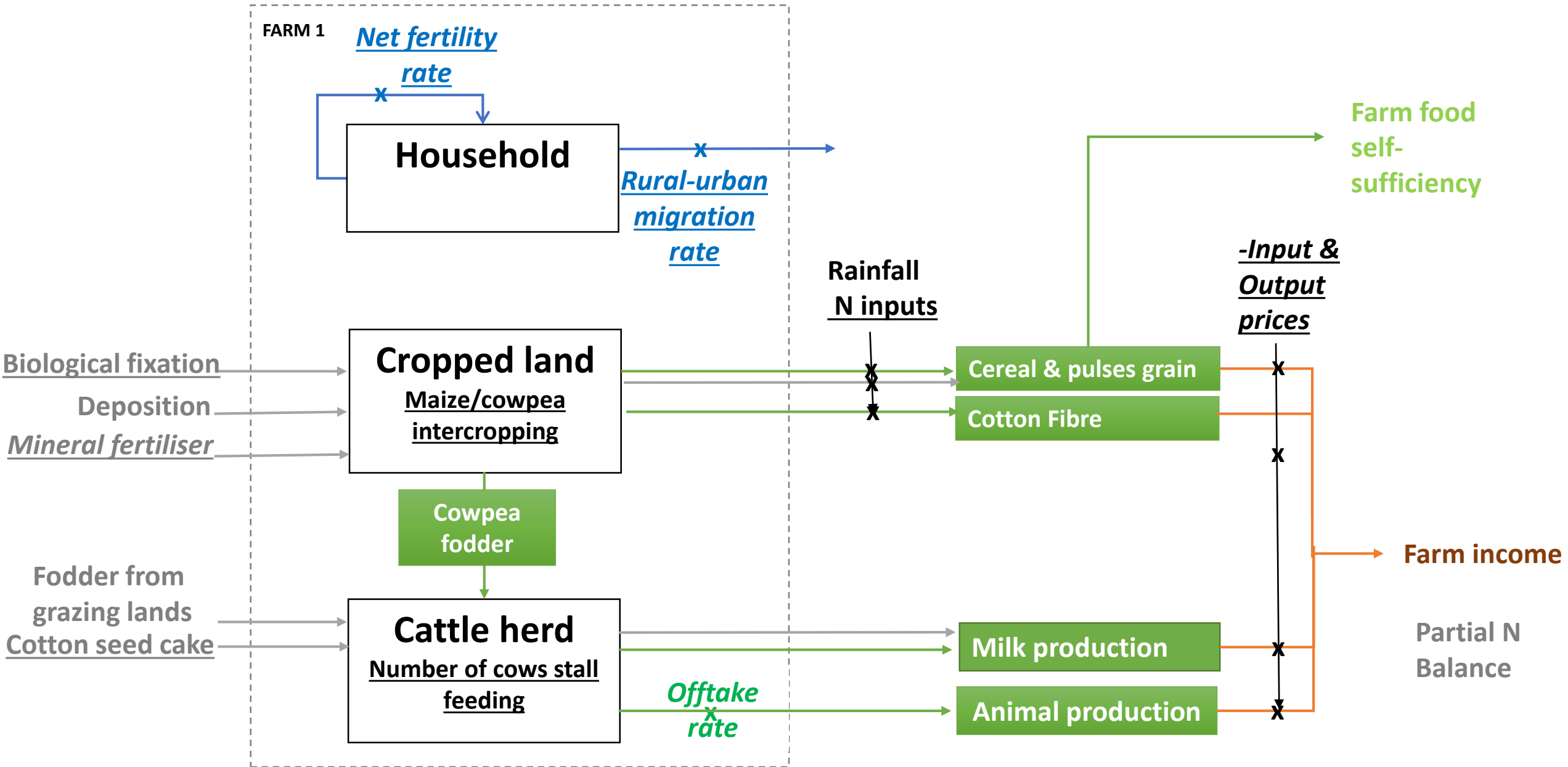
Deposition

Mineral fertiliser

Fodder from
grazing lands

Cotton seed cake





Economic

Human well-being

Environment

*Per capita
farm income
(\$PPP/day)*

*Calorie
self sufficiency
ratio*

*Zinc
self sufficiency
ratio*

*N
balance
(kgN/ha)*

Baseline

Business as usual

Crop-livestock integration

Socio-economic development

Yield gap closure

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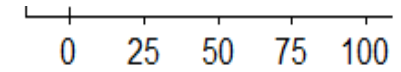
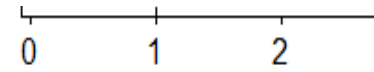
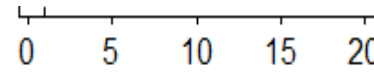
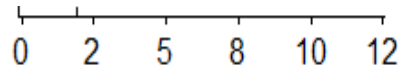
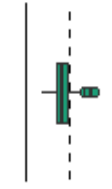
Baseline

Business as usual

Crop-livestock integration

Socio-economic development

Yield gap closure



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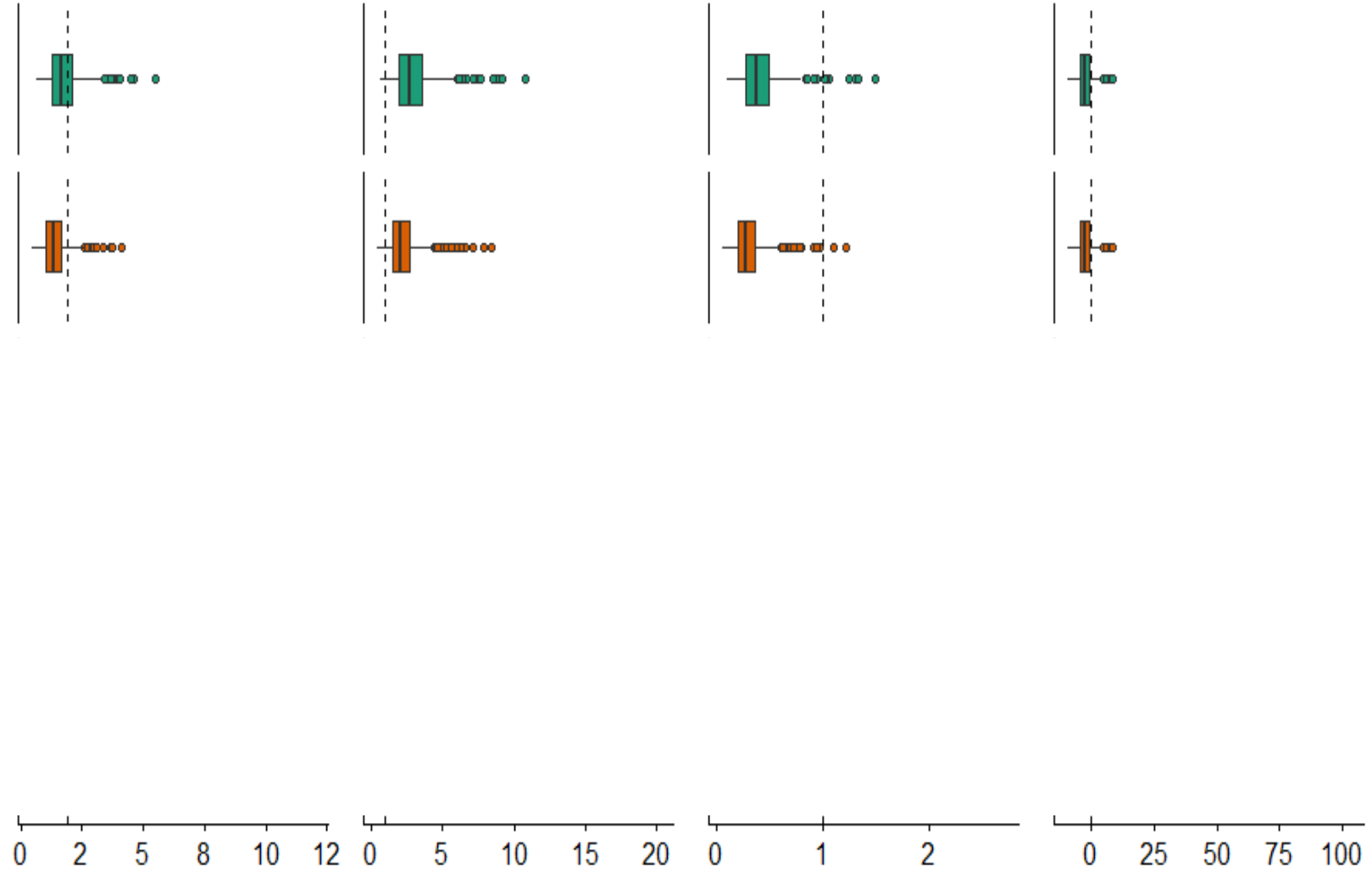
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Business as usual

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Socio-economic development

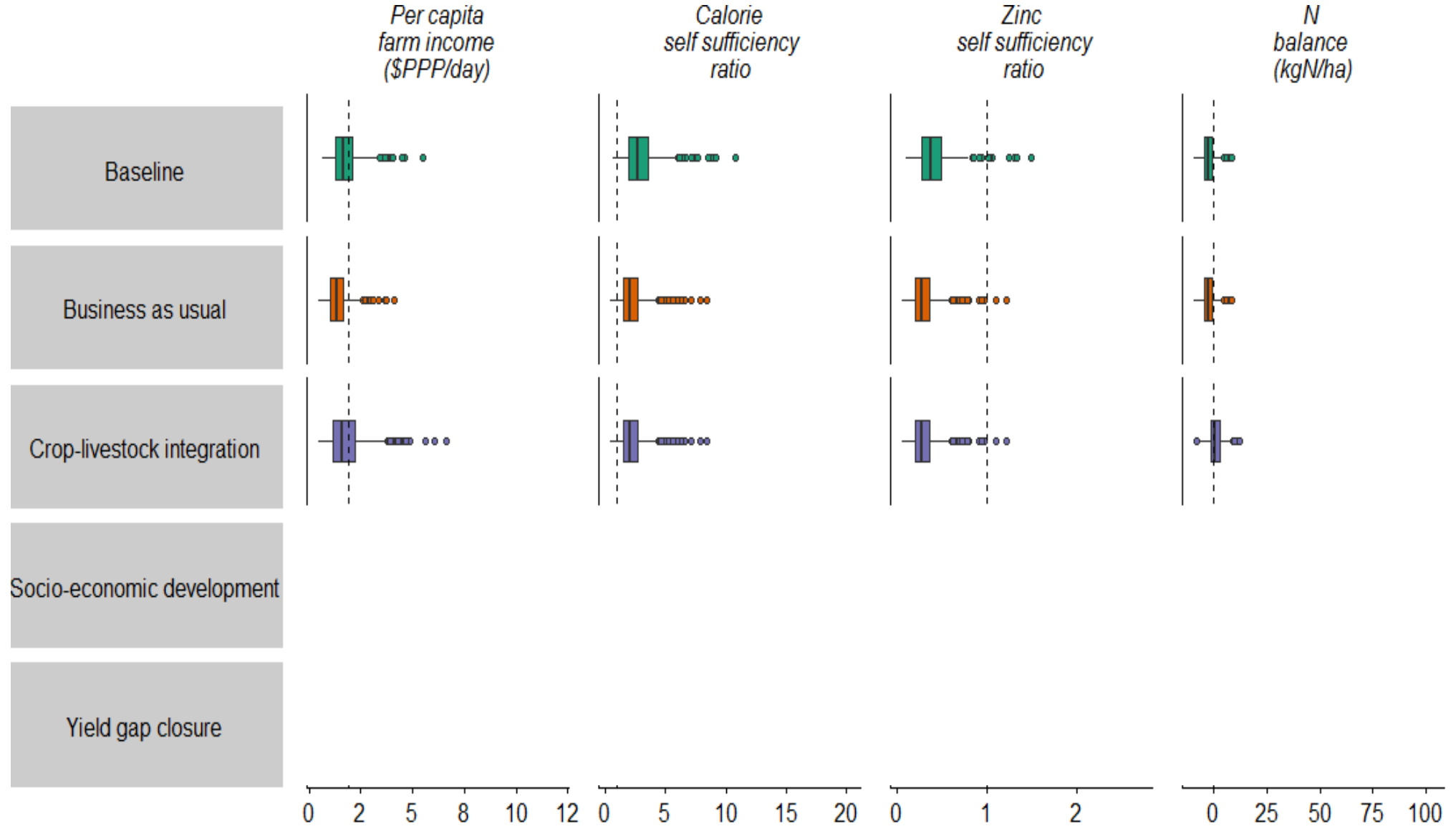
Yield gap closure



Economic

Human well-being

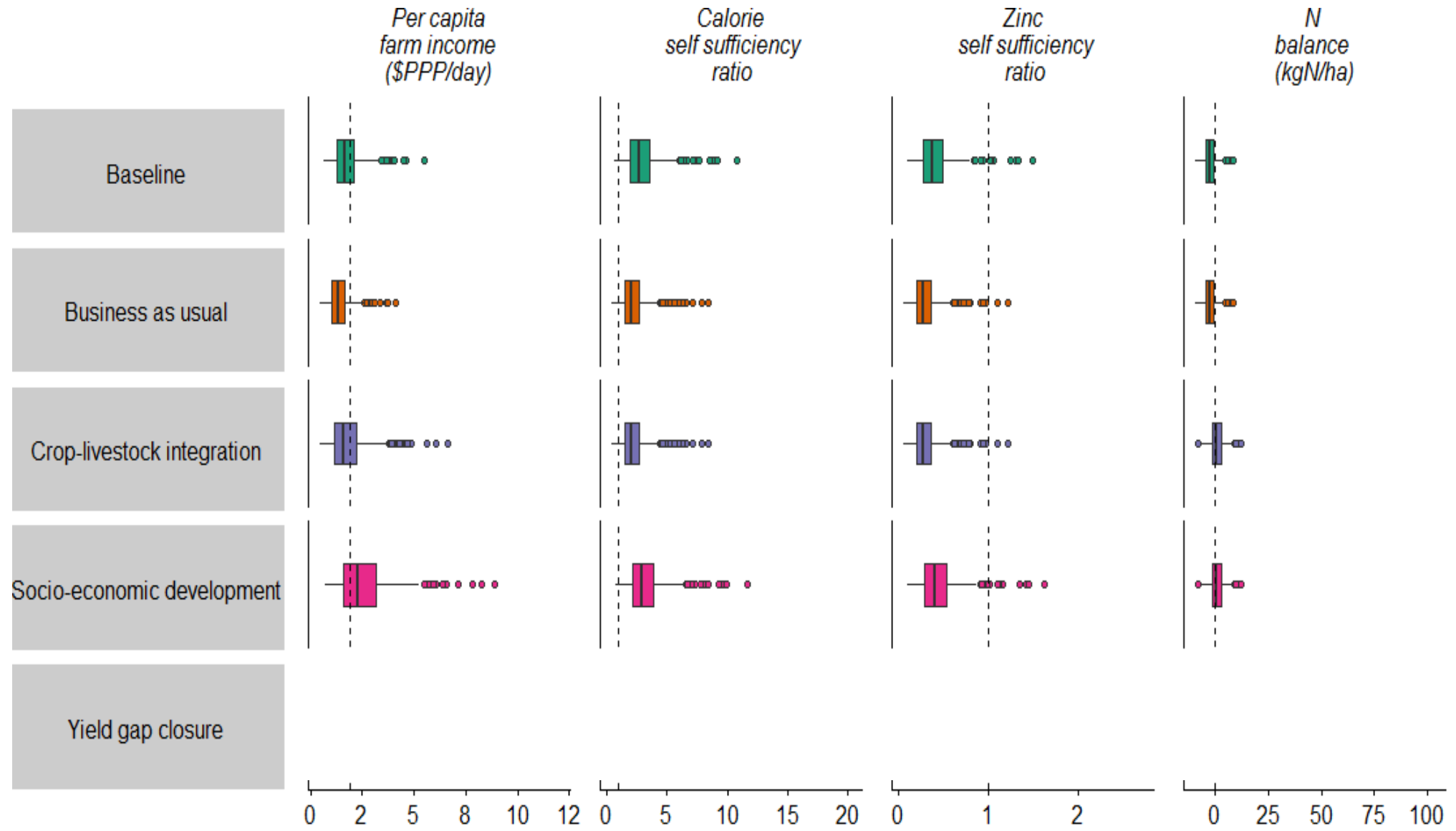
Environment



Economic

Human well-being

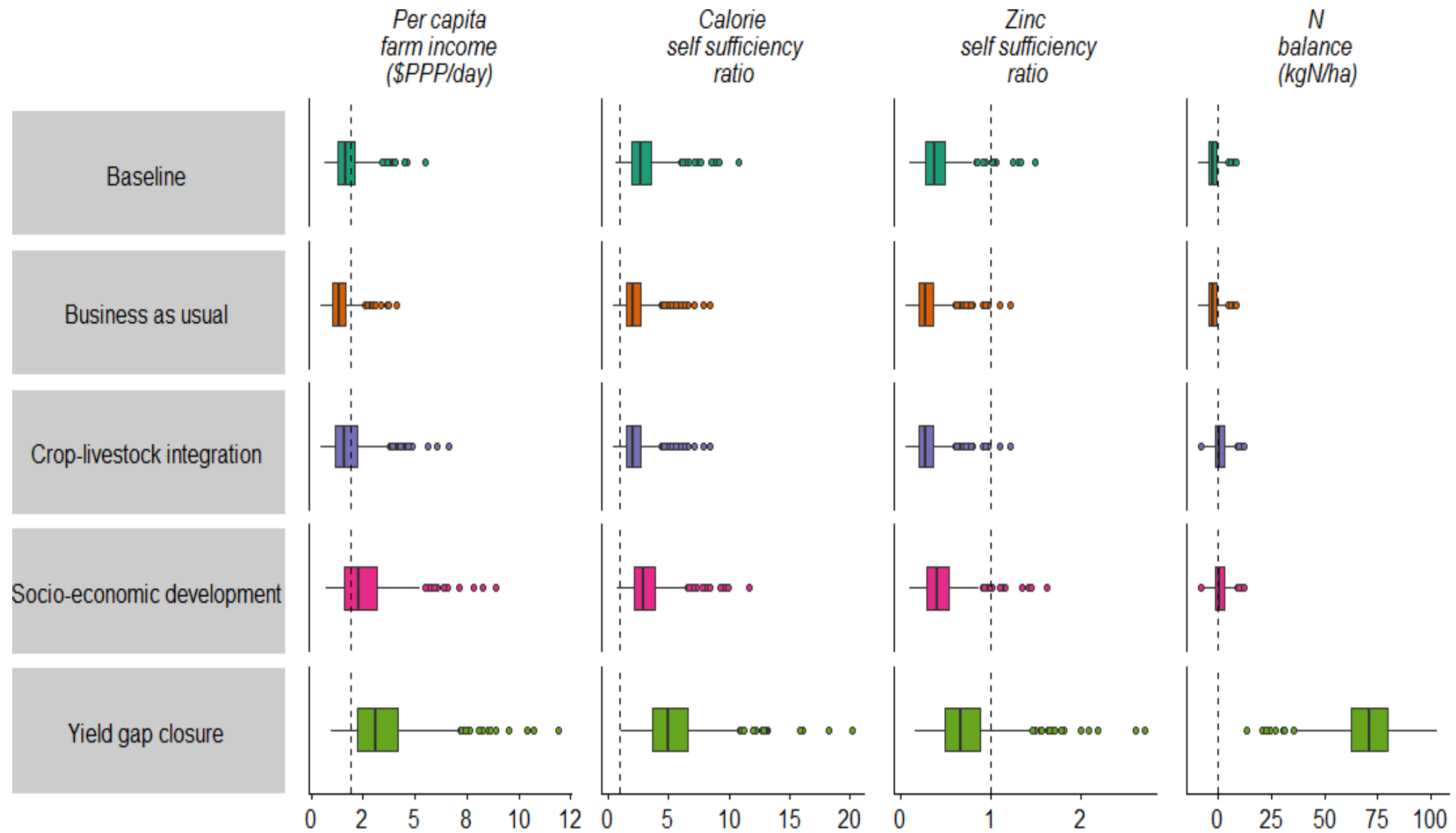
Environment



Economic

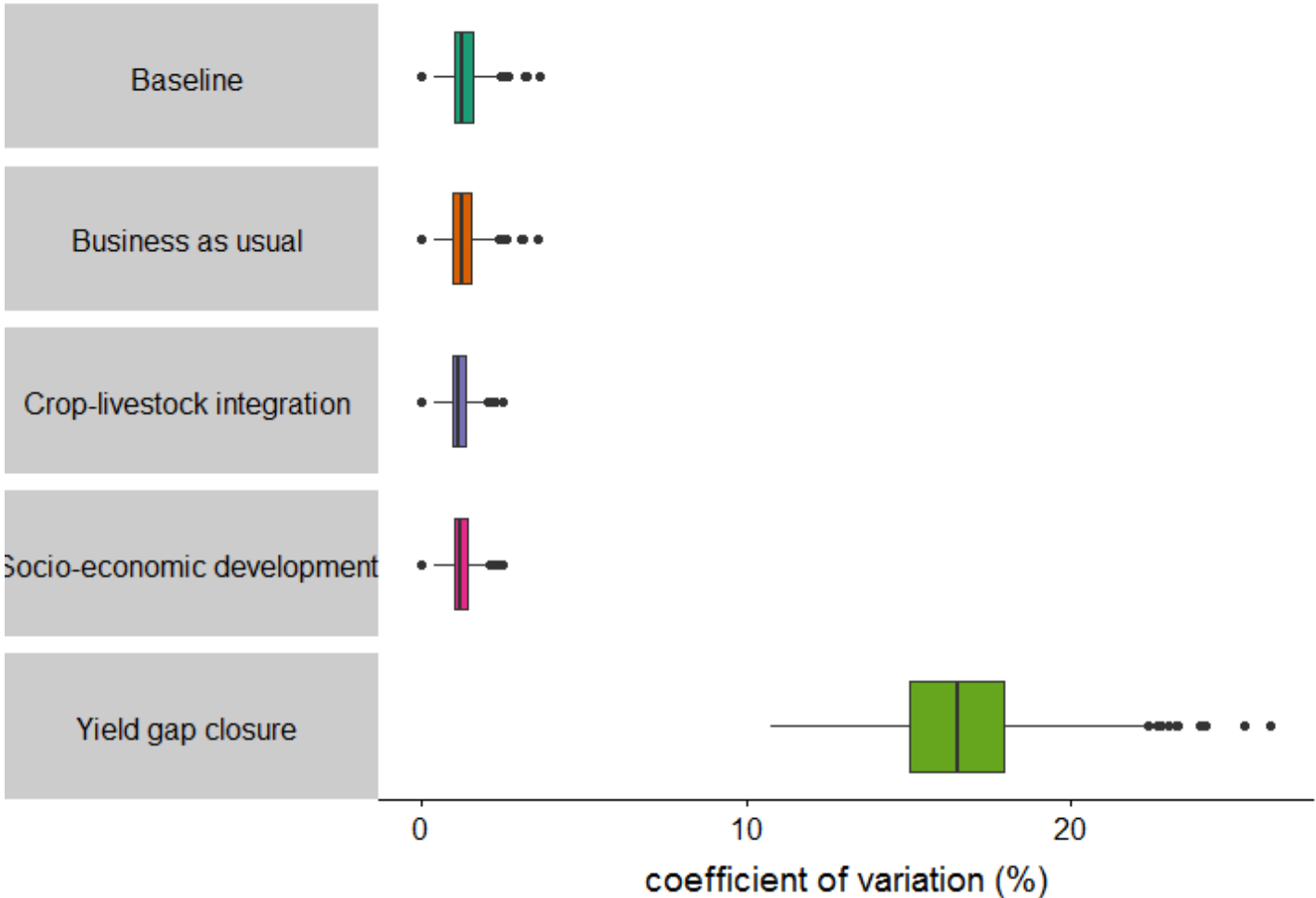
Human well-being

Environment

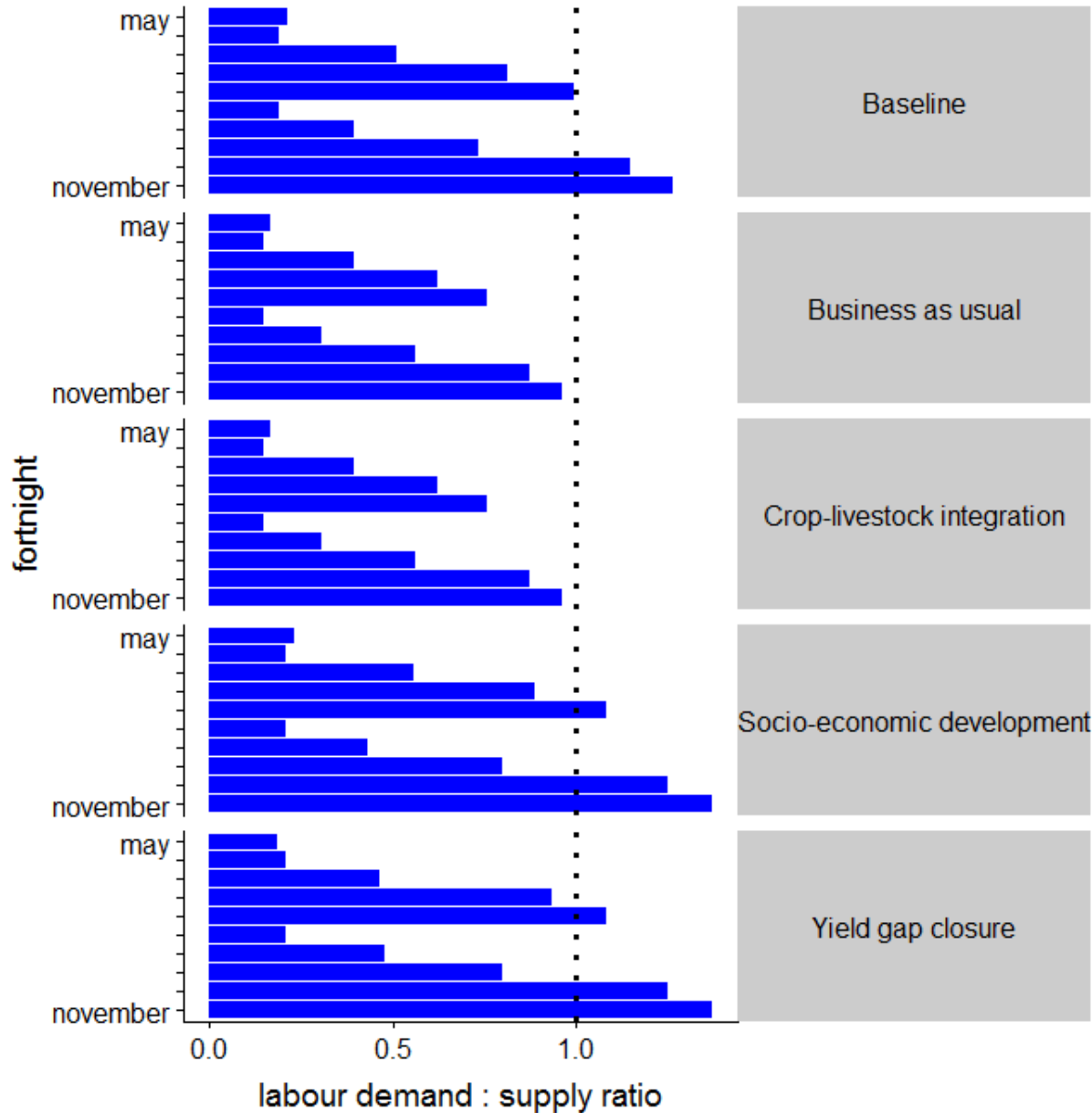


Trade-off : increase in farm income and risk

Per capita farm income

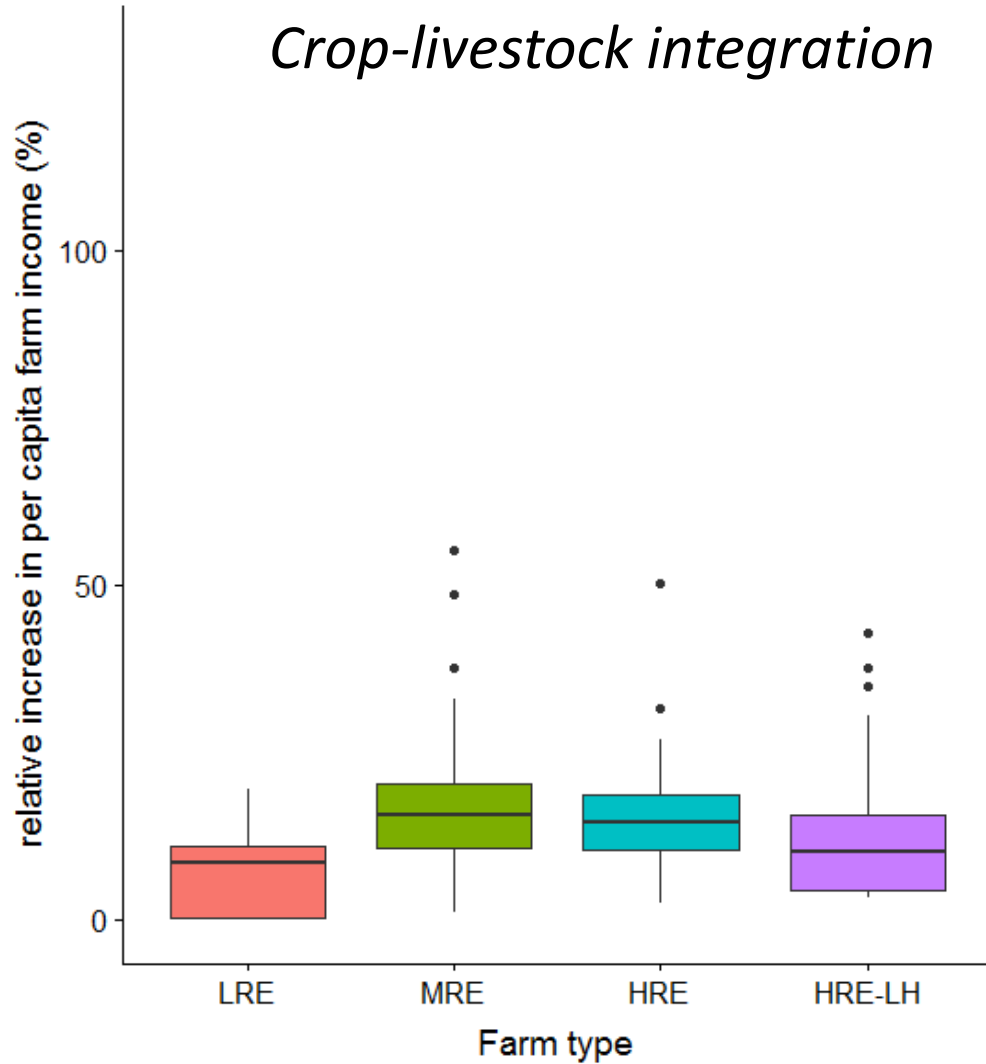


Trade-off : migration and labour shortage

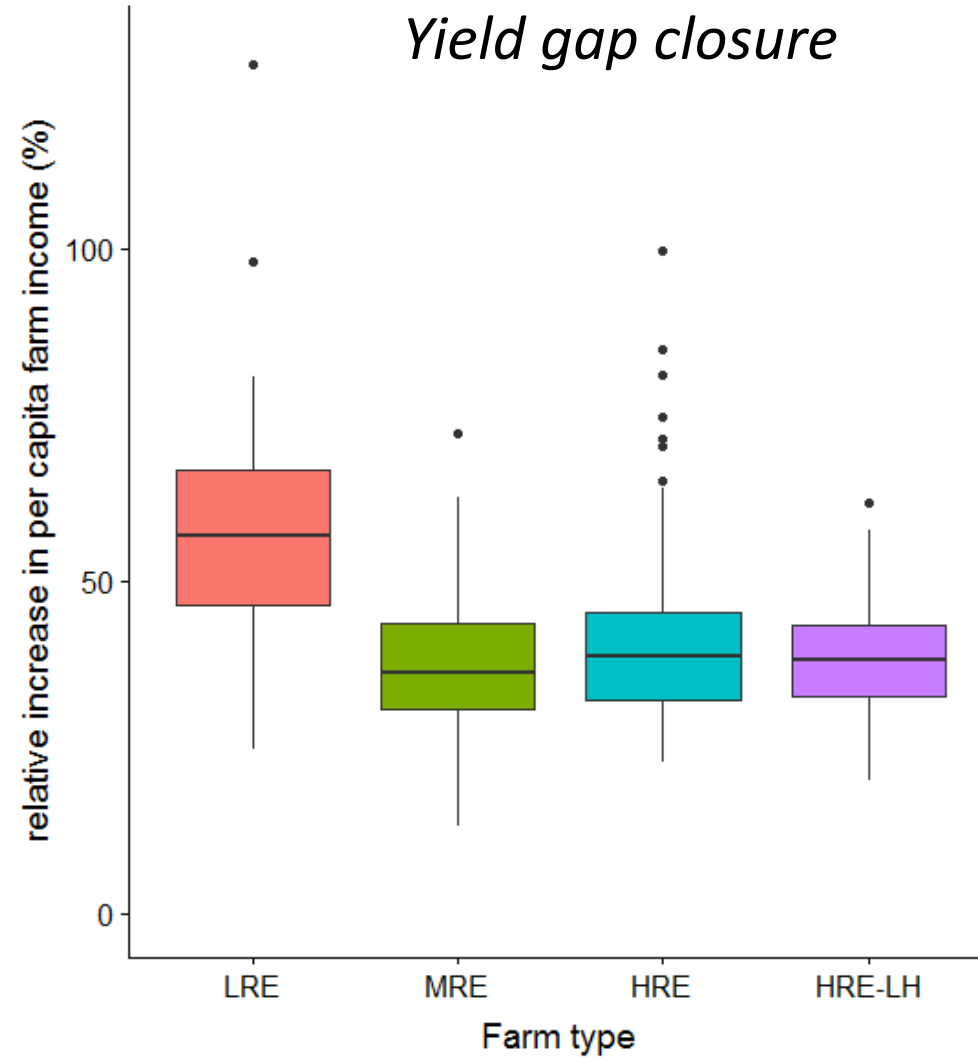


How different farms respond to different interventions ?

Crop-livestock integration



Yield gap closure



Conclusion

1. What is the potential of changes in farm practices to improve farming sustainability in southern Mali ? *Which policies are needed to support sustainable development ?*

Optimistic picture – can interventions happen at the required pace ?

2. Are there trade-off between sustainable intensification indicators

Yes – more investigations needed to design additional changes in farm practises/
policy interventions

3. How different farms respond to different interventions ?

Multisectoral and diverse set of interventions needed

Thank you !