CIAT

International Center for Tropical Agriculture
*Since 1967 / Science to cultivate change*

# Climate-smart soil protection and rehabilitation in Benin, Burkina Faso, Ethiopia, India and Kenya

November 2016, Nairobi, Kenya

**An Notenbaert, Birthe Paul, Caroline Mwongera, Celine Birnholz, Deborah Bossio, Evan Girvetz, Jessica Koge, Juliet Braslow, Katherine Snyder, Rolf Sommer, Wendy Okolo and Špela Kalčić**

# Outline

- Objectives of the CSS project
- CSS evaluation
  - Farm Typology
  - Climate Smartness Assessment (Kalkulator)
  - Evaluation of Land Management Options (ELMO)
  - Attainable impact
- CSA prioritization framework
- Recommendations

# Objective of the Climate Smart Soils Project

- **Assessment of climate smartness of ongoing and potentially suitable alternative agricultural soil conservation practices, including:**
  - **analysis of farm-level cost-benefit and tradeoffs**
  - **evaluation of the overall CSA impact and scope**
  - **adoption and scaling potentials**
- **Design of a CSA prioritization process**

**"Agriculture has to be part of the solution to climate change."**

***Patrick Verkooijen, The World Bank, 2012***

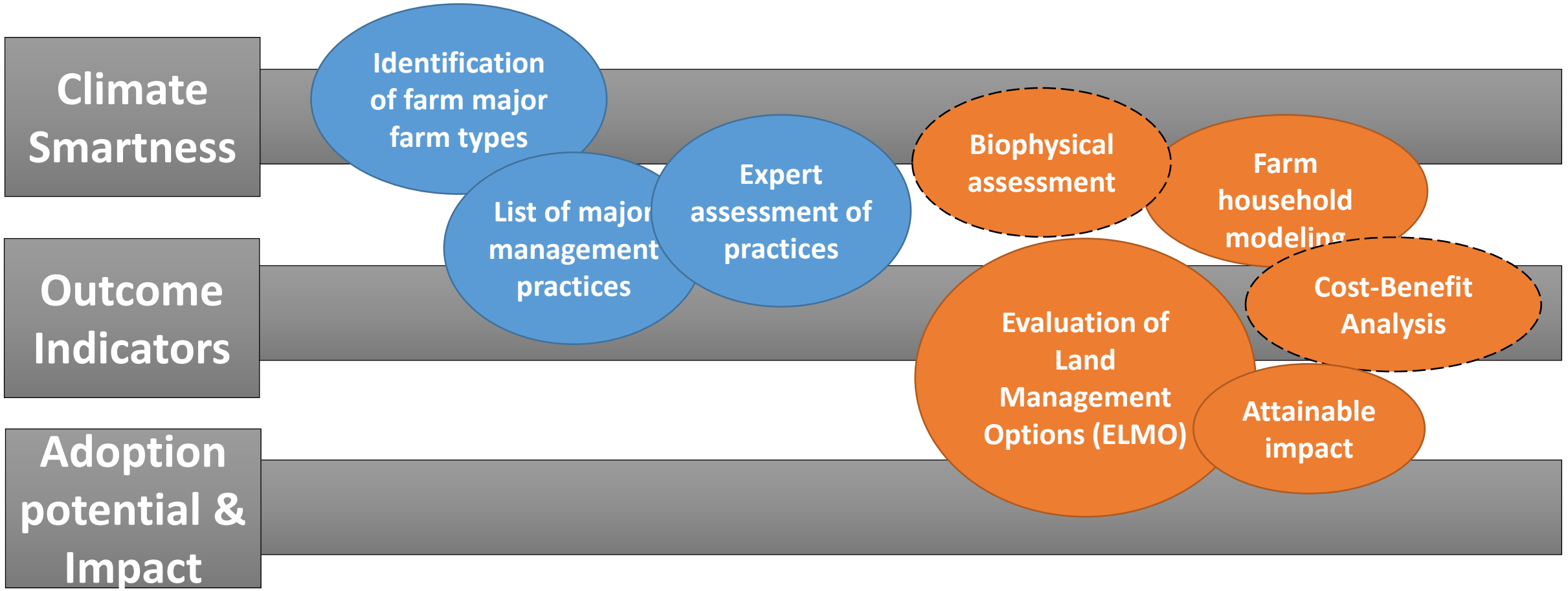
# Climate smart agriculture

Triple-win goal – three pillars (FAO 2013):

1. Sustainably increasing agricultural productivity and incomes;
2. Adapting and building resilience to climate change;
3. Climate change mitigation: reducing greenhouse gases emissions, where possible.

*"To ensure a food-secure future, farming must become climate resilient."*

# CIAT's approach to evaluate the climate smartness



# CSA rapid assessment - methodology

**Stakeholder workshops** → Farming system types → **Case study farmer interviews**

**Stakeholder workshops** → Soil technology shortlist

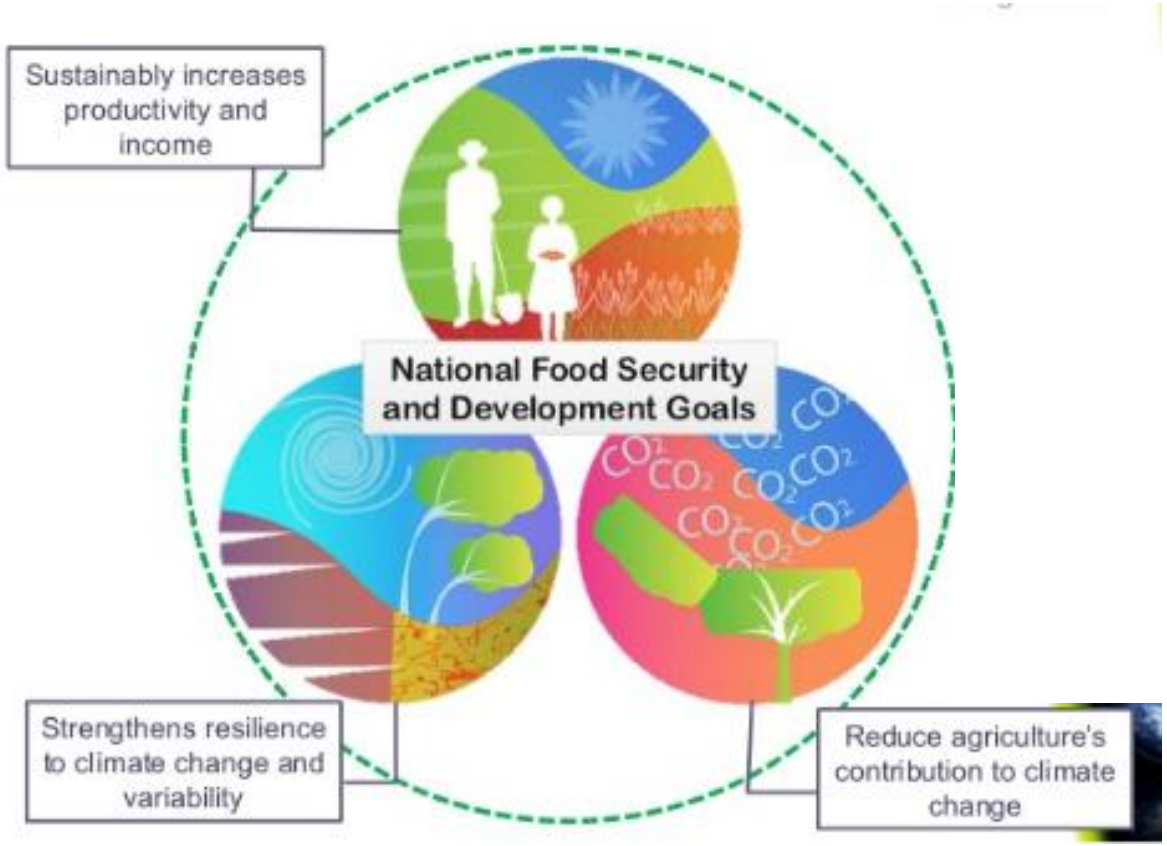
**Case study farmer interviews** → Input data

**Modelling CSA indicators for baselines and scenarios**

# Modelling of CSA indicators and trade-offs

## Calories produced on farm/hectare

- Cash crops and meat not taken into account
- 'Potential supply' only




## Soil nitrogen balances farm/hectare

- Simplified, non-holistic indicators

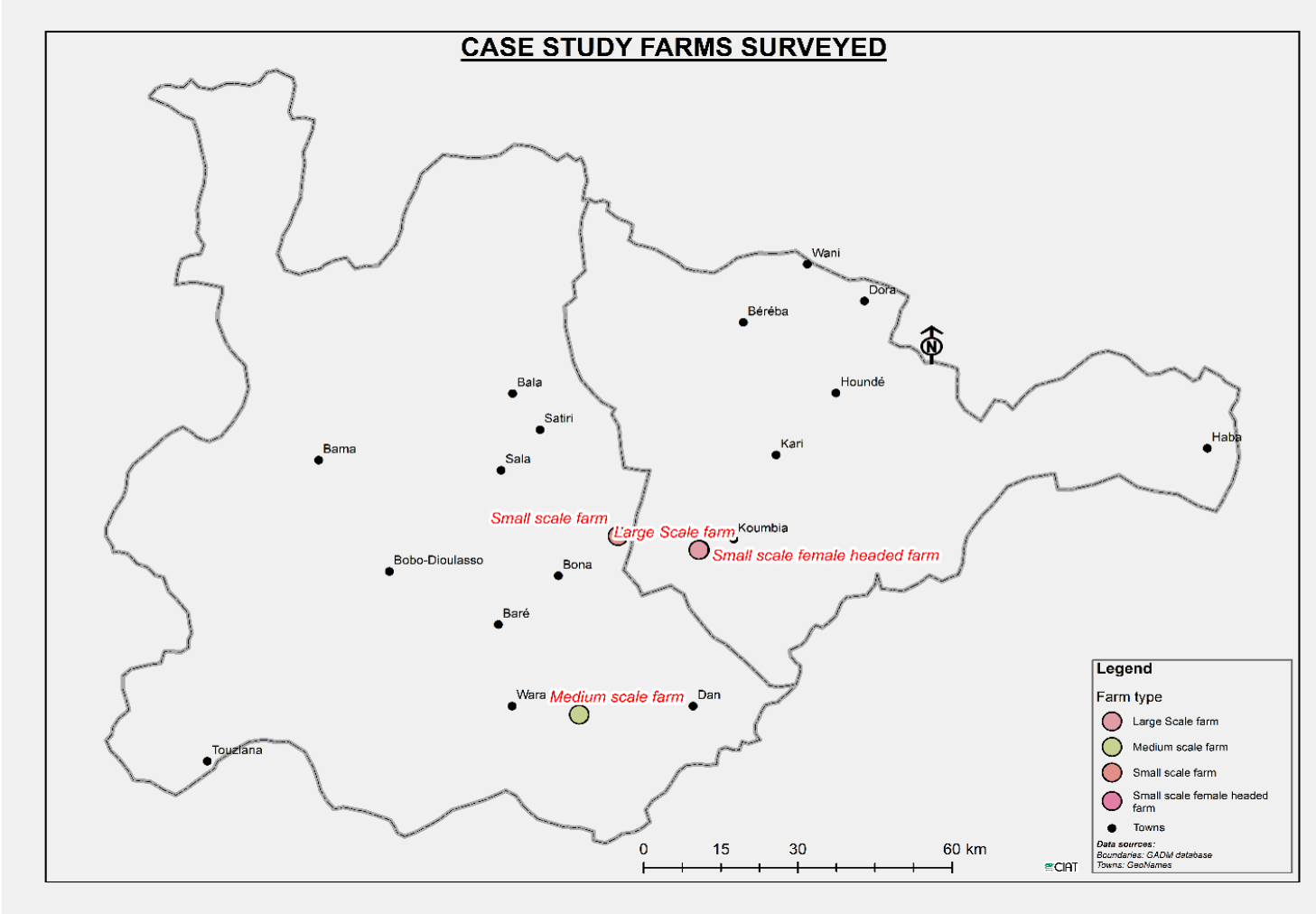
## GHG emissions from agriculture per farm/hectare

- Soil C stock changes not included
- IPCC tier 1/2 overestimating for SSA

# Farming system types

**Factors**: intensification, production orientation, commercialization, agro-ecological potential and resource endowment

- Large scale, modern farm
- Medium scale, semi-modern farm
- Small-scale, traditional farm
- Small-scale, female-headed farm



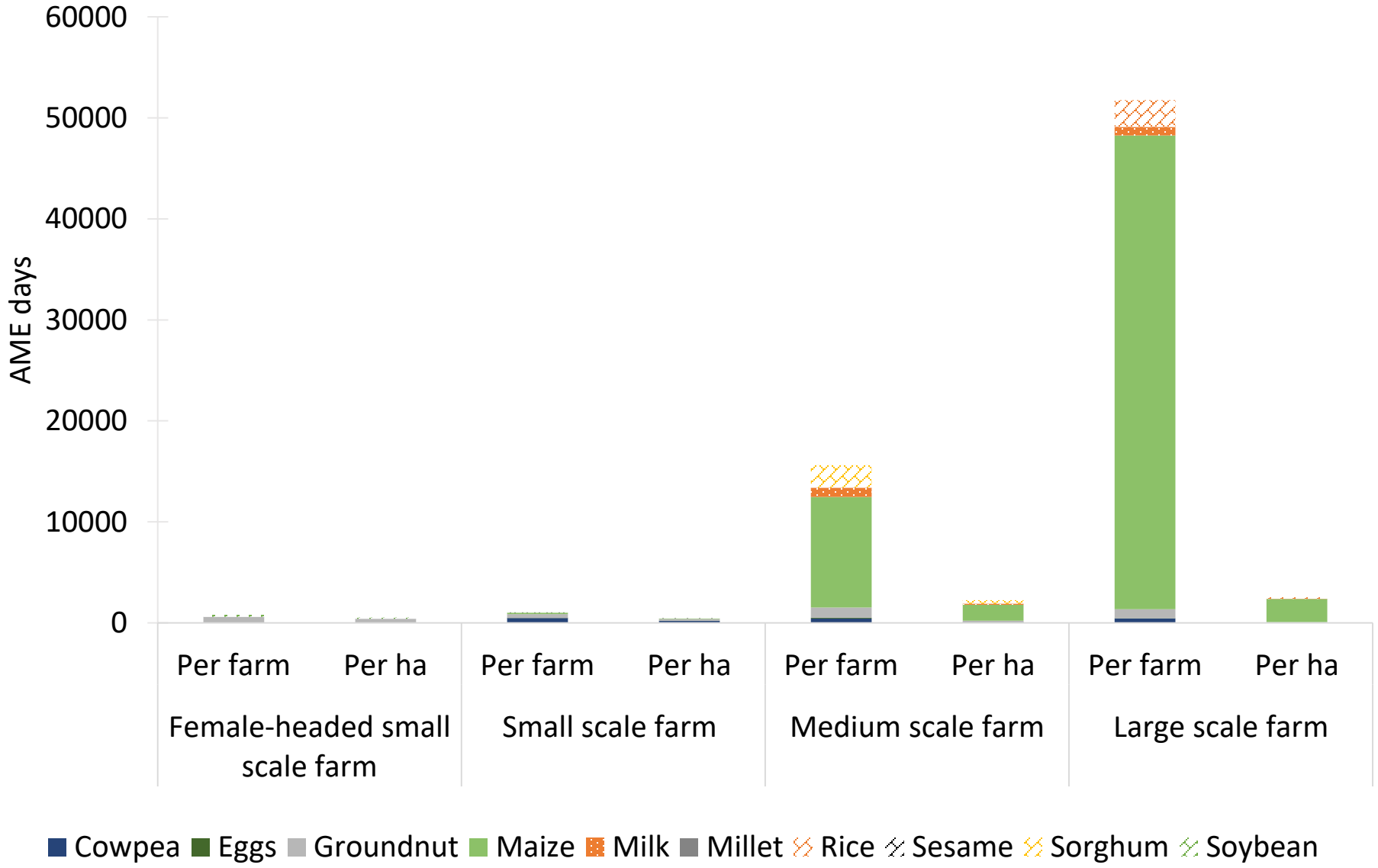
# Shortlisted/tested soil technologies

Stakeholders listed most relevant soil protection and rehabilitation technologies

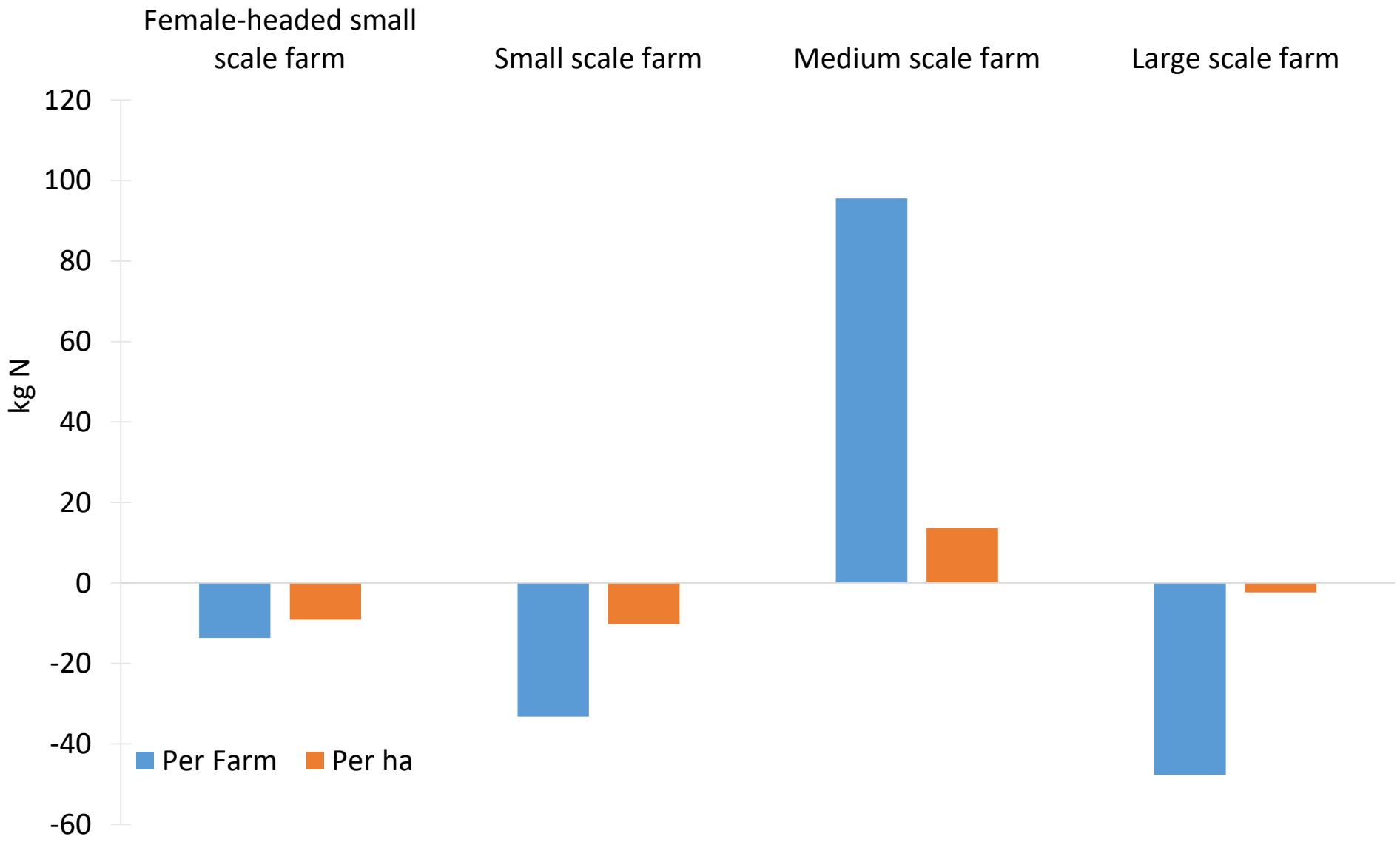
- Stone bunds
- Composting with manure
- Intercropping sorghum/maize with cowpea
- Relay cropping with mucuna

Picture: Stephanie Malyon, CIAT

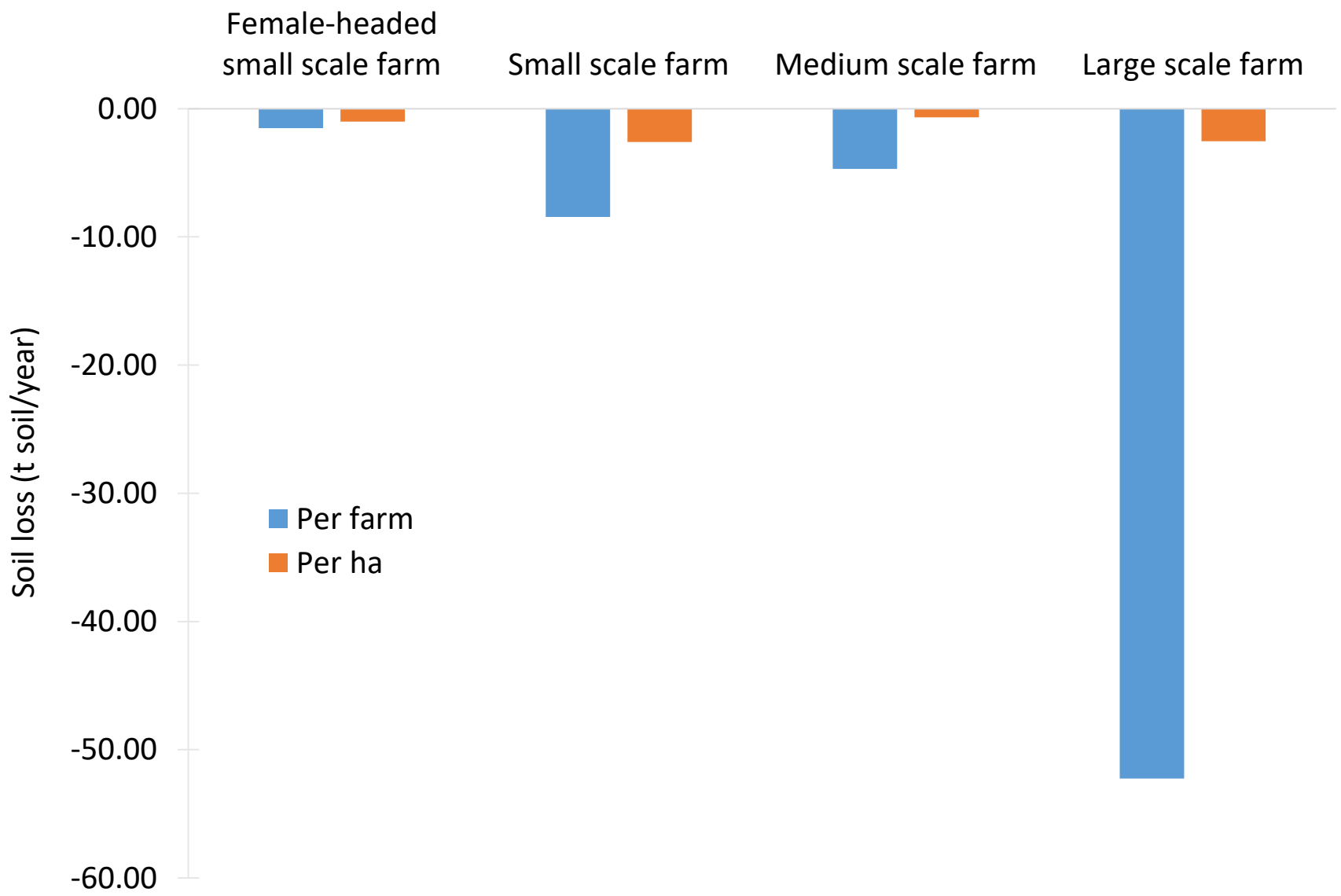
# Calories produced on farm



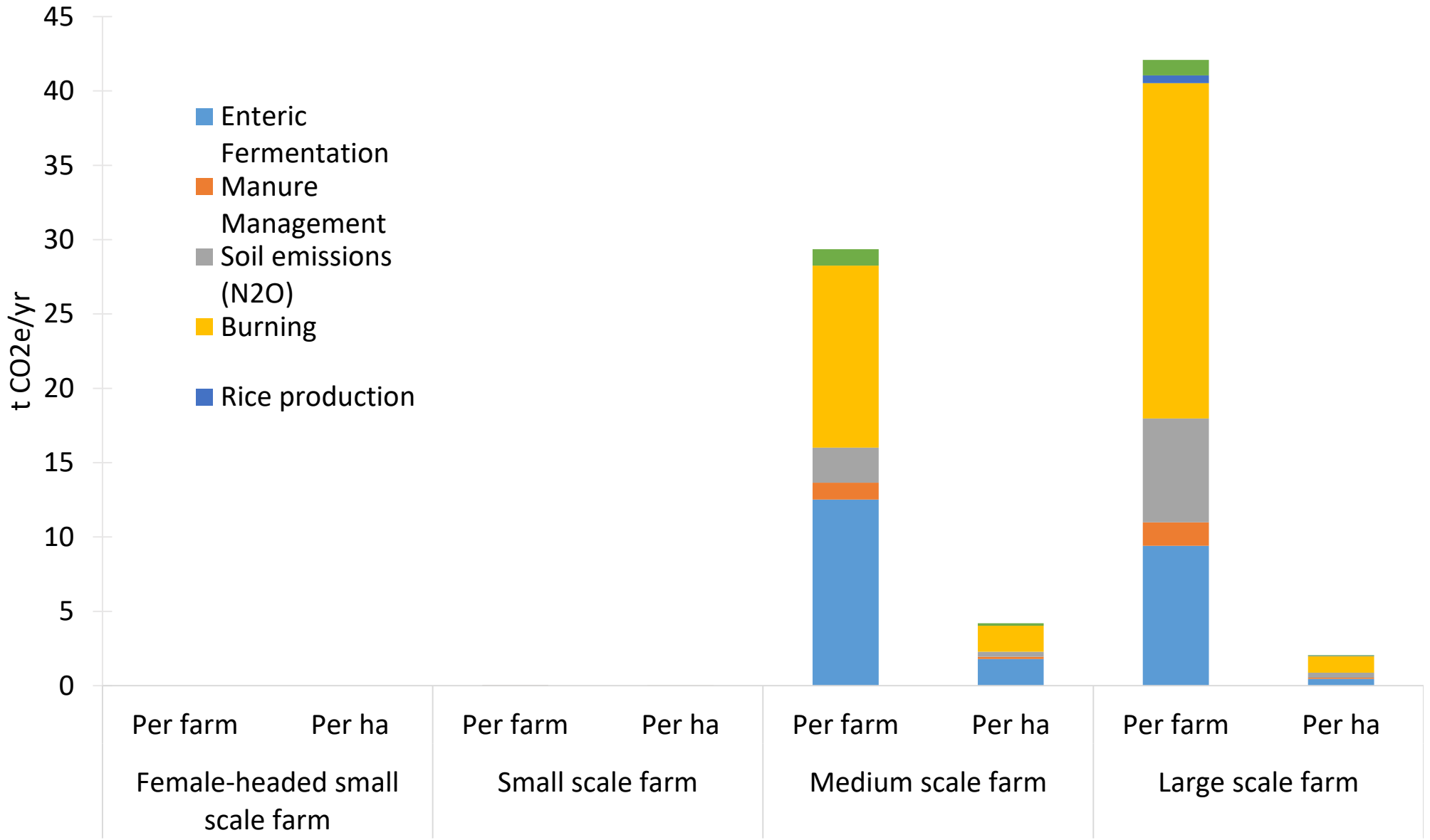
# Nitrogen balance



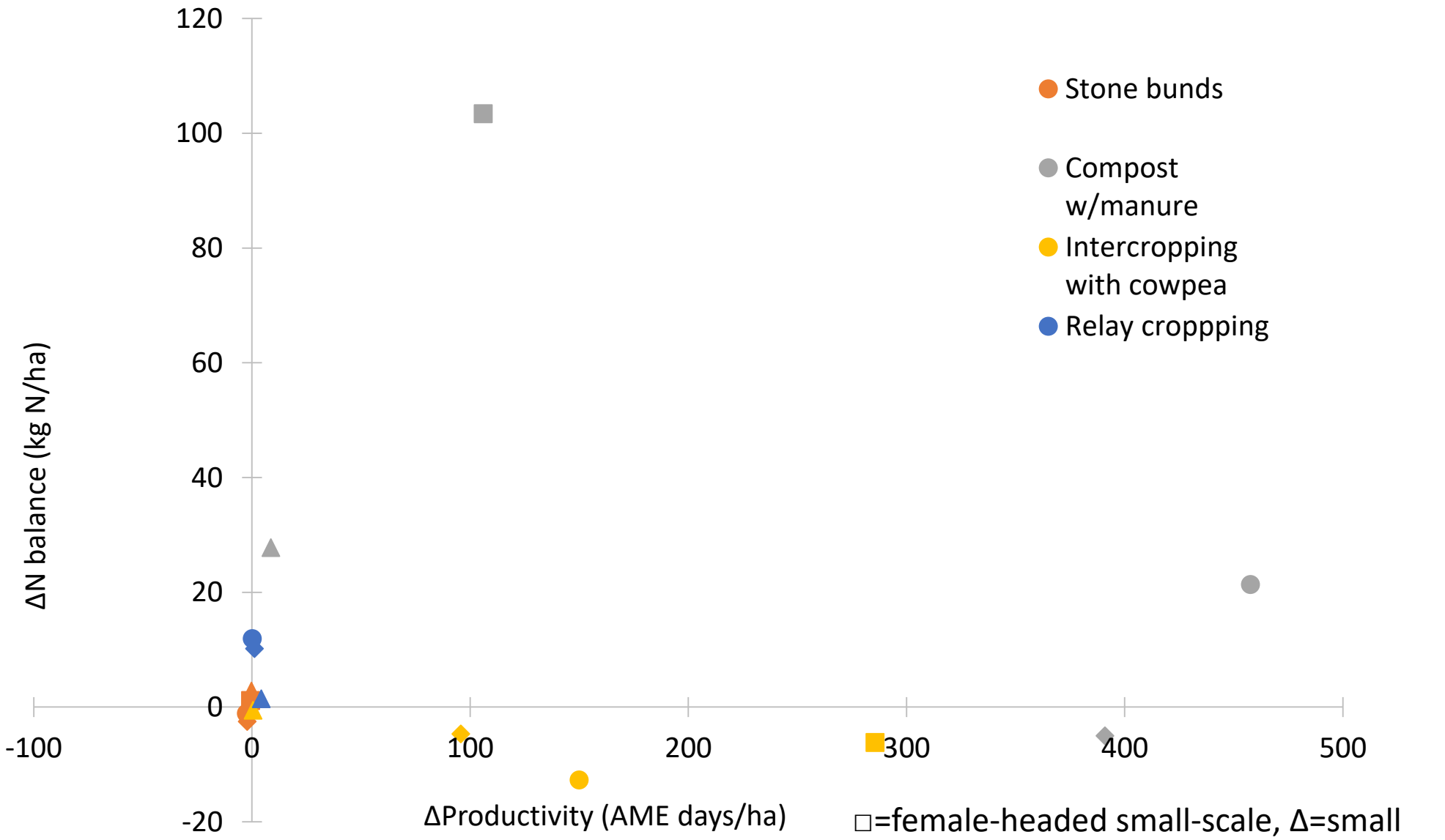
# Soil erosion



# Greenhouse gas emissions

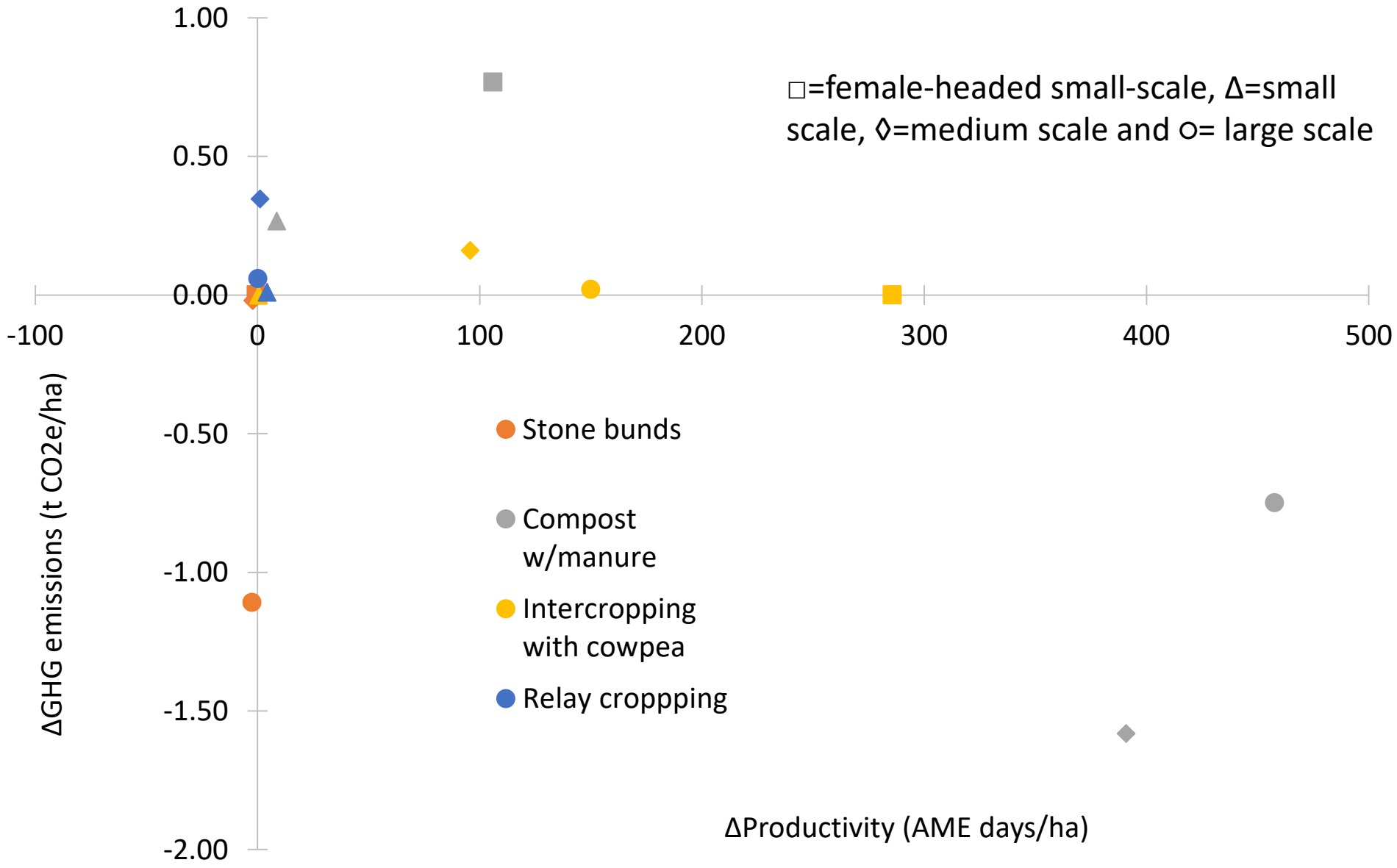


# Trade-offs: Productivity vs. N balance




□=female-headed small-scale, Δ=small scale, ◊=medium scale and ○= large scale

# Trade-offs: Productivity vs. GHG emissions



# Evaluating Land Management Options (ELMO)

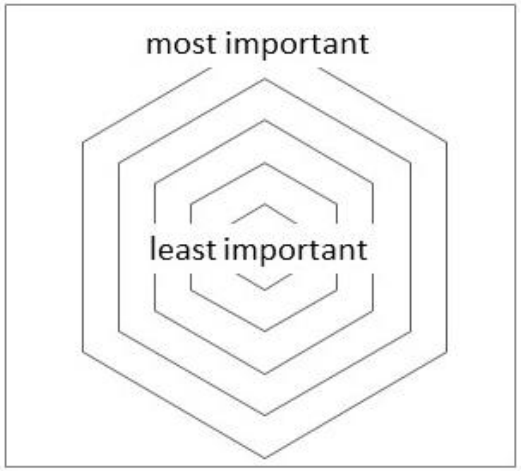
Participatory tool for assessing farmers' land management (LM) decisions, preferences & trade-offs

1. Identify techniques & attributes to be discussed
2. Record respondent characteristics
3. Define LM techniques & baseline
4. Rank & Score LM costs & input requirements
5. Rank & Score LM benefits & desired outcomes
6. Rank LM advantages & positive attributes
7. Rank LM disadvantages & negative attributes
8. Rank and weight LM alternatives overall

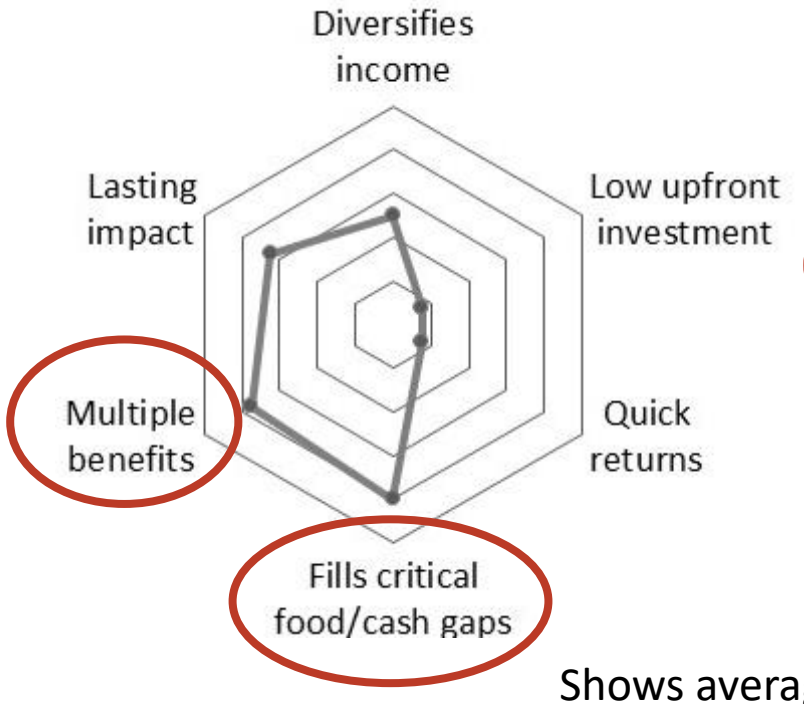
Individual discussions with farmers

# ELMO - results

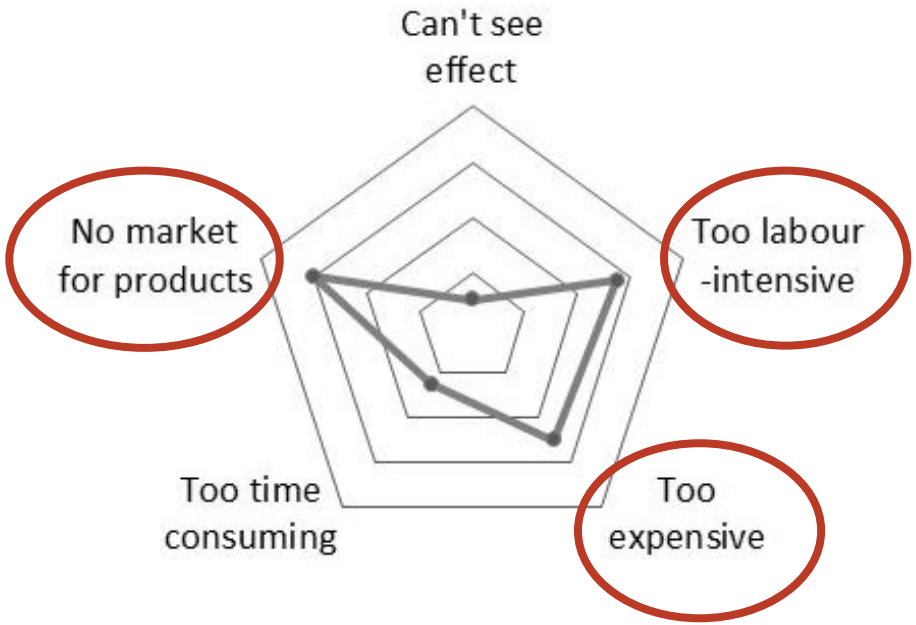
Relative importance of advantages & disadvantages of practices




Advantages

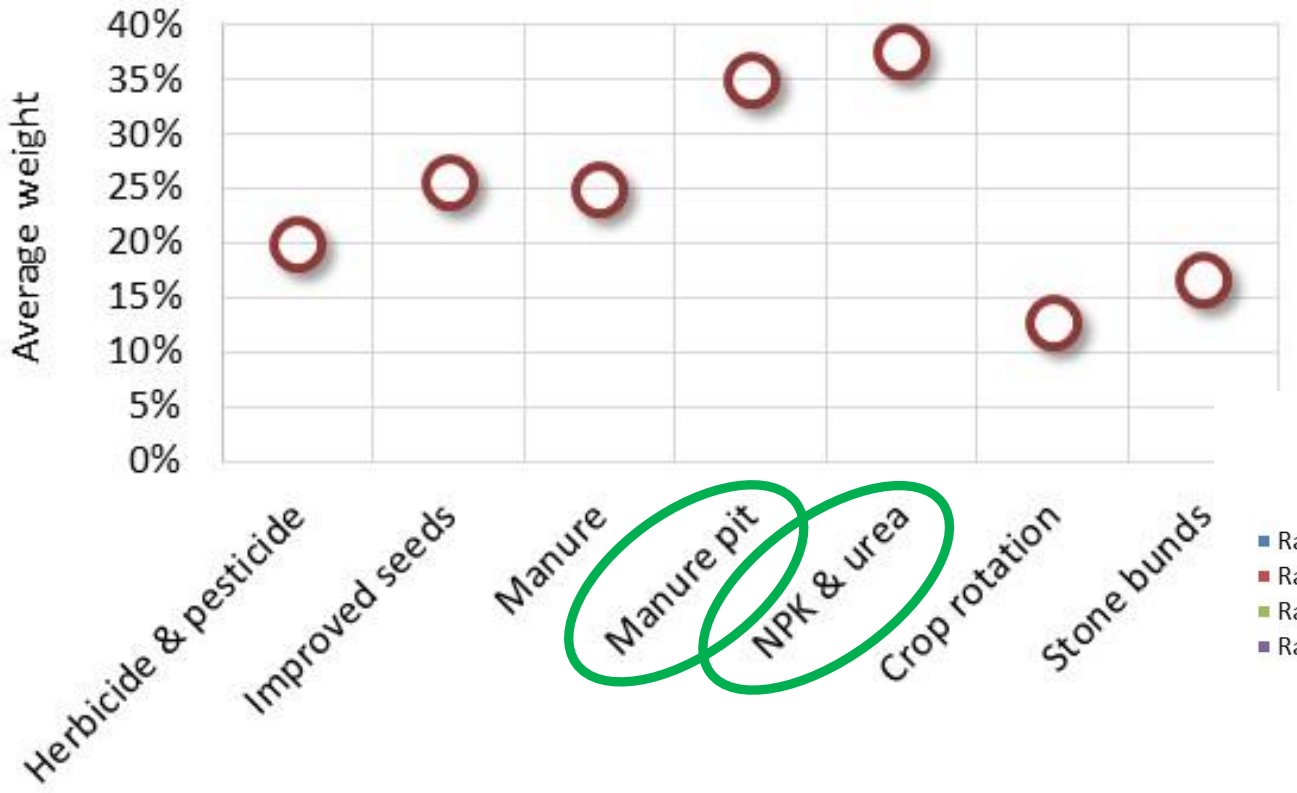


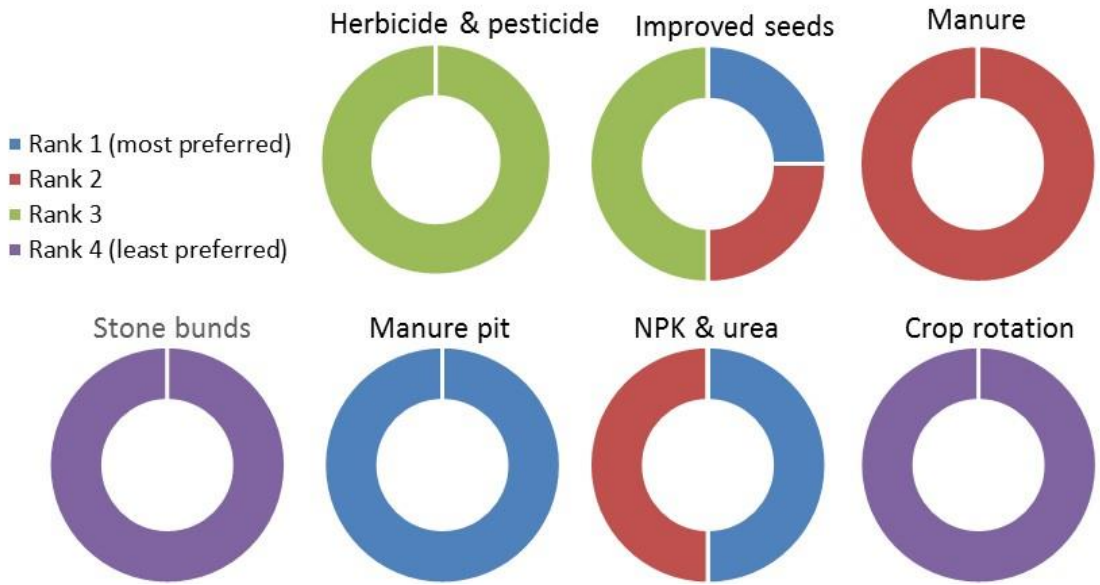

Disadvantages




Shows average scoring by farmers

# Overall preference of practices

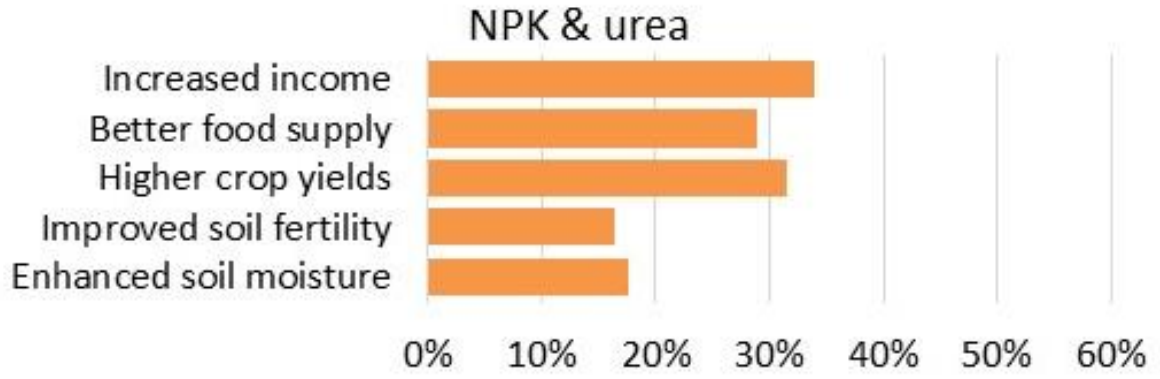


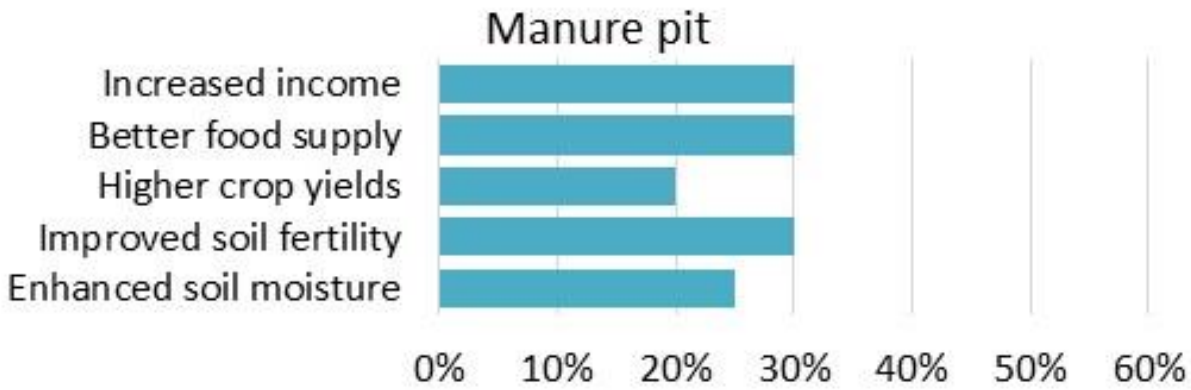




*Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.*

# Farmer's general perceptions and preferences

- Practices that demand large amounts of **labor and other purchased items** are beyond the reach of many farmers
- **Diversity of benefits** is an important factor shaping farmers' land use preferences
- Practice must be able to show **improvements in soil fertility, crop yields and income generation** and also contribute towards better food supplies to be attractive and viable
- Being able to demonstrate quick wins in monetary terms, although desirable, are not by themselves enough to make a practice the most preferred choice or most viable option for the farmer



# Calculating “attainable impact” across the two regions

1. Number of farm households of each farm type

   ~ rural population / HH-size * farm type %

| | Small-scale / Traditional managed by woman or young man | Small-scale / Traditional | Medium-scale / Semi-modern | Large-scale / Modern |
|---|---|---|---|---|
| % | 5 | 35 | 49 | 11 |
| Number HHs | 7,359 | 51,514 | 72,119 | 16,190 |

2. Adoption rates (% of the HHs likely to adopt the specific intervention) per farm type

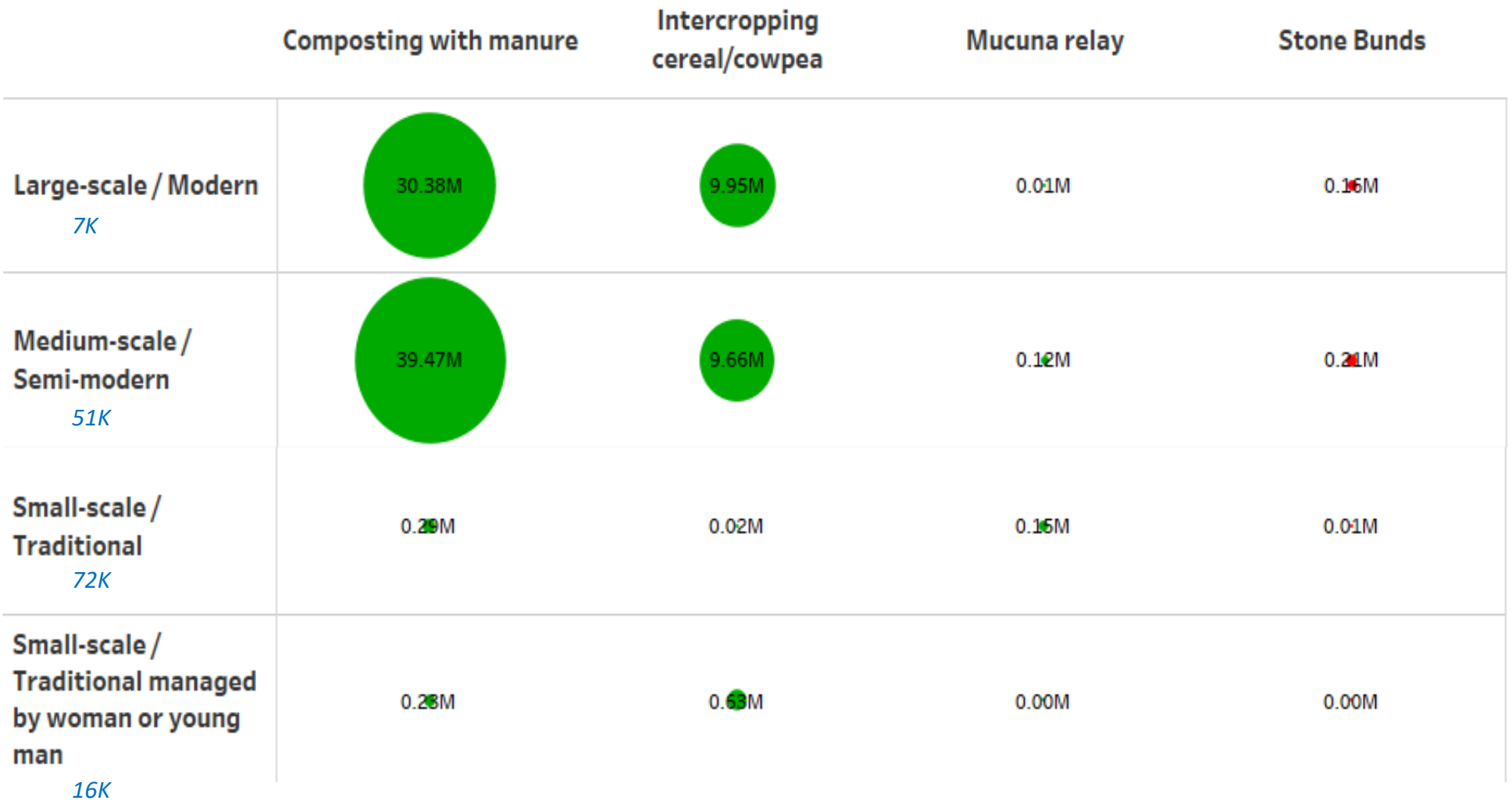
3. ~ ELMO

20% or

| Composting with manure | Intercropping cereal/cowpea | Mucuna relay | Stone Bunds |
|---|---|---|---|
| *35* | *12* | *12* | *16* |
| *“manure pit" score* | *“crop rotation" score* | *“crop rotation" score* | *“stone bund” score* |

# Calculating “attainable impact” across the five districts

3. Number of adopting farms x estimated impact per farm



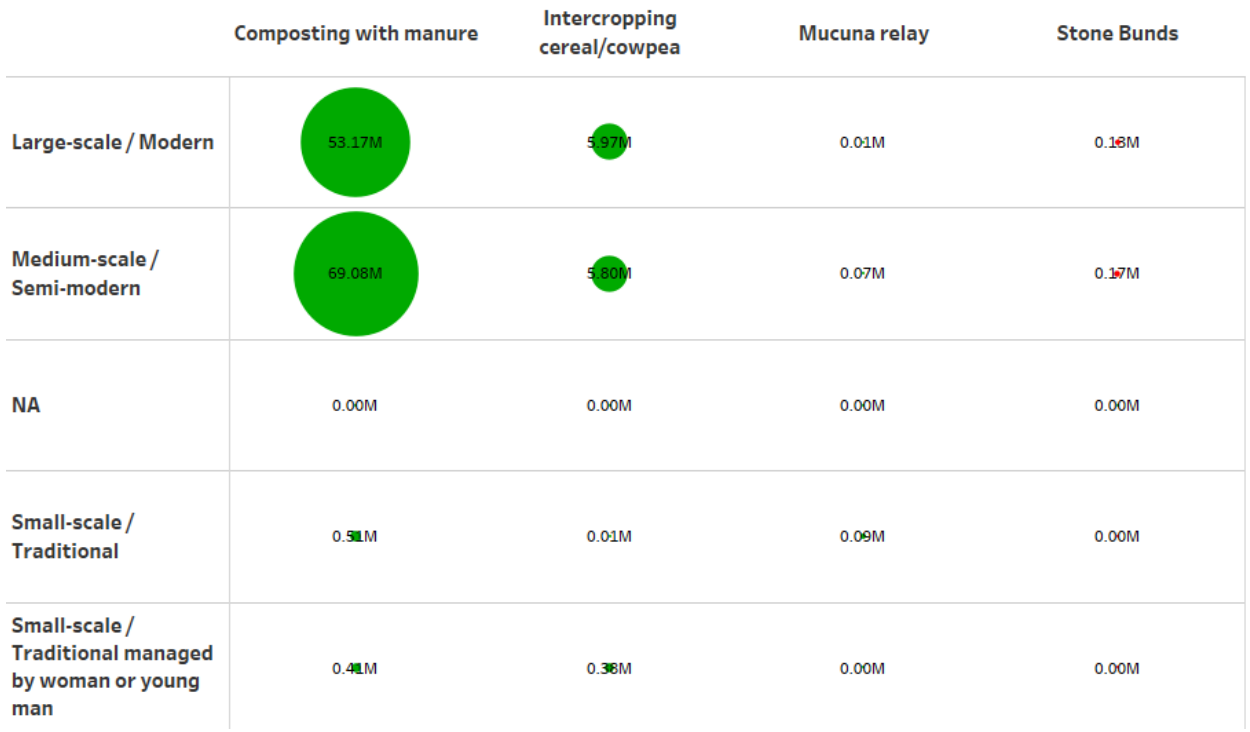

AME days

# Importance of expected adoption rates

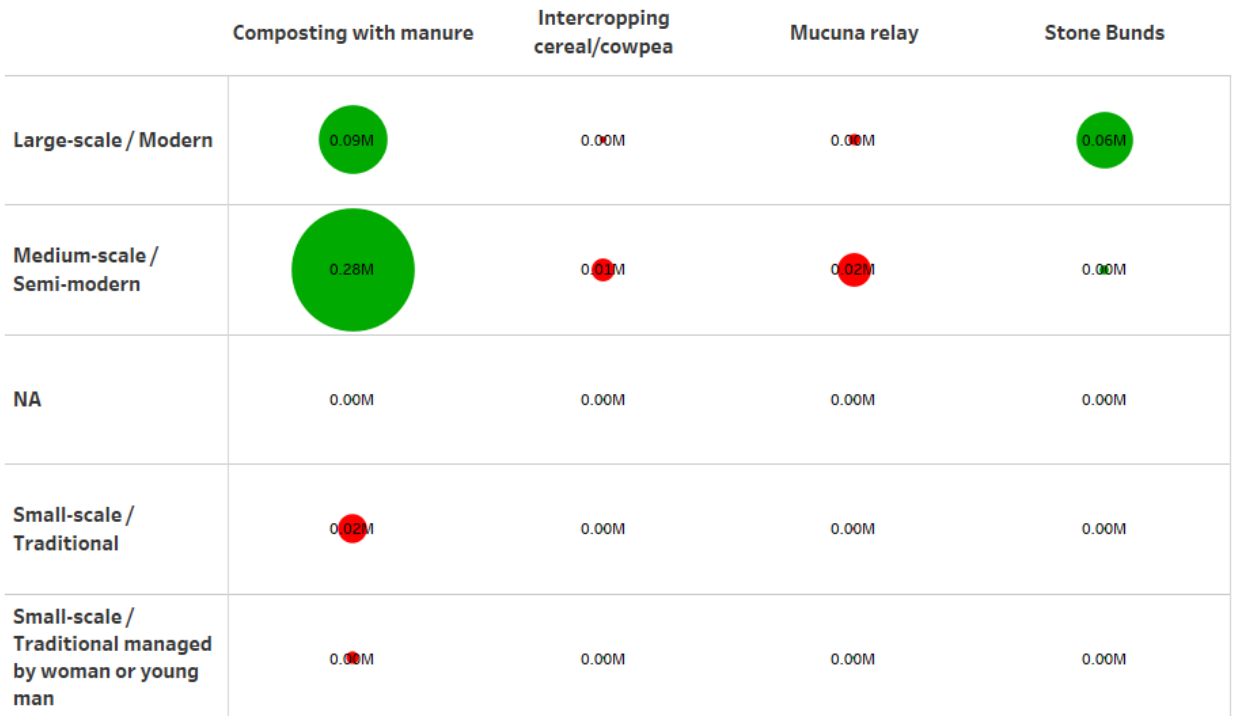
| | *35%* Composting with manure | *12%* Intercropping cereal/cowpea | *12%* Mucuna relay | *16%* Stone Bunds |
|---|---|---|---|---|
| Large-scale / Modern *7K* | 53.17M | 5.97M | 0.01M | 0.18M |
| Medium-scale / Semi-modern *51K* | 69.08M | 5.80M | 0.07M | 0.17M |
| Small-scale / Traditional *72K* | 0.51M | 0.01M | 0.09M | 0.00M |
| Small-scale / Traditional managed by woman or young man *16K* | 0.41M | 0.38M | 0.00M | 0.00M |

# Trade-offs with GHG emissions

## AME days




## GHG emissions



# Trade-offs with soil fertility

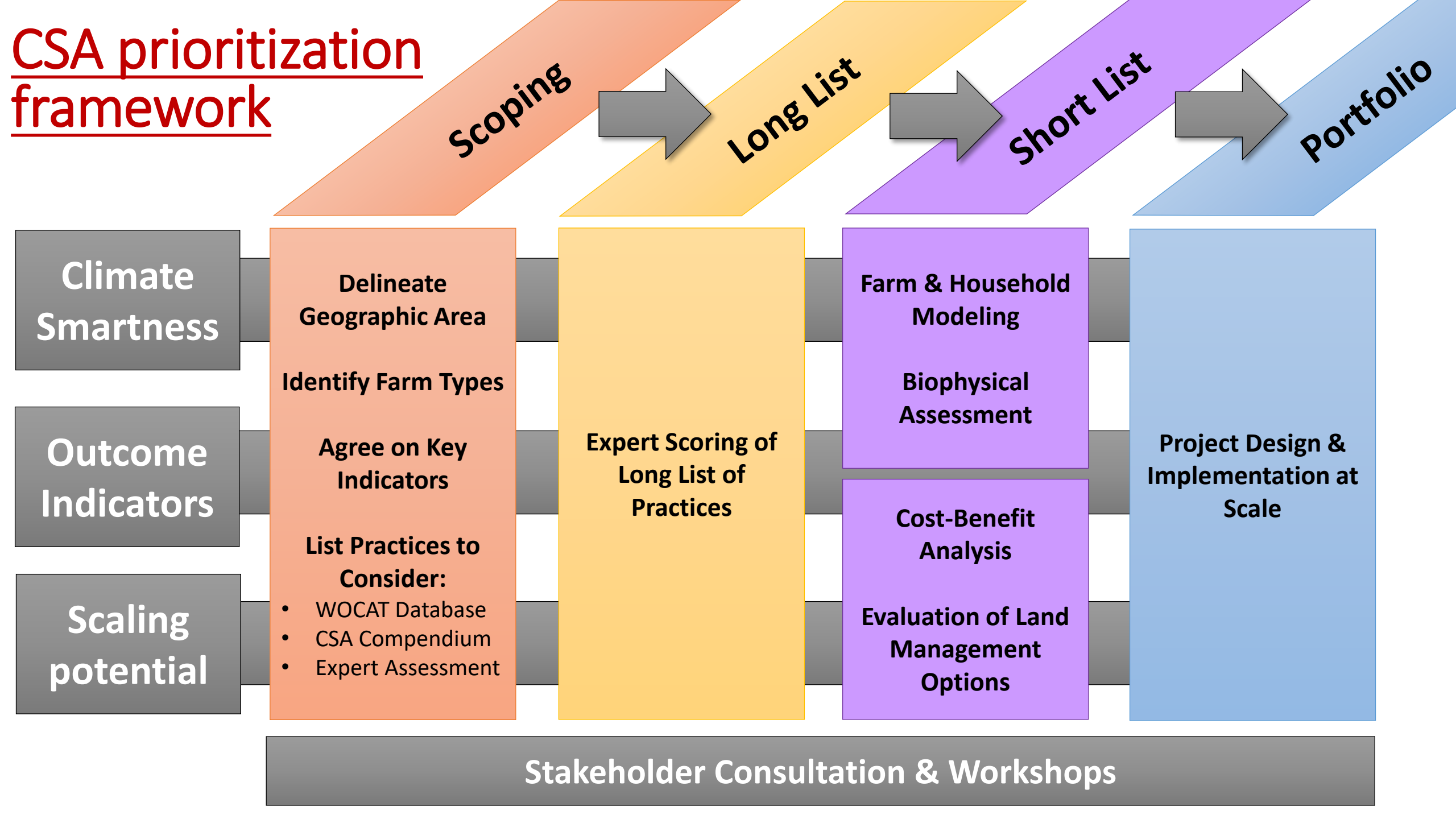
## AME days

| | Composting with manure | Intercropping cereal/cowpea | Mucuna relay | Stone Bunds |
|---|---|---|---|---|
| Large-scale / Modern | 53.17M | 5.97M | 0.01M | 0.16M |
| Medium-scale / Semi-modern | 69.08M | 5.80M | 0.07M | 0.17M |
| NA | 0.00M | 0.00M | 0.00M | 0.00M |
| Small-scale / Traditional | 0.51M | 0.01M | 0.09M | 0.00M |
| Small-scale / Traditional managed by woman or young man | 0.41M | 0.36M | 0.00M | 0.00M |

## N Balance

| | Composting with manure | Intercropping cereal/cowpea | Mucuna relay | Stone Bunds |
|---|---|---|---|---|
| Large-scale / Modern | 2.48M | 0.51M | 0.47M | 0.06M |
| Medium-scale / Semi-modern | 0.89M | 0.28M | 0.62M | 0.20M |
| NA | 0.00M | 0.00M | 0.00M | 0.00M |
| Small-scale / Traditional | 1.63M | 0.01M | 0.03M | 0.07M |
| Small-scale / Traditional managed by woman or young man | 0.40M | 0.01M | 0.00M | 0.00M |

# CSA prioritization framework




Thank you!