Co-designing a relevant basket of options for climbing bean cultivation in Uganda

Esther Ronner

Katrien Descheemaeker
Conny Almekinders (KTI)
Peter Ebanyat (IITA Uganda)
Ken Giller

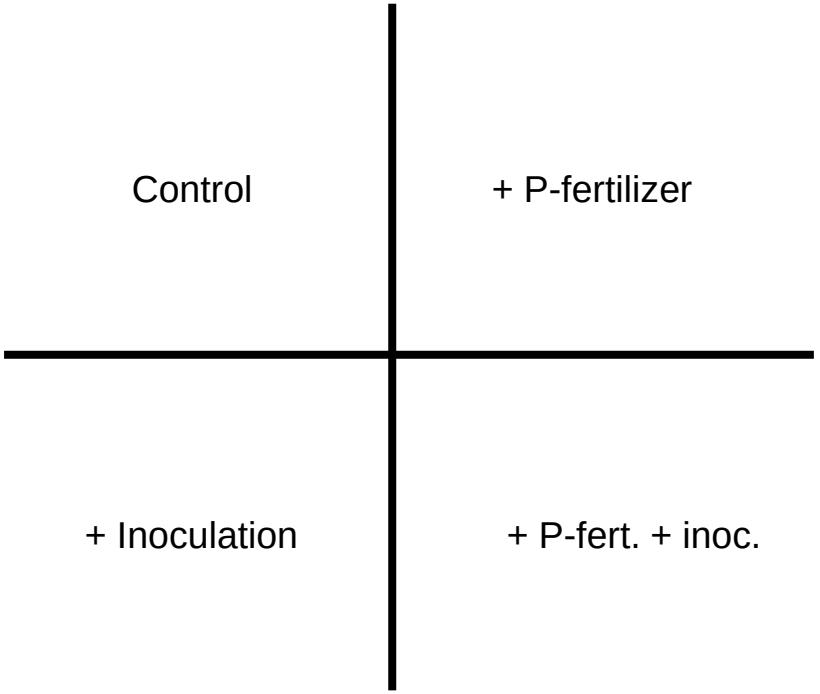
WaCASA lunch meeting
8 November 2017

Background PhD research

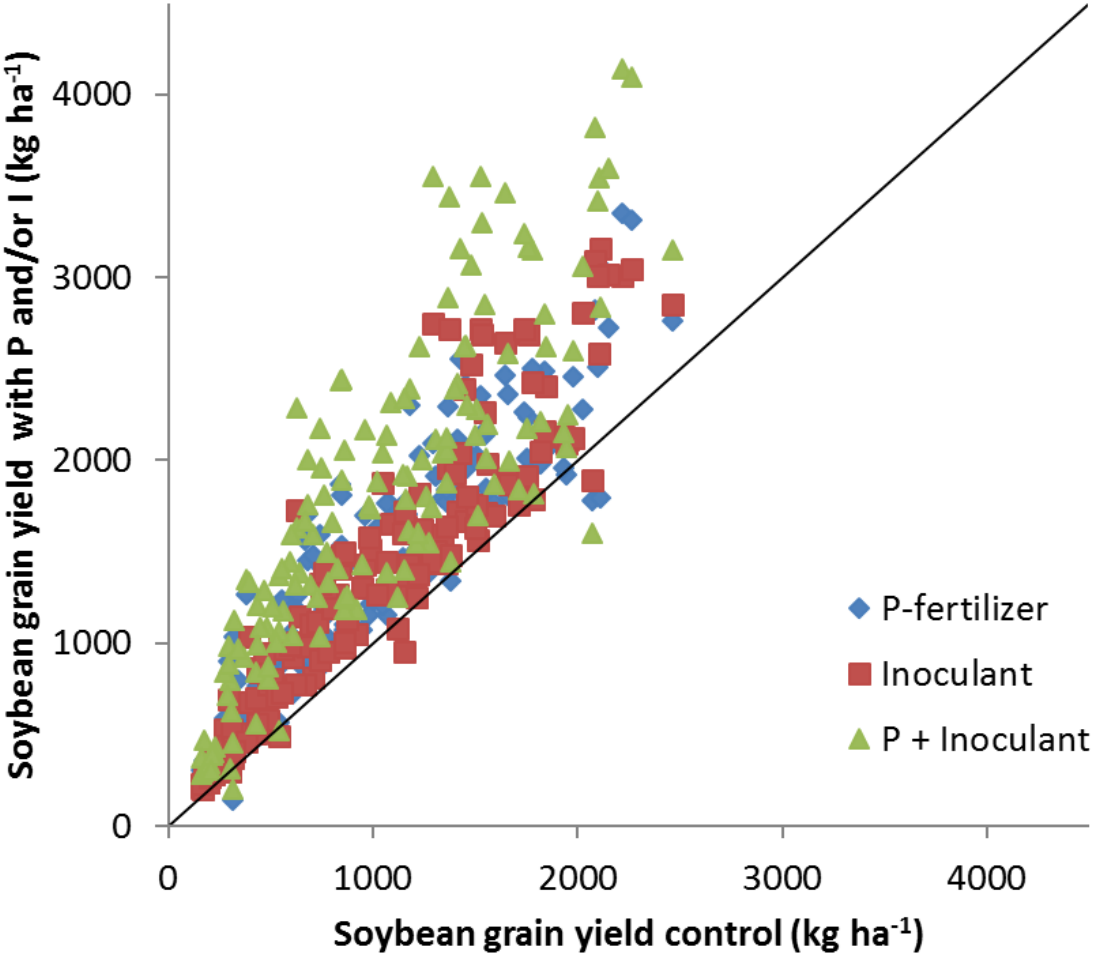
In first chapter PhD:

- Technologies work on research stations, not necessarily on farmers' fields
- Widespread testing on farmers' fields
- Understanding variability in yields to find niches for legume technologies

Soybean in Nigeria:



Results soybean in Nigeria, 2011 and 2012



Background PhD research

- In general:
  - P + Inoculants largest yields (and profitability)
  - Planted early and weeded in time

→ Ideally adopted by all farmers growing soybean

- But in reality not all farmers apply ideal combination
  - Capital, labour constraints
  - Land constraints (intercropping)
  - Other priorities (other crops, maximizing or optimizing yield)?

Theoretical framework

- Diversity of farmers
  with different objectives,
  possibilities and constraints

- Develop relevant
  options for different types
  of farmers

Theoretical framework

- Through a “co-design” process
  - Understand objectives and preferences of the users of a technology
  - Which criteria do users of the technology use to determine which options are ‘best’?

- Understand use and adaptation of options developed through co-design process

Applied to climbing beans in Uganda

Option for densely populated highland areas of Uganda

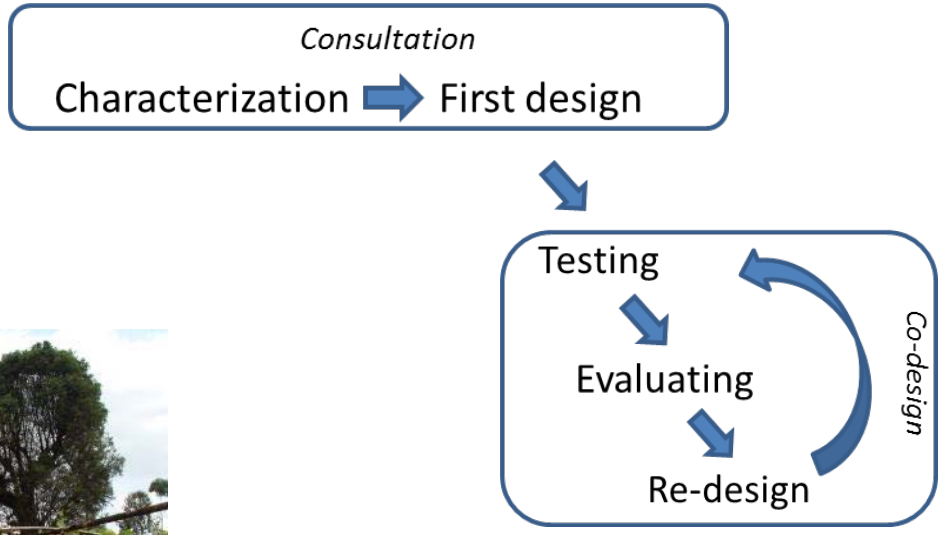
- Bush bean: 3 t/ha;
  climbing beans: 4 to 5 t/ha

- New technology
- Change in cropping system
- Need for staking

Objective 2: co-design a basket of options

- Develop and apply a **co-design process**, resulting in relevant **basket of options** for farmers in different **contexts**:
  - Geographical regions in Uganda (agro-ecology, market access, input use, access to trees for staking, history of climbing bean cultivation)
  - Socio-economic background, gender

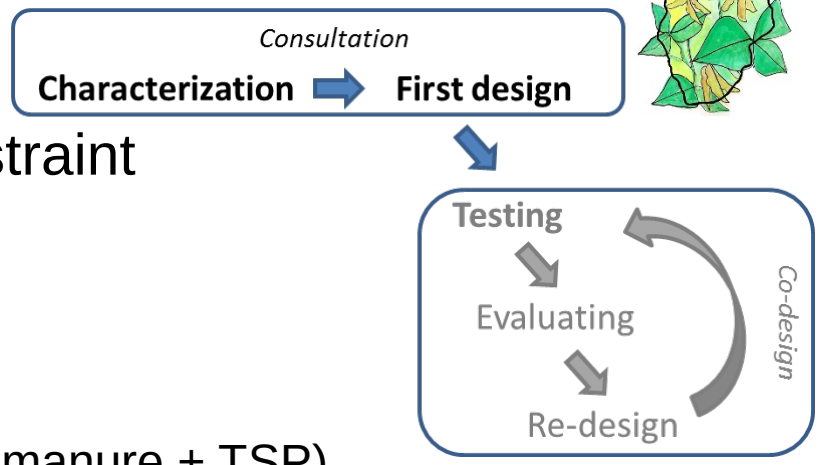
Co-design process



3 cycles

Characterization and design of first options

- Started in eastern highlands
- Characterization: staking main constraint
- Treatments in demonstration:
  - Different staking methods
  - Varieties (local and improved)
  - Inputs (manure and TSP fertilizer)
  - Researcher best-bet (improved variety; manure + TSP)

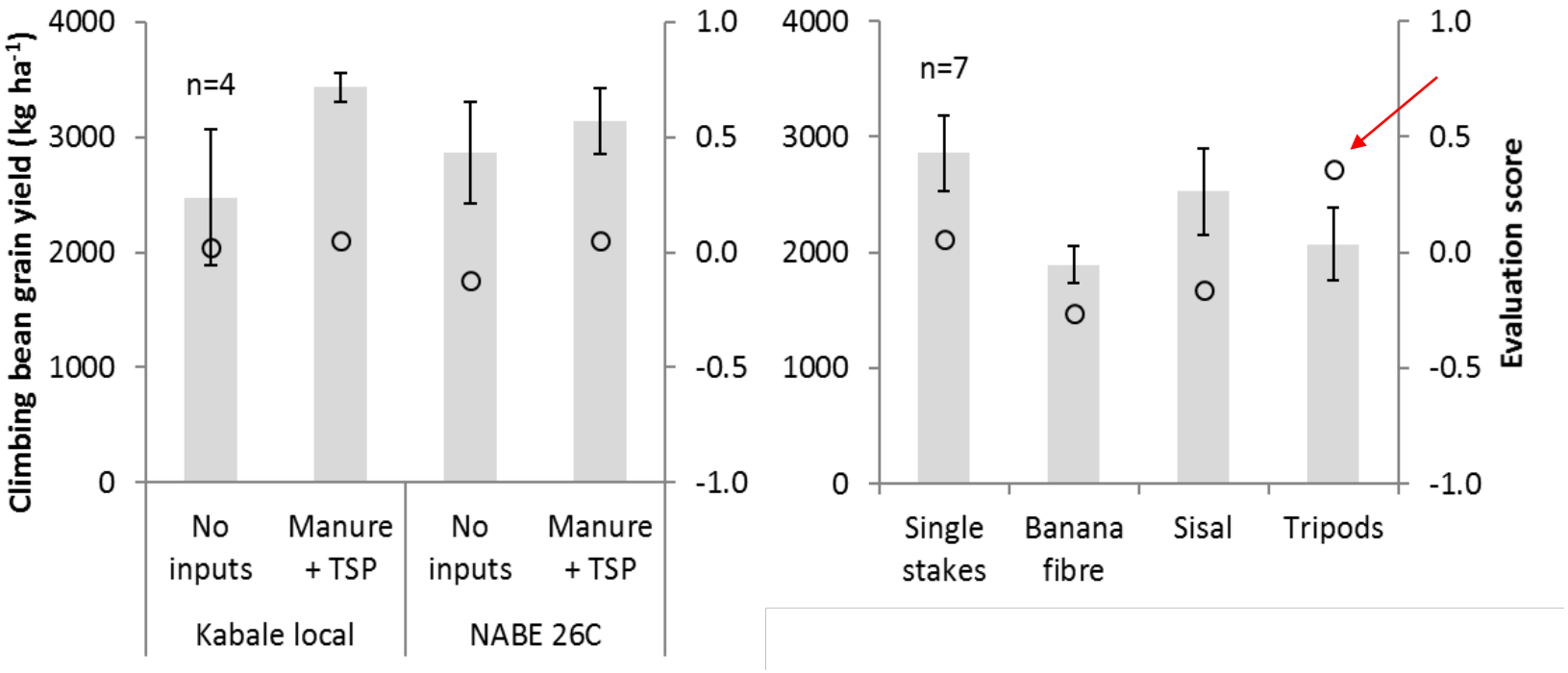



Single, wooden stakes


Strings (sisal or banana fibre)


Tripods

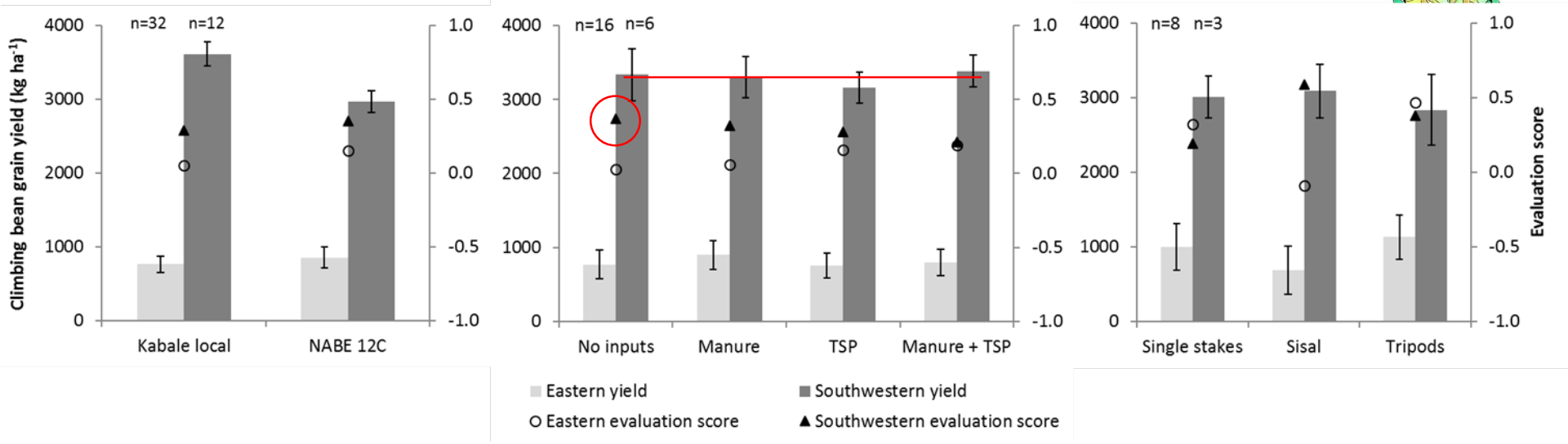
Testing and evaluating: season 2014A



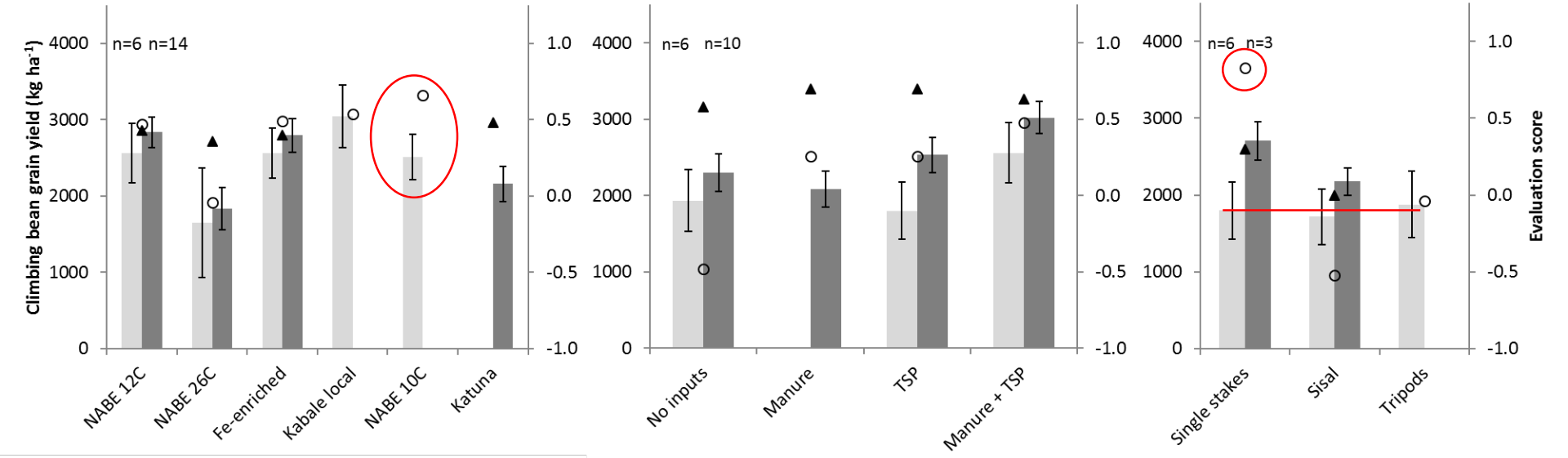
Varieties and inputs

Staking methods

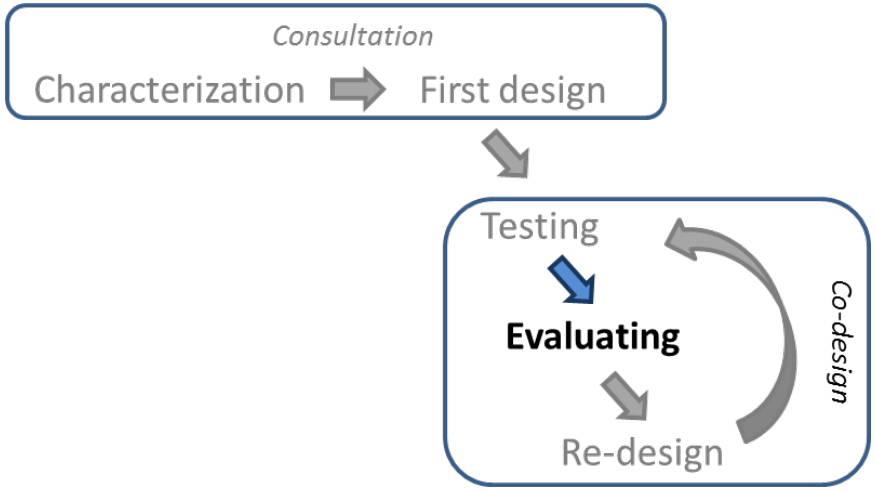
Testing and evaluating: 2014B and 2015A



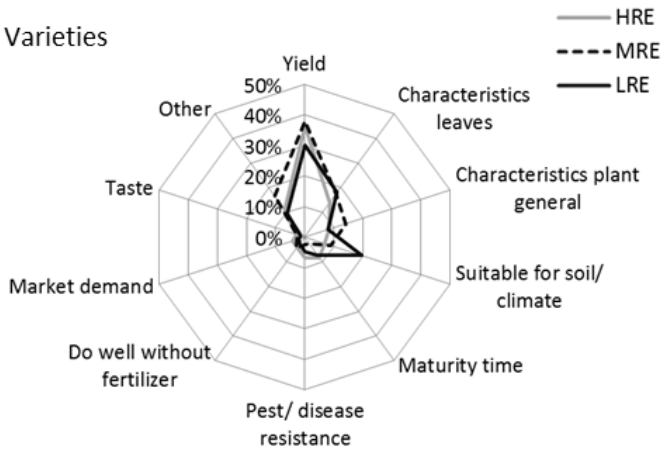
Varieties *Inputs* *Staking methods*

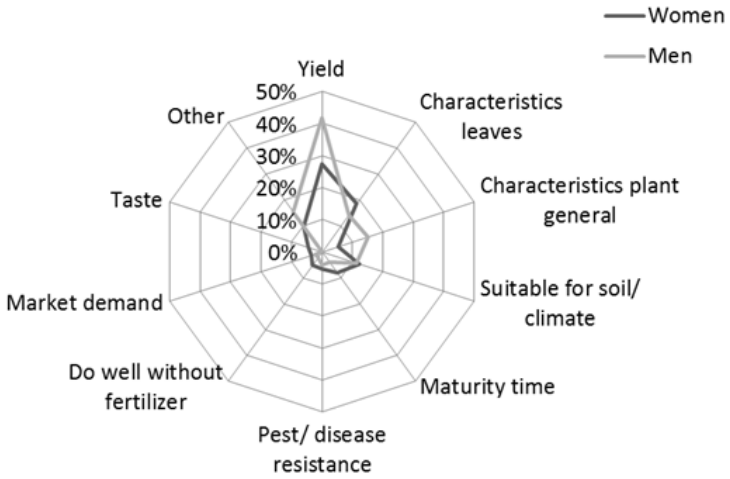


Evaluating: reasons for preference



A. Varieties





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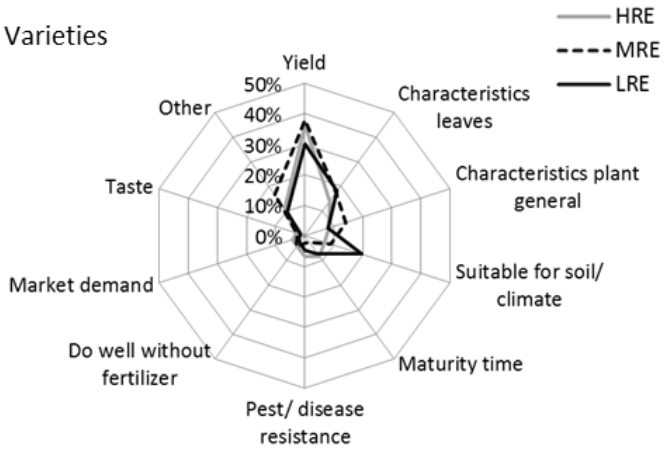
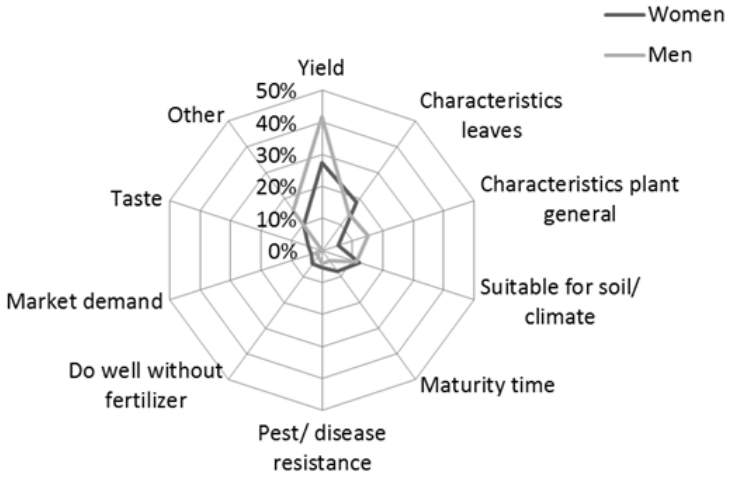
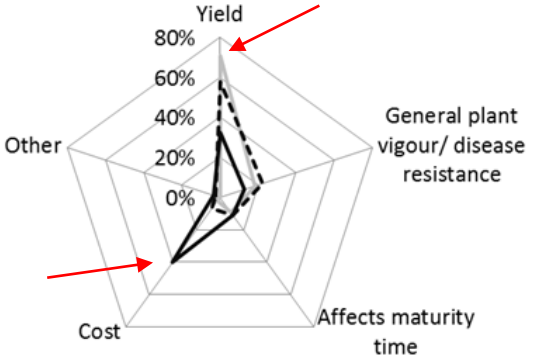
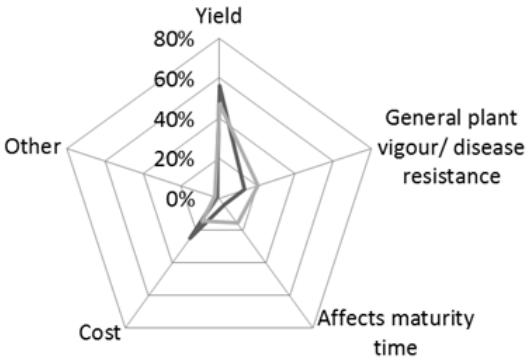
A. Varieties



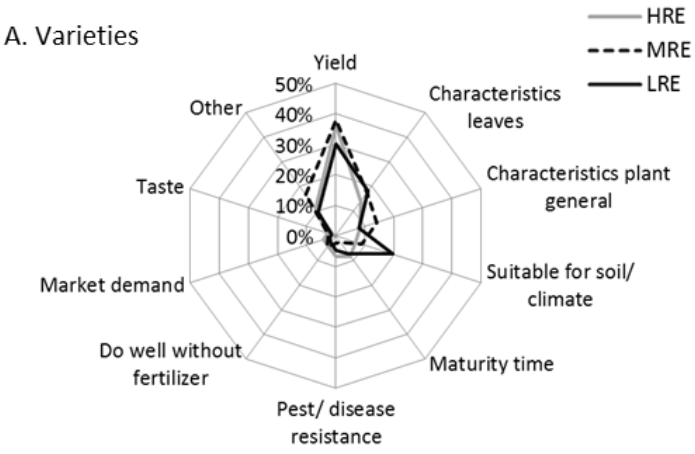


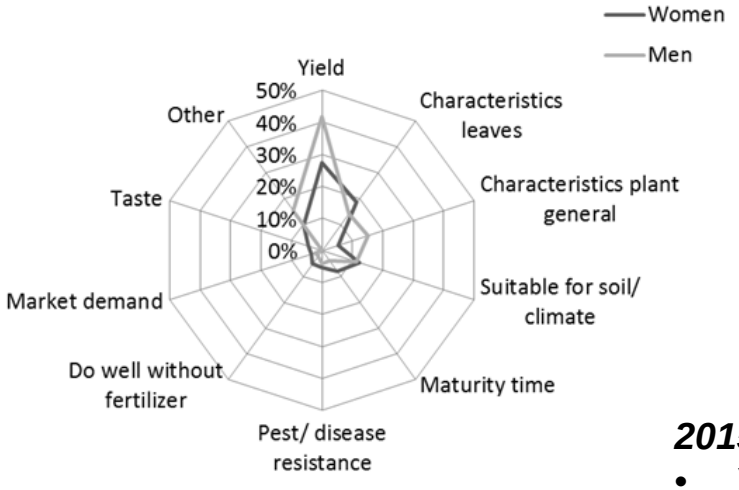
B. Inputs

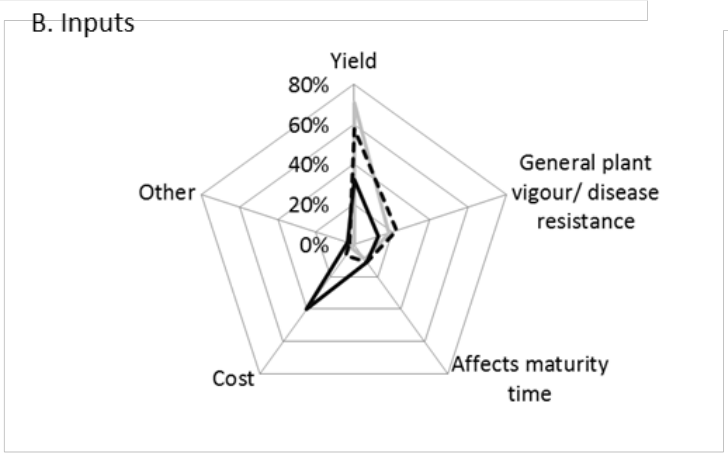


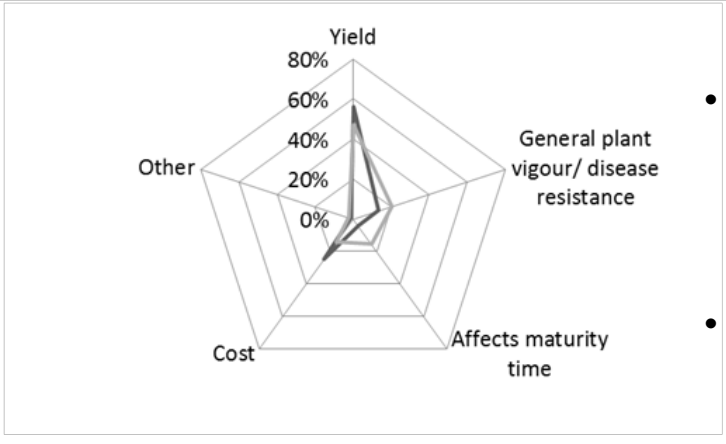


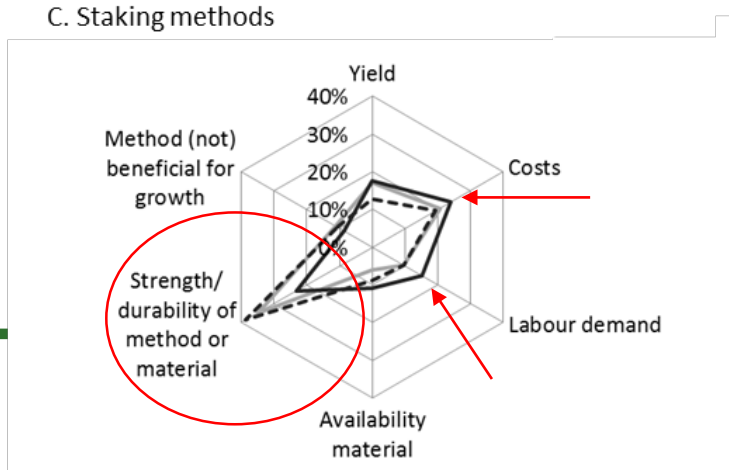
Putting nitrogen fixation to work for smallholder farmers in Africa

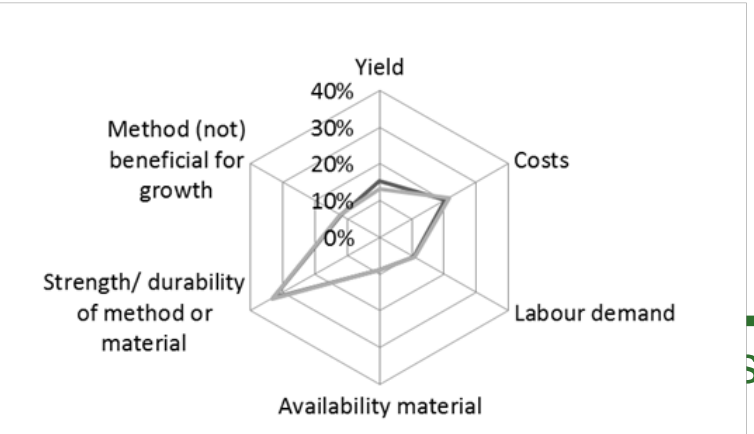












2015A:

- *Yield important, some other criteria more*
- *Home consumption: costs & benefit/ cost ratio more important (than farmers producing for sale)*
- *Lots of variability/ inconsistency*

s in Africa

Basket of options

	Researcher best-bet	Additional options	Reasons for preference
Varieties	Improved variety	Multiple varieties	Multiple variety traits
Inputs	Manure + TSP	No inputs	Costs
		Manure or TSP only	Availability, costs
		DAP	Availability, costs
Staking	Single stakes	Strings	Availability, costs
		Tripods	Strength, labour
	Wooden stakes	Banana fibre	Availability, costs
		Papyrus	Availability, costs
		Maize stalks	Availability, costs
		Sisal	Strength, re-usability, costs
		Nylon	Strength, re-usability, costs
	Stakes > 1.75m	Shorter stakes	Availability, control bird damage
Other practices	Sole cropping	Intercropping	Land scarcity, risk reduction
	Row planting	Broadcasting/ random planting	Labour
	One seed per hole	Two or more seeds per hole	Risk reduction, labour

Conclusions

- Broadening scope of technology evaluations from ‘yield’ to multiple criteria improves understanding of relevance of options
  - Take farmer evaluations serious!

    “Farmers evaluate and researchers decide...”

- Disaggregated analysis improved visibility of different preferences and perspectives (who do we interact with??)

    “Only some women will like variety Kabale local”

    “Staking should not be a problem for serious farmers”

Objective 3: Use and adaptation of options

Understand farmers' **use and adaptation** of the practices included in the co-design process, and use this understanding to inform **technology re-design** and **recommendation domains**

- Use and adaptation monitored:
  - In adaptation trial (farmers receive seed and fertilizer)
  - One to three seasons after adaptation trial (using own seed and fertilizer)

Definition use and adaptation

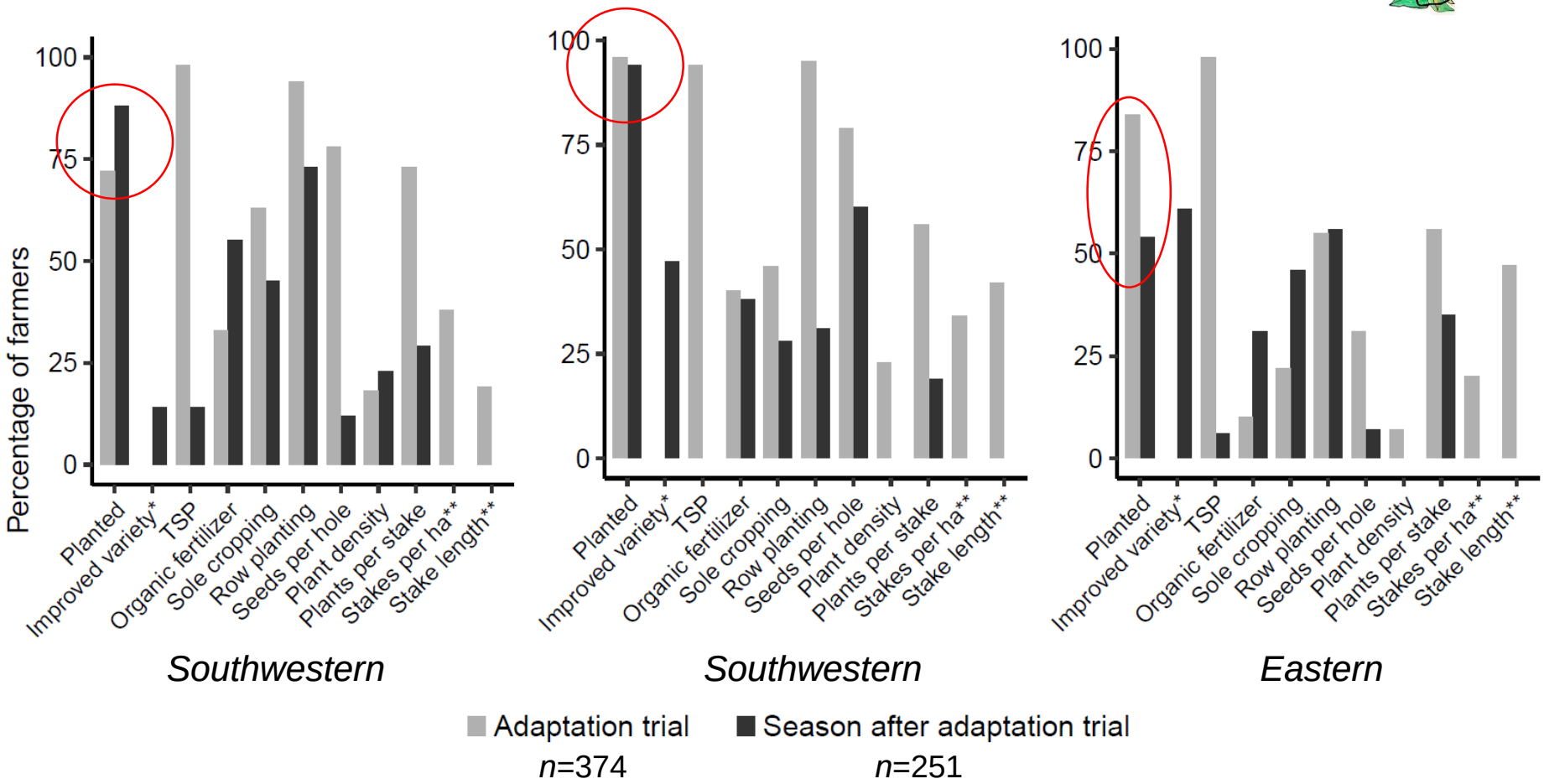
- Climbing bean technology = complex technology = consisting of combination of practices
- Combination of ‘best yielding’ practices = “researcher best-bet” technology

Climbing bean technology
Improved variety
Manure
TSP
Sole cropping
Row planting
160,000 plants per ha
40,000 stakes per ha
Stakes > 1.75m

- Farmers applying researcher best-bet = use (adoption)
- Farmers applying selection of practices = adaptation

Adaptation
Improved variety
Manure
~~TSP~~
~~Sole cropping~~
Row planting
160,000 plants per ha
~~40,000 stakes per ha~~
~~Stakes > 1.75m~~

Farmers applying options on their own field



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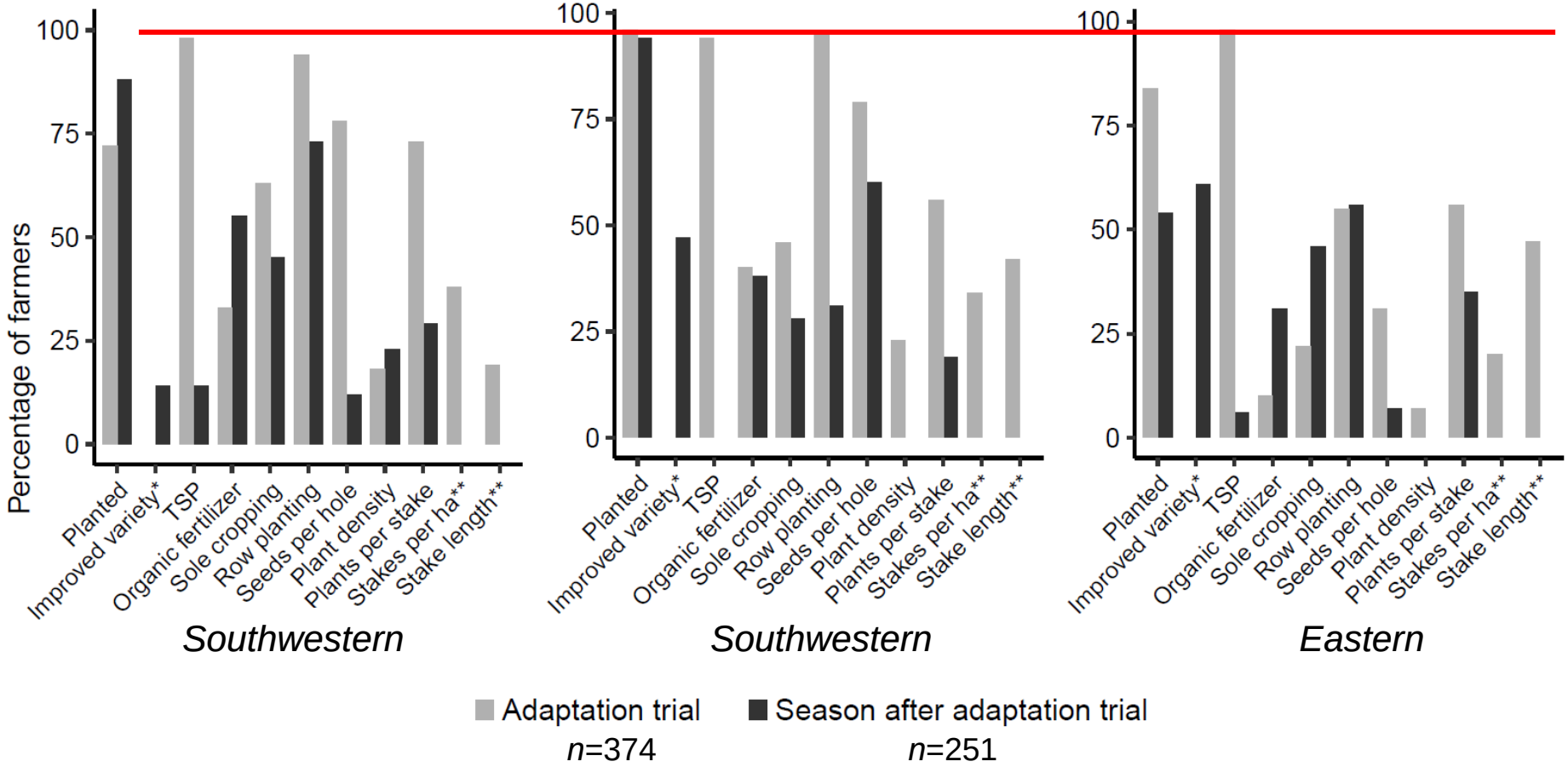
Farmers applying options on their own field

Only 2 farmers used all practices (99% adapted)



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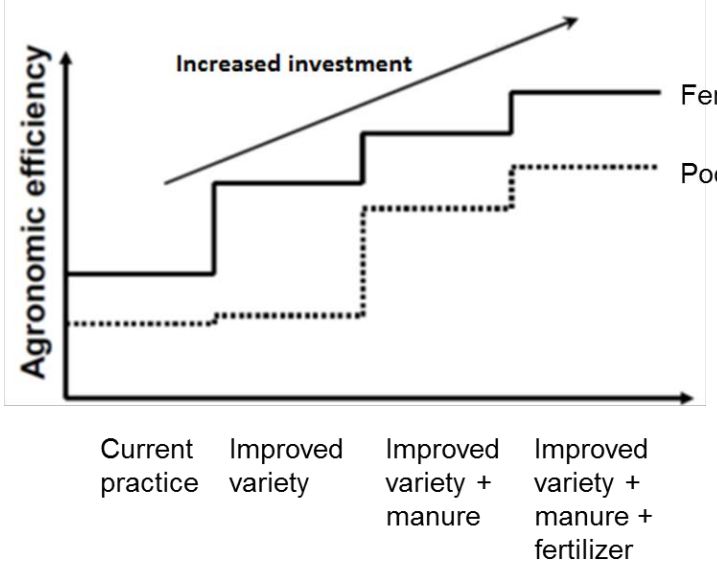
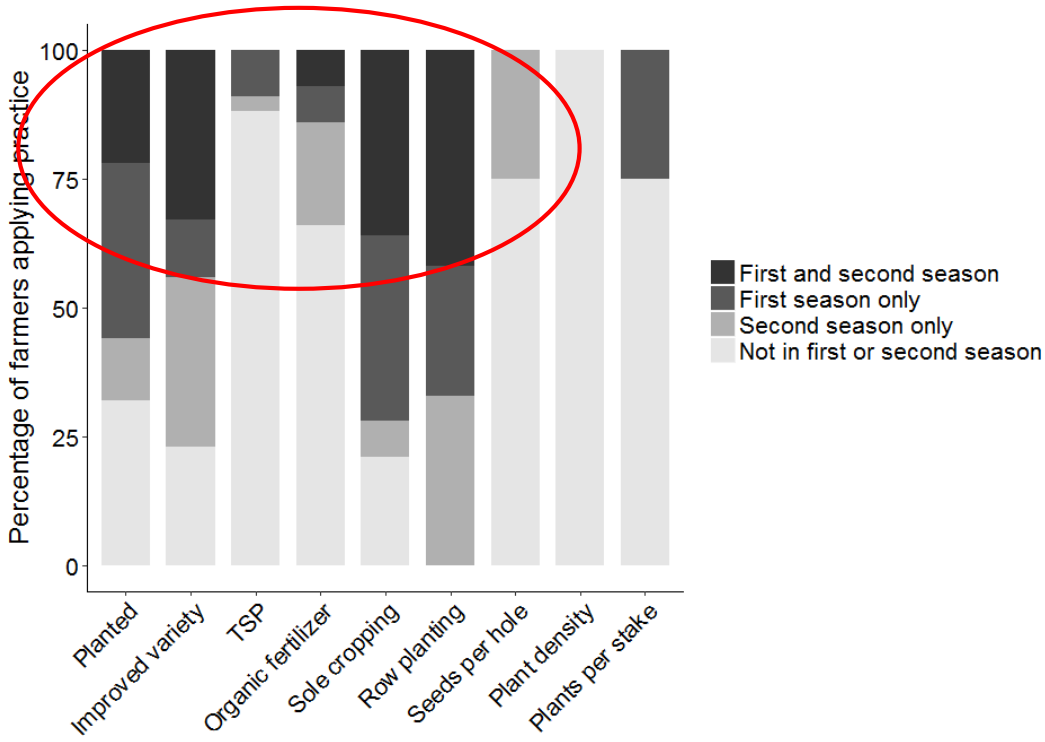
Increase and consistency in use of practices?



Adapted from Vanlauwe et al. (2010)



Which farmers use which practices?

- Poorer farmers planted climbing beans more often
  → adaptations (varieties, manure, stake length)

- Only farm size consistent positive relationship with use of practices
- Again a lot a variability/ inconsistencies...

- ...but surprising? Use of practices also inconsistent!

Conclusions

- Only two farmers used ‘full package’, 99% adapted
- Different farmers used different combinations of practices; few consistent explanatory variables
- Inconsistency in use of practices over time
- Adoption: not binary or linear, but dynamic process → snapshot in time will not tell much

Recommendation domains & variability

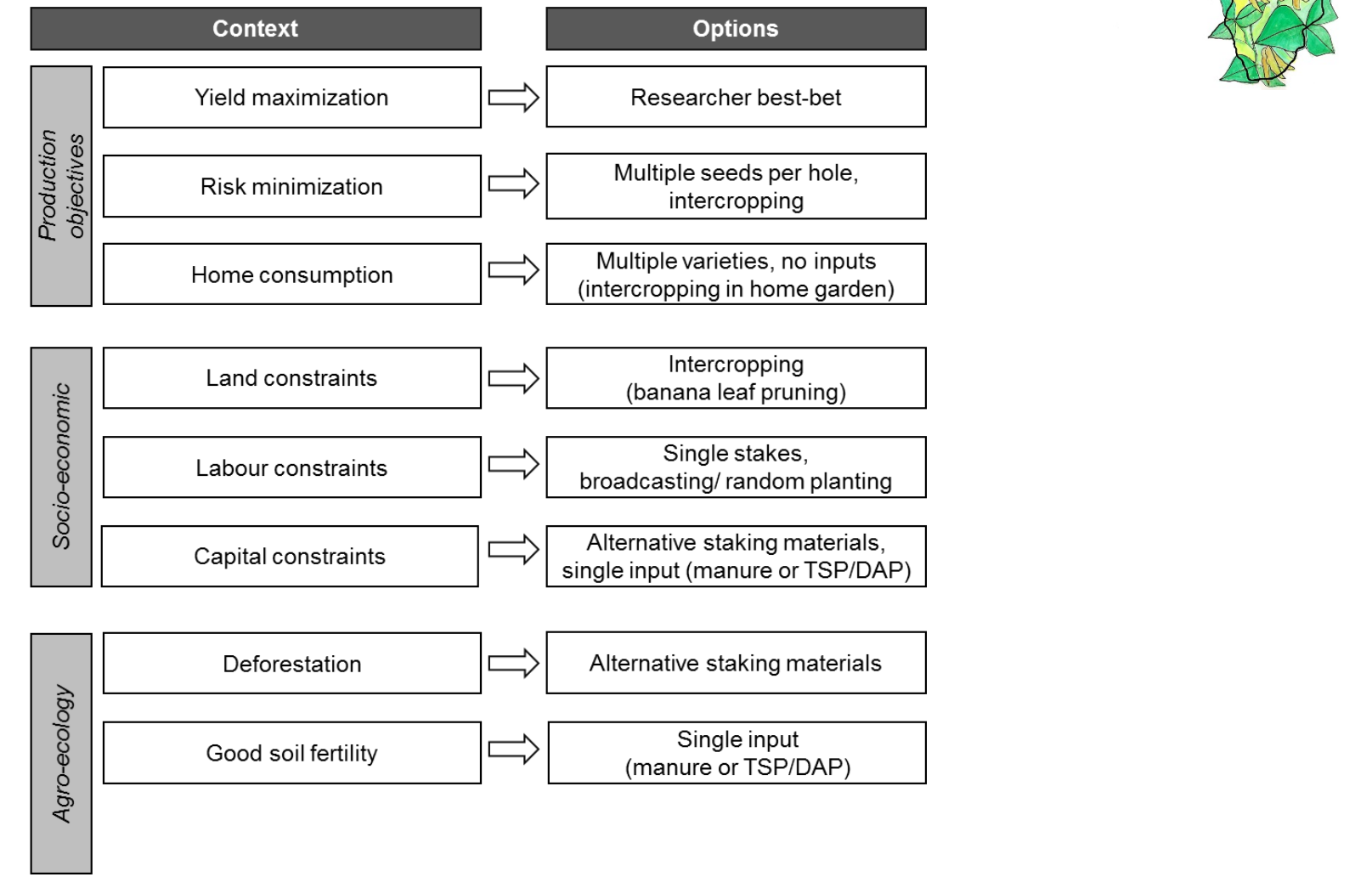
- In both studies:
  - Diversity of preferences/ use and links with household characteristics
  - Link to inconsistency in use of practices? (weather, market, access to resources in the right time)

- Instead of packages for recommendation domains
  - Basket of options
  - Sets of practices instead of fixed packages for every farm type
  - Recommendations of how to use practices, under which circumstances

- Inconsistency in use of practices → understanding variability in yield???


Thank you!

Outscaling tool: “Option x context matrix”



Use of co-designed options....

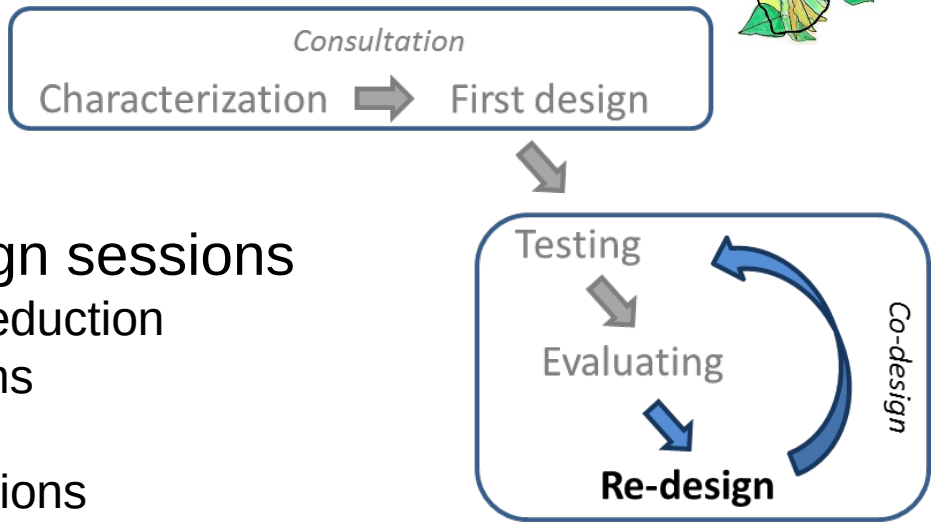
- More than half of the farmers used local varieties (marketability, taste, availability)

- Use of P-fertilizer in general very low
  - Only one farmer bought TSP
  - Others used DAP
- Only very few farmers used tripods and strings
  - Difficult to develop options for poorer farmers

- Intercropping and broadcasting more popular than sole cropping and row planting
  - Varieties & management recommendations for intercropping

Re-design sessions

- Re-design of treatments for demonstrations next season



- Contributions farmers in re-design sessions
  - Suggestions for cost, labour, risk reduction
  - Request solutions for local problems
  - New research questions to explore
  - Check relevance of proposed solutions
- Research, extension and NGO staff: knowledge and technologies from elsewhere
- Suggestions farmers and researchers compared in demonstrations

Evaluating: options for different farm types?

- Varieties evaluated similarly
  - Season 2014B: women preferred Kabale local
- Treatment with manure + TSP valued by wealthier farmers, no inputs by poorer farmers & farmers producing for home consumption
- Sisal strings low-cost alternative, but better scores from wealthier farmers

Preference for options added during co-design process

- Varieties: local varieties added as comparison
  - Local varieties received high scores, although yields comparable or smaller
  - Local varieties valued for disease resistance, grain colour, maturity time and suitability for climate
  - Improved varieties valued for yield and grain size

- Inputs: inclusion of DAP in eastern highlands
  - DAP received highest score; better availability than TSP and manure

- Staking methods: strings included as low-cost alternative for poorer farmers
  - Strings consistently received lowest scores (except southwest 2014B)
  - Compared with single stakes: availability of material, additional labour demand, costs, ease of method and re-usability of material all lower scores

Discussion/ conclusions

Lessons learned from co-design process

- Individual evaluations easier than groups, but results more variable

- Broadening scope of technology evaluations from ‘yield’ to multiple criteria
- Multiple (stepwise) options have more local relevance than only best-yielding combination of practices

Discussion/ conclusions

Options for different types of farmers

- Finding suitable options for resource-poor farmers difficult
  - Multiple constraints
  - Institutional change required

- Disaggregated analysis improved visibility of different preferences and perspectives (who do we interact with??)

  "Only some women will like variety Kabale local"

  "Staking should not be a problem for serious farmers"

  - Not only best-yielding varieties
  - Intermediate input options
  - Management recommendations for farmers intercropping with banana

Discussion/ conclusions

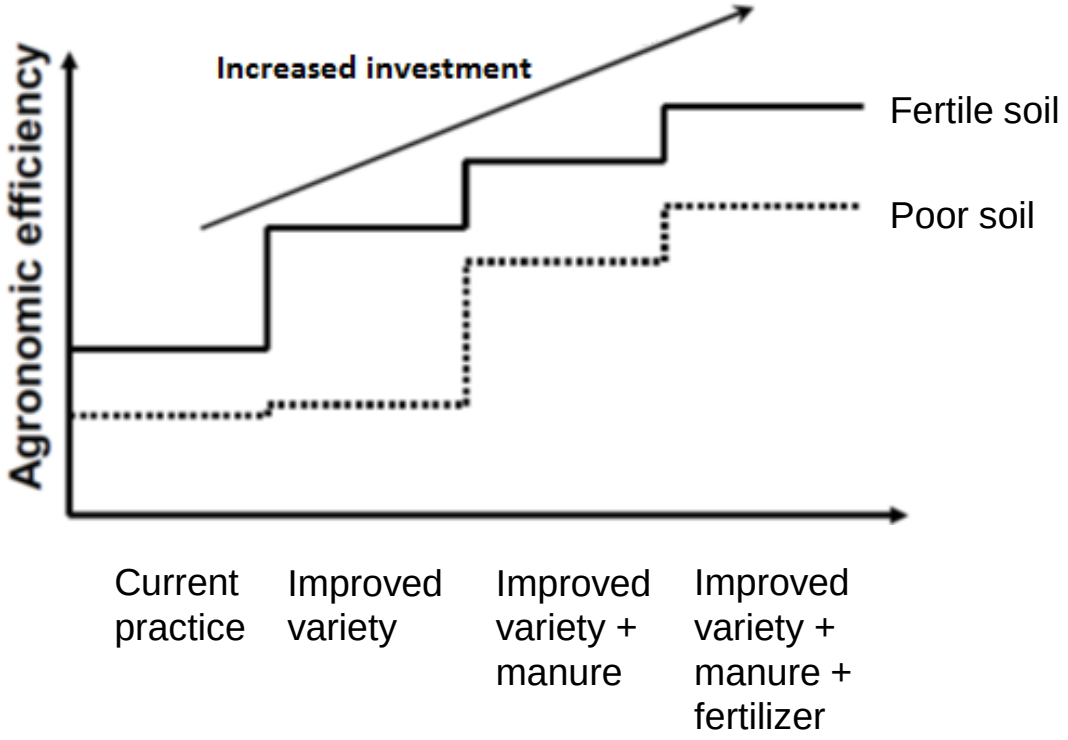
Applicability in large-scale development project

- Basket of options for East-African highlands
- Basic methodology of testing, evaluation and re-design applicable
  - Use of tablets enables faster feedback loops
  - Make use of household data already collected in project for disaggregated analyses
  - Take farmer evaluations serious! *“Farmers evaluate and researchers decide...”*

Principles for co-design in large-scale projects

Instead of best yielding technology:

- Range of options
- Stepwise introduction



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