

Designing agricultural development interventions for social inclusion

**Global Cropping Systems and Sustainable Development
Fall Term, November 5, 2020**

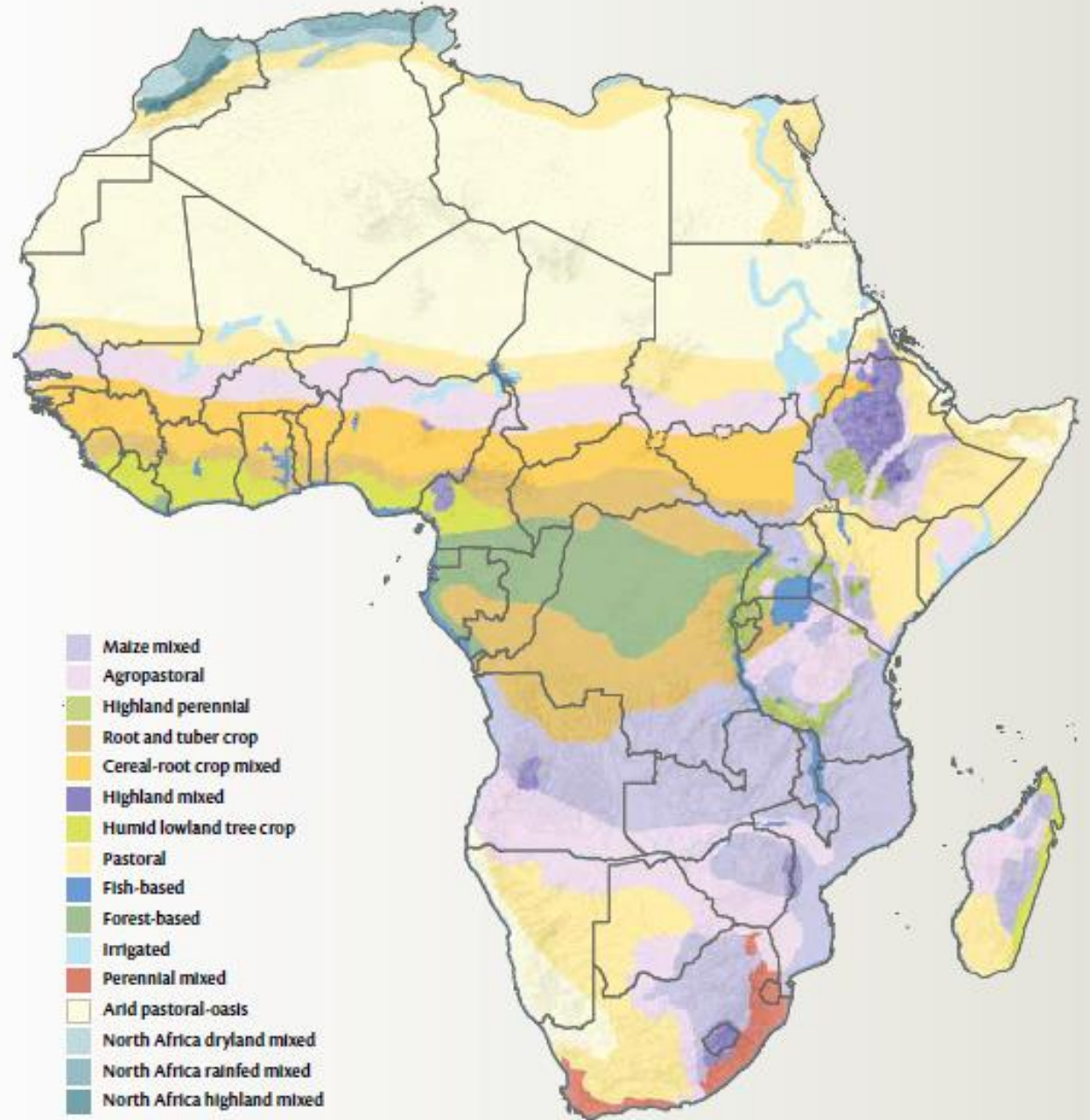
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Farming systems are diverse

A farming system

- “...is a population of individual farm systems that may have widely differing resource bases, enterprise patterns, household livelihoods and constraints...”
- The **farm systems** exhibit varying degrees of interdependency and interact in use of common property resources...
- The diversity of farm enterprises requires that development strategies, interventions and policies need to be tailored to their different needs and opportunities.” (Giller 2013)



Map: Farming systems of Africa (Auricht et al. 2014)

Smallholders in farming systems

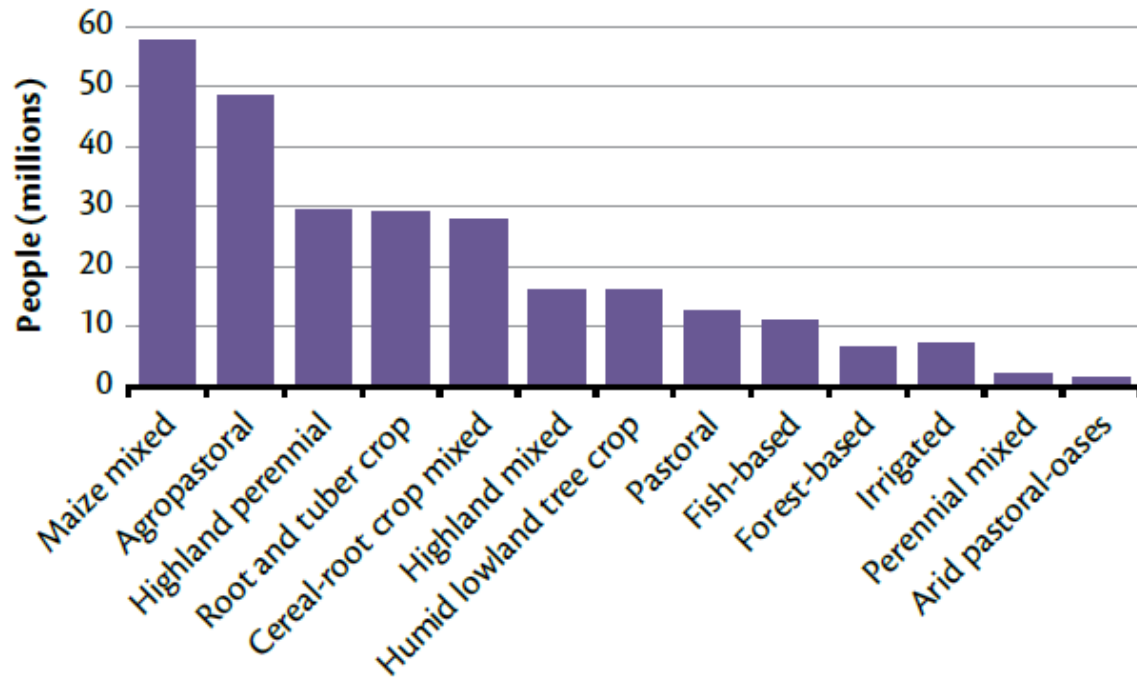
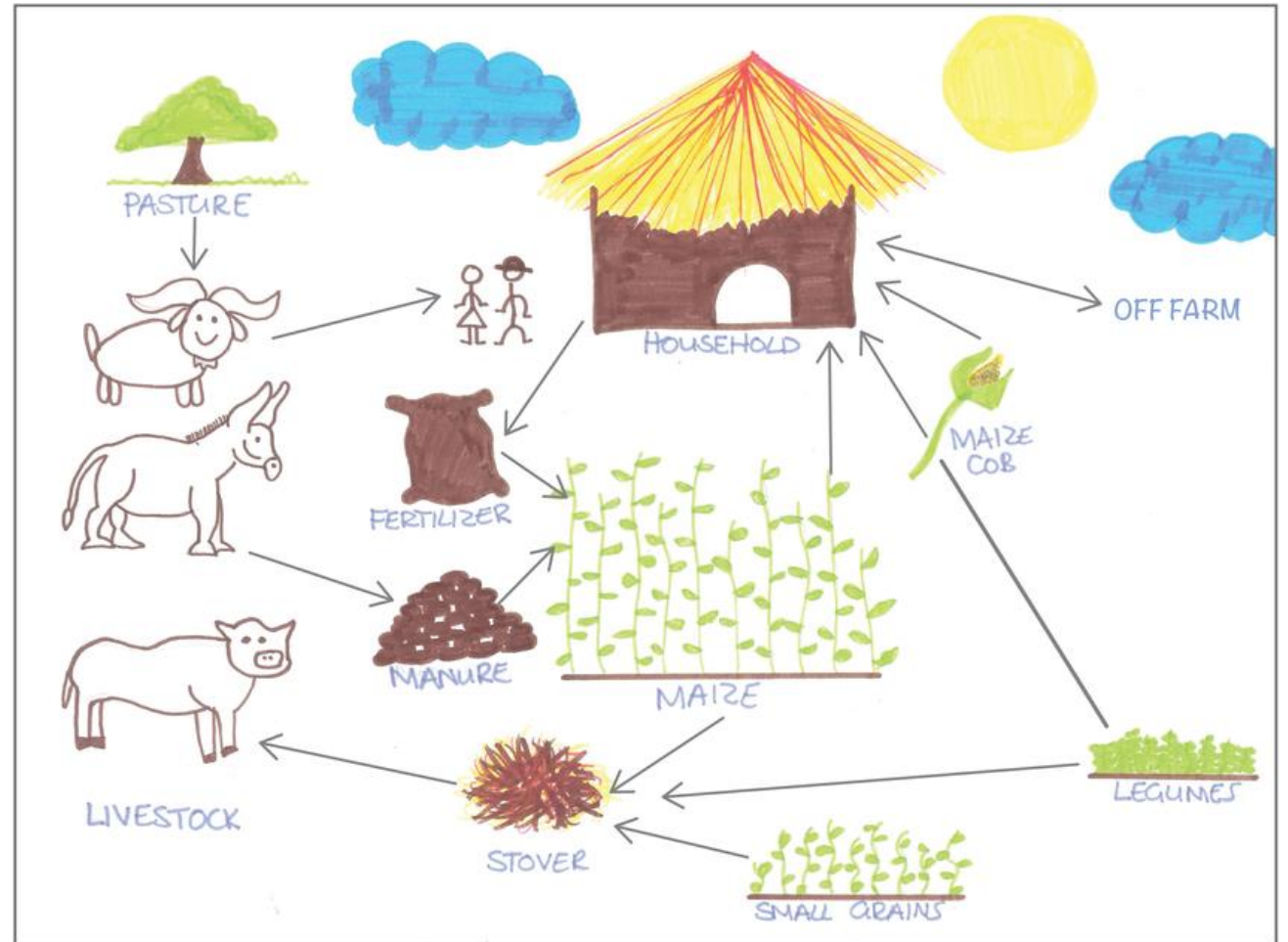


Figure. Rural poor living on \leq \$1.25/day by farming system, Africa south of the Sahara, 2010 (Auricht et al. 2014)

- Smallholder farm systems share certain characteristics (e.g., limited access to land, inputs, financial capital, and markets), which distinguishes them from larger-scale enterprises (Kuivanen et al. 2016)
- Nonetheless, smallholder farm systems vary and are complex (Giller et al. 2011)

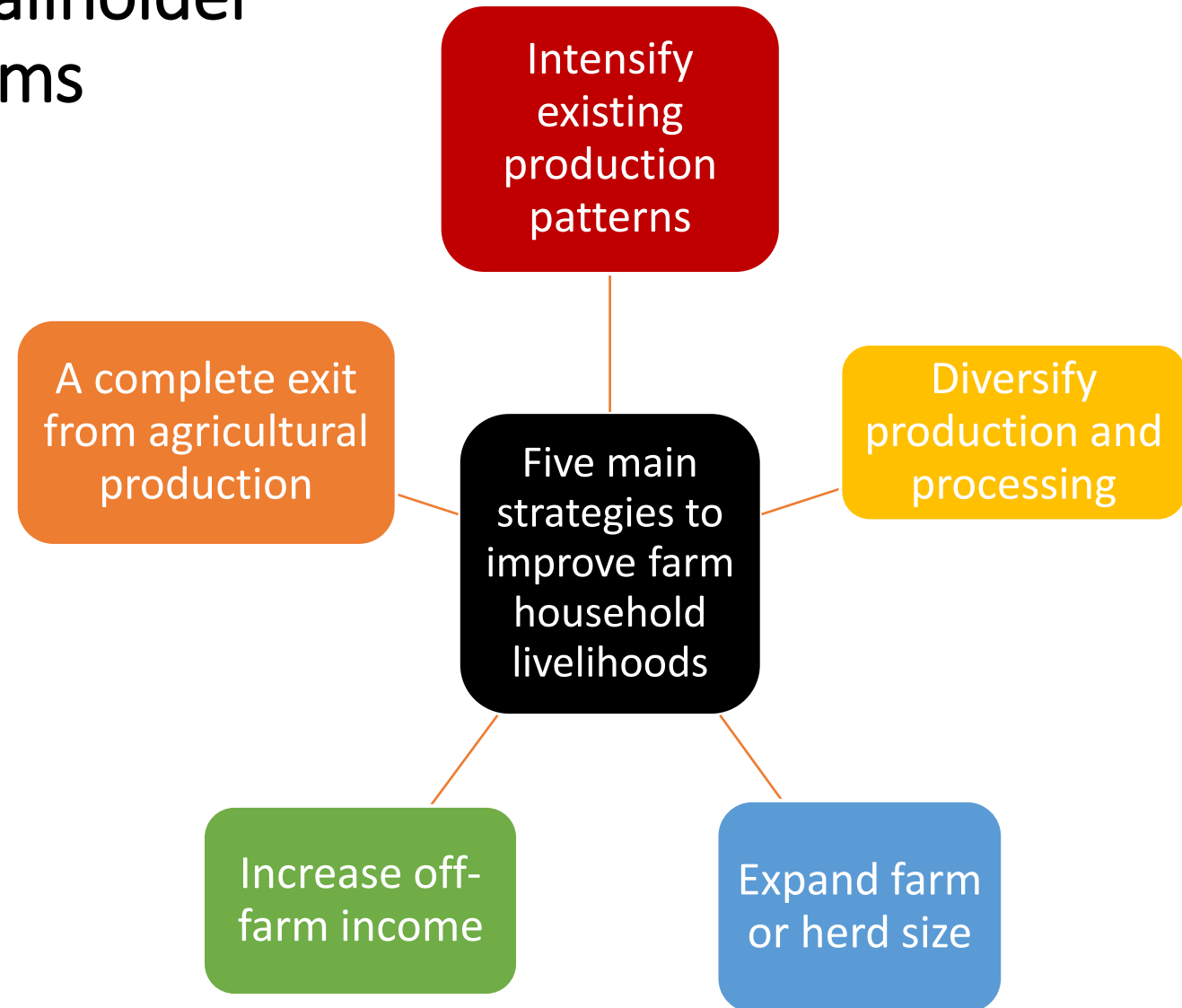
Example: Maize mixed farming systems

- In sub-humid and humid areas, dominated by maize with legumes
- Located in East, Central and Southern Africa
- Livelihood derived principally from maize, tobacco, cotton, legumes, cassava, cattle, goats, poultry and off-farm work (Garrity et al. 2012)



Broad strategies to improve smallholder livelihoods across farming systems

- Five main strategies to improve farm household livelihoods (Garrity et al. 2012)
- Proposed options are not mutually exclusive
- Households could pursue a mixed set of strategies
- Some options have greater potential for success when pursued in certain farming systems



How can a better understanding of the heterogeneity in smallholder farm systems (within a farming system) help in the design of agricultural development interventions for greater social inclusion?



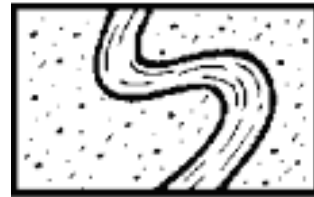
Food Crops



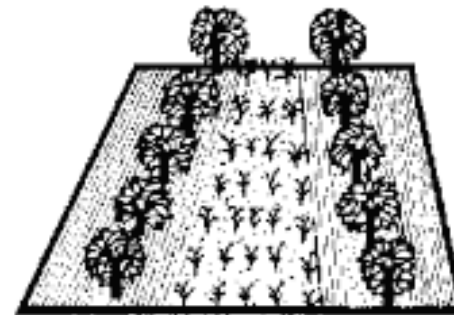
Farming Operations



Tree Crops



Soil & Water



Family Labour



Tools for Farming



Livestock



Climate

Farm household typologies

- Smallholder farming households are not a monolithic group
- Different smallholder farming households face different constraints when making farming decisions, which influence how they respond to new opportunities or shocks or stresses
- Recognizing such heterogeneity exists is key when designing and promoting technologies that aim to improve production, productivity and/or profitability at farm level
- One-size-fits-all solutions or recommendations do not exist

Farm household typologies

- One way to appreciate (also manage) the diversity of household types within farming systems is to cluster households into groups according to shared characteristics
- Farm household typologies is a procedure of artificially stratifying smallholders in homogenous groups based on specific criteria (Kuivanen et al. 2016)

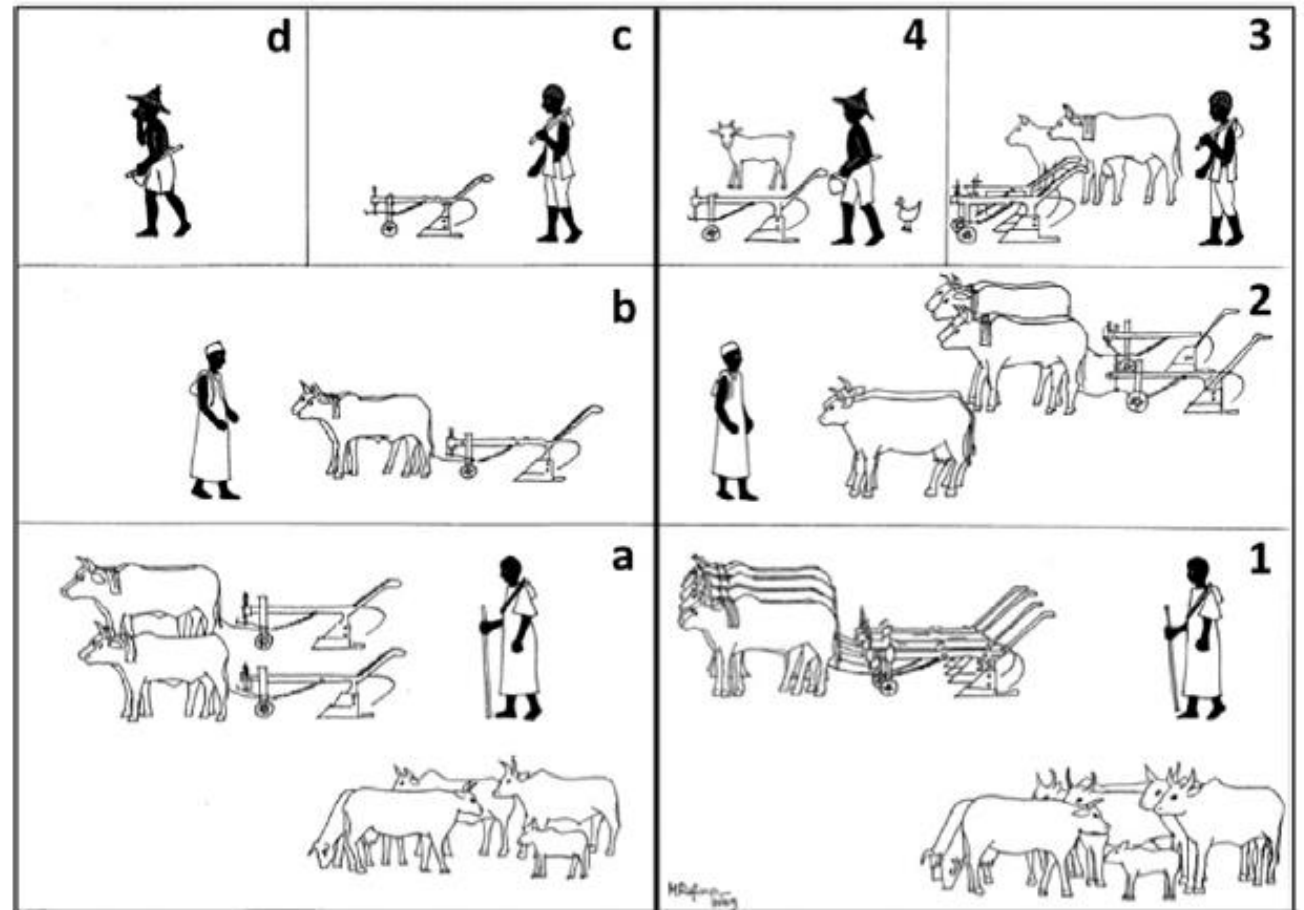
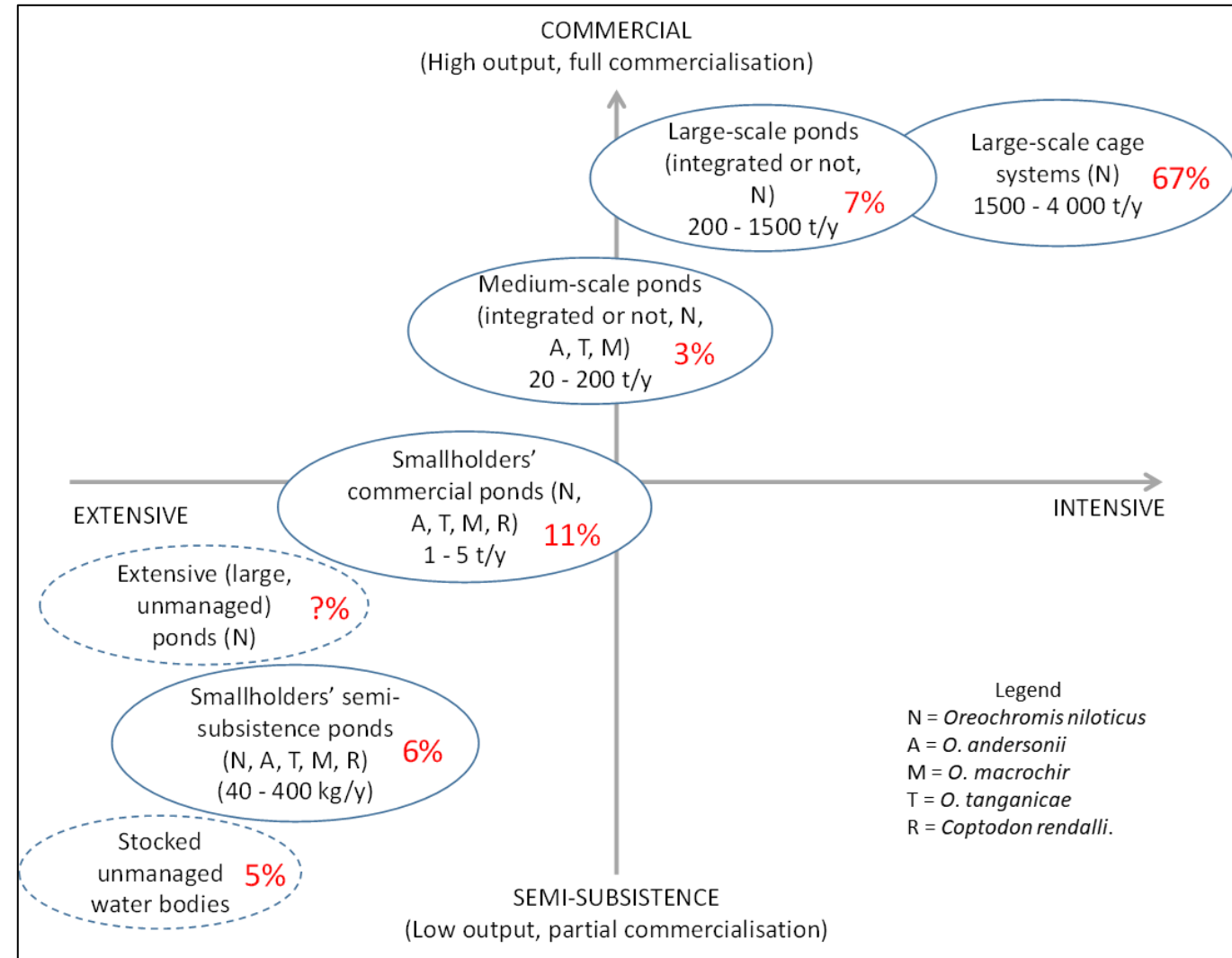


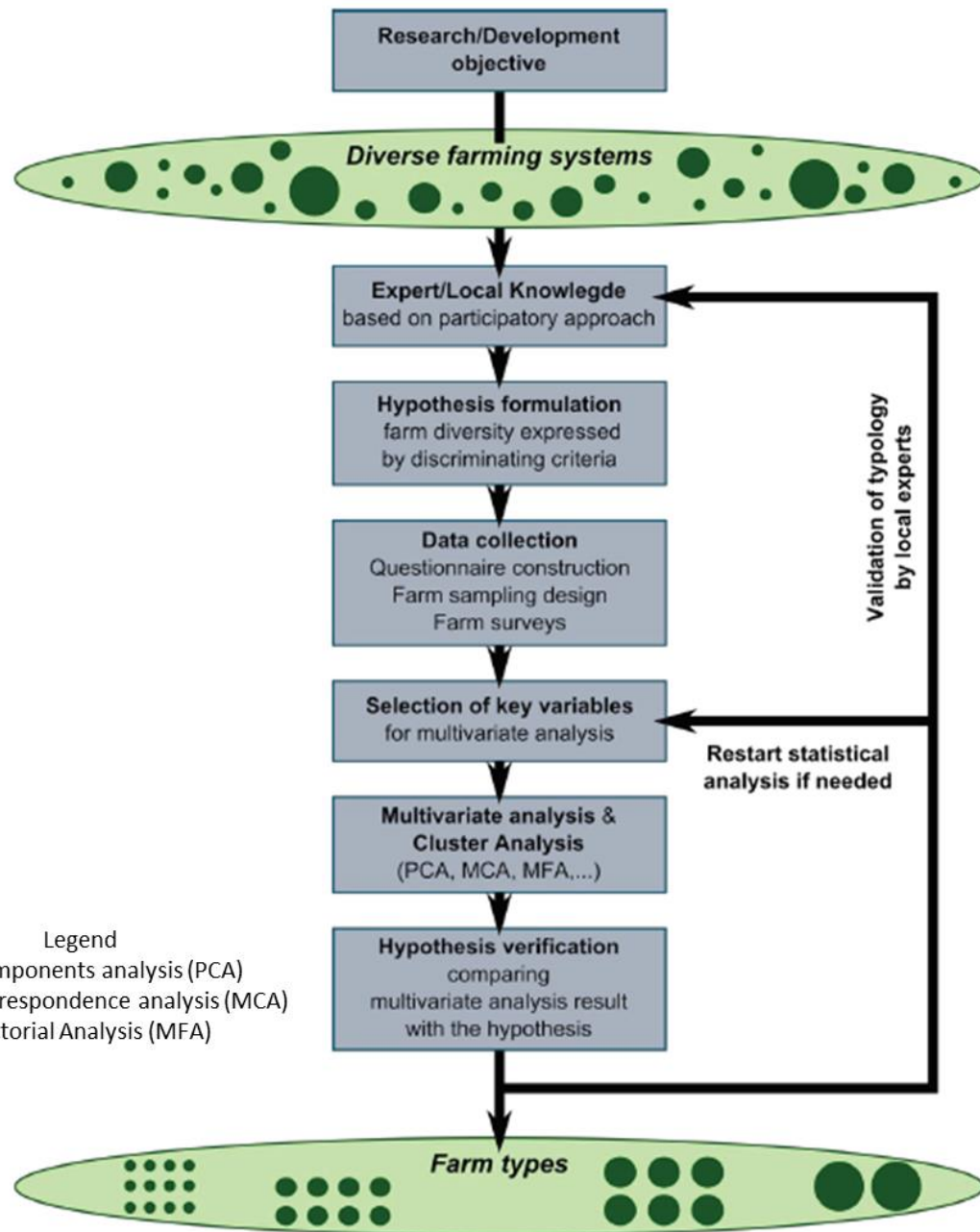
Figure. Cartoon illustrating the main features of different farm types based largely on traction and livestock ownership in Koutiala, Mali (Giller et al. 2011)

Farm household typologies

- Criteria used to construct farm household typologies depends on the objectives of the initiative and the available data
- Typologies can be used to help implement a range of activities that aim to support smallholder farming households (Alvarez et al. 2014)



A framework for creating typologies



Legend
 Principal components analysis (PCA)
 Multiple correspondence analysis (MCA)
 Multiple Factorial Analysis (MFA)

Classes of typologies

Structural typologies

- Using variables that describe household wealth, asset and resource endowments (e.g., land size, livestock ownership)

Functional typologies

- Using variables that describe livelihood strategies and household dynamics (e.g., production objectives, sources of income, age of household heads)

Figure. General framework of the typology process (Alvarez et al. 2014)

See Tiftonell et al. (2010); also Alvarez et al. (2014).

Example: Kuivanen et al. (2016)

- In two districts of Ghana's Northern Region:
 1. Identified and characterized farm types
 2. Analyzed patterns and inter-relationships between the types
 3. Considered the implications of findings for more efficient tailoring of agricultural support to farm type-specific challenges
- A typology constructed using survey data incorporating multiple quantitative variables of farm:
 - Structure (describing resource endowment)
 - Functioning (describing livelihood strategies)
- Farm clustering arose from multivariate analysis of these variables, using principal component analysis (PCA) and cluster analysis (CA)



Example: Kuivanen et al. (2016)

Type 1 (11%)

- Well resource-endowed with large cattle herd
- Maize-based cropping system
- Ample non-farm activities

Type 2 (10%)

- Well resource-endowed with larger farm areas
- Legume and maize-based cropping system
- Market oriented

Type 3 (13%)

- Medium resource-endowed with herd dominated by small ruminants
- Legume-and maize oriented
- On-farm labour intensive

Type 4 (46%)

- Medium resource-endowed with herd dominated by small ruminants
- Ample hired labour
- Farm income provided mostly by crop product sales

Type 5 (14%)

- Resource constrained
- Maize-based cropping system
- Almost no income generated by off/non-farm activities

Type 6 (6%)

- Severely resource constrained with a small herd dominated by poultry
- Income generated from livestock product sales and off-farm activities

% = percentage of sampled farms

Example: Kuivanen et al. (2016)

Table 3
Main implications of the farm typology for targeting of agricultural interventions in Savelugu-Nanton and Tolon-Kumbungu districts of Ghana's Northern Region.

Opportunities and constraints	Implications for targeting	Farm Types					
		1	2	3	4	5	6
Opportunities							
High availability of family labour	Promote profitable but potentially labour-intensive technologies and practices	x	x				x
Access to animal traction	Promote traction tools for reducing drudgery of land preparation, seeding and weeding	x	x				
Access to manure	Encourage practices that ensure more efficient collection, storage, and use of manure supplied by cattle herds, and promote (targeted) manure application to crops	x	x				
Higher farm investment capacity	Promote improved agricultural technologies, inputs and practices (e.g. improved seed, fertilizers, irrigation)	x	x	x	x		
Experience with diversified crop production	Increase multi-cropping, intercropping, crop rotation and new crop varieties use		x	x	x		
Responsive to commercial farming opportunities	Promote high value crops, improve marketability		x	x	x		
Higher investment in livestock herd	Improve crop-livestock integration and promote multi-purpose crops (e.g. food-fodder crops) and leguminous fodder	x	x				
Constraints							
Low availability of family labour	Support adoption of time saving practices and low-cost alternatives for transportation and tillage traction			x	x		x
Difficulty accessing manure	Promote use of nitrogen-fixing legumes (as green manures, intercrops, fodder crops etc.) and composting of crop residues and household waste			x	x	x	x
Higher food insecurity	Increase farm productivity, promote high yielding food crop varieties, improve post-harvest storage facilities				x	x	x
Poverty (cash flow constraints, hand-to-mouth existence)	Promote low-input technologies with improved resource use efficiency, support access to inputs at the beginning of the cropping season, improve farmers' ability to accumulate capital and reinvest in their farms					x	x

Alternative ways of grouping households

Farming styles (see Graymore et al. 2015)

- Targeted approach to understanding what drives farming decision making and uptake of technologies
- Creates different farmer typologies based on their social values and approaches to farming (e.g., differences in attitudes to risk or planning, technology use, or farming practices)
- Such 'social' variables predict farmer behavior better than using structural and demographic information
- Enables the design of agricultural development programs that appeal to each farming style, resulting in increased adoption of technologies and/or agronomic practices, etc.

Alternative ways of grouping households

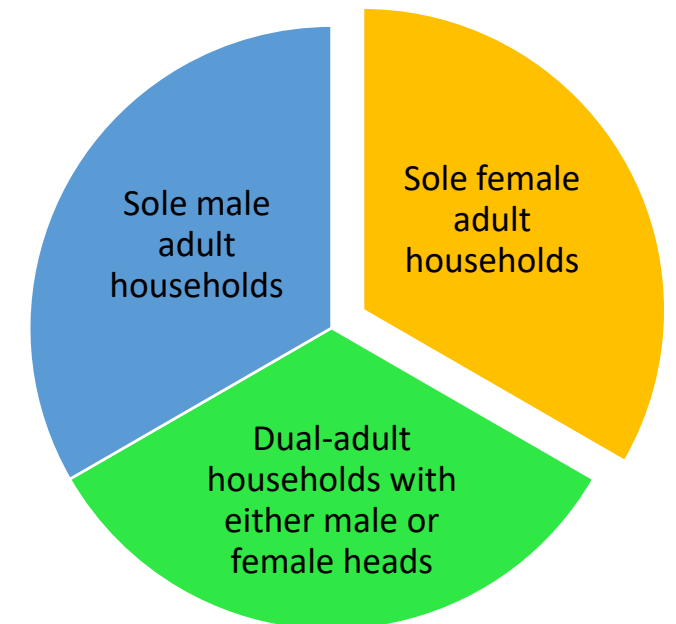
Sex of the household head

- Used as a variable when developing farm typologies (Bidogeza et al. 2009; Kumar et al. 2015)
- Used to group households into male-headed versus female-headed as the only determinant for the typology (Molua 2011)
- Comparing male- and female-headed household types confounds gender and household structure (Doss and Kieran 2014)
 - Women often live in male-headed households, but female-headed households are usually defined as not having present a male adult – thus are not comparable
- The approach fails to appreciate women in male-headed households, thus making them invisible

Gendered typology of households

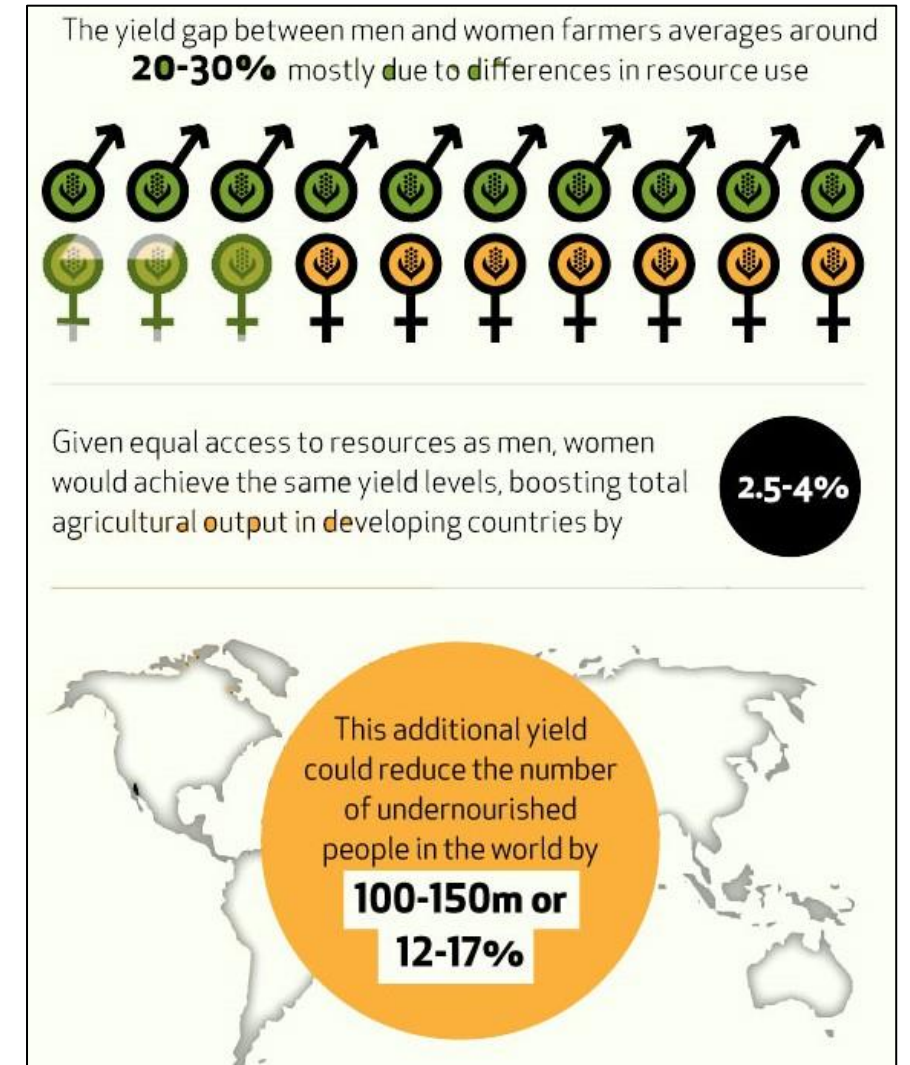
(Ragasa et al. 2019)

- Recognizes that different household types face dissimilar constraints and may use different on- and off-farm strategies to achieve food security



Unpacking the household 'black box'¹

- Gender gap in agricultural productivity – wide and pervasive (World Bank 2014)
- Gendered agricultural input, technology, and extension services gaps create productivity differences between women and men (Peterman et al. 2010)
- A large percentage of women comprise the global agricultural labor force at 43% (FAO 2011)



¹a system or process that uses information to produce a particular set of results, but that works in a way that is secret or difficult to understand ([source](#))

Unpacking the household 'black box'



- Social institutions enact rules governing seed systems that impact women and men differently (Mudege and Walsh 2016)
- As a result, men tend to access seed from formal sources and women from informal sources (McGuire and Sperling 2016; Galiè et al. 2017)
- Women have less access to or control over cash to purchase seed (Mudege and Torres 2017)
- Women farmers utilize other strategies to source seed including in exchange for their labor (Mudege et al. 2015)



Unpacking the household 'black box'

- Globally, women's involvement in unpaid work far exceeds that of men's involvement, which limits their abilities to engage in productive agricultural and non-agricultural work (FAO 2011)
- As a result, women are often described as food crop producers, while men are framed as focusing more of their time on producing cash crops given their roles as breadwinners
- These divisions of labor shape gendered preferences, for example, for different crop varieties (Amri and Kimaro 2010)



Women on average spend
4.1 hours/day
on unpaid care and
domestic work, compared to
1.7 hours/day
for men



Women's unpaid contributions
to healthcare equate to
2.35%
of global GDP, or the
equivalent of
US\$ 1.5 trillion

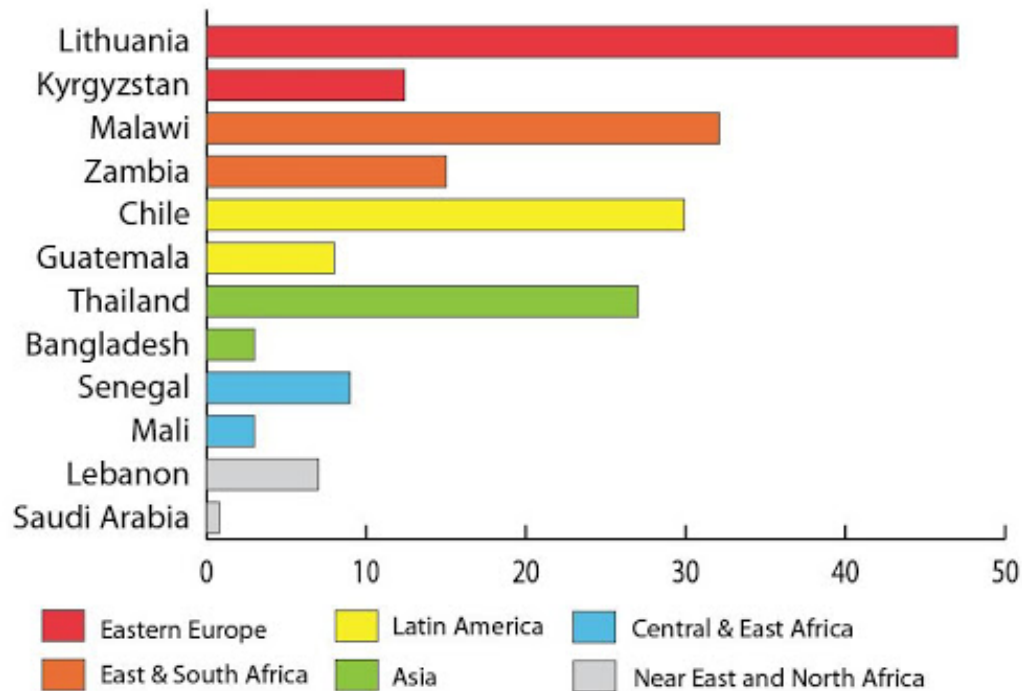


When women's contribution to
all types of care (not just
healthcare) is considered, this
figure rises to
US\$ 11 trillion

Source: <https://data.unwomen.org/features/covid-19-sends-care-economy-deeper-crisis-mode>

Unpacking the household 'black box'

Percentages of agricultural land holdings held by women
(high/low in selected regions)



Source: <http://www.fao.org/3/al059e/al059e00.pdf>

- Globally, women have less access to land compared to men (FAO 2010)
- Lack of access to land influences the types of crops women can grow and the production and marketing decisions they make, among other things
- Studies also show that access to agricultural information favors men (Mudege et al. 2016; Galiè et al. 2012)
- Men often make up most extension officers servicing smallholder farmers, which creates barriers for women to access information and training (Adam et al. 2019)

Moving inside the household

Harvard Analytical Framework (March et al. 1999)

- Understanding gender division of labor and who has access to and control over different resources within the household
- Used for tailoring interventions

Training sessions to fit women's needs

- For example, hold meetings at a time or locations convenient to women

Adjusting extension program agendas

- For example, include crops grown by women for household consumption rather than markets

Planning new extension activities

- For example, increase demonstration plots on women's fields

Source: Ludgate (2016)

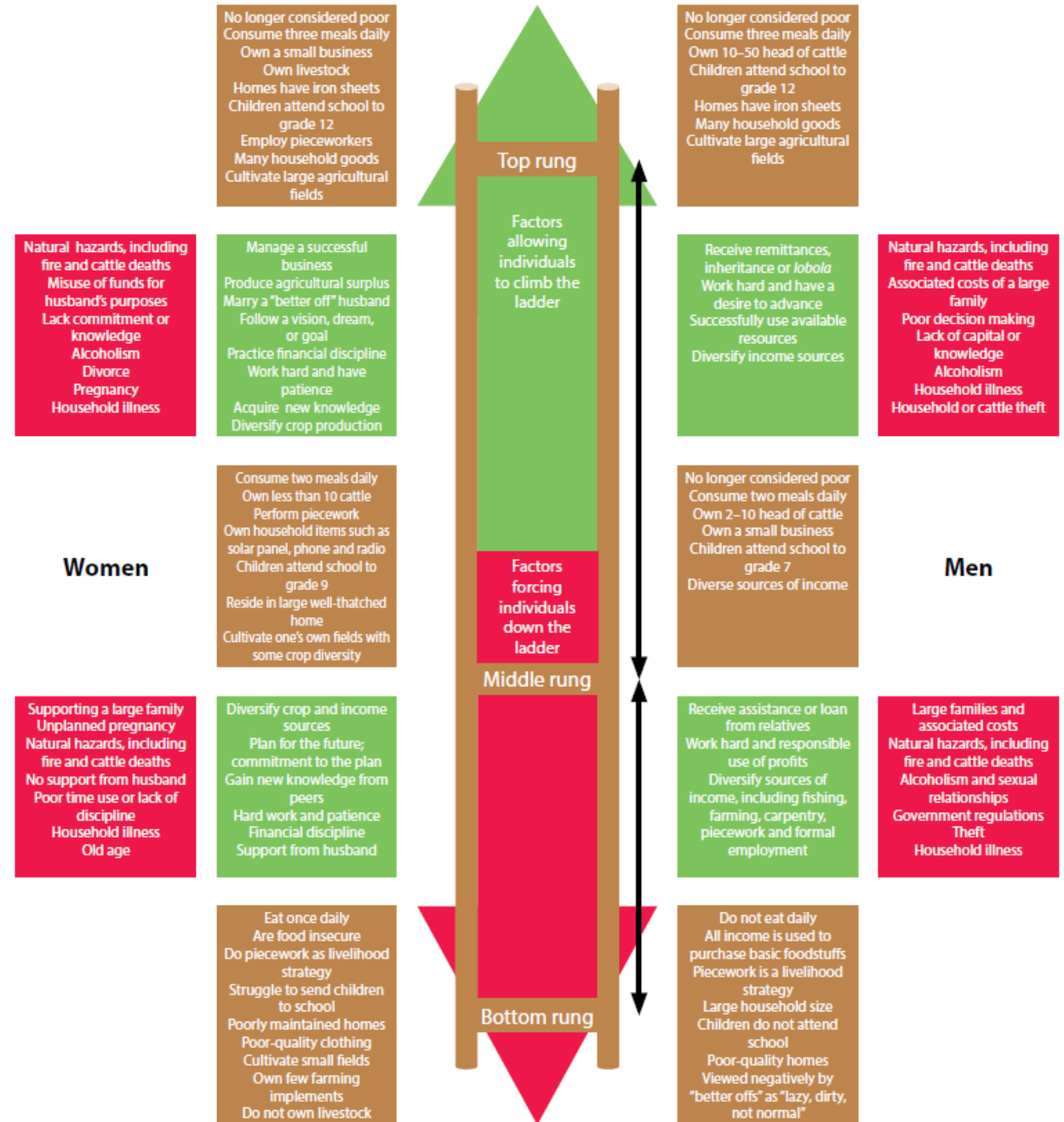


Source: [top photo](#), [2nd top photo](#), [3rd top photo](#), [bottom photo](#)

Moving inside the household

Wellbeing ladder (Rajaratnam et al. 2015)

- Understanding the wellbeing status of women and men at household level
- Exploring which factors help or hinder their movement up or down the ladder
- Used for identifying interventions to help alleviate the constraints and/or further enhance or promote what is already working



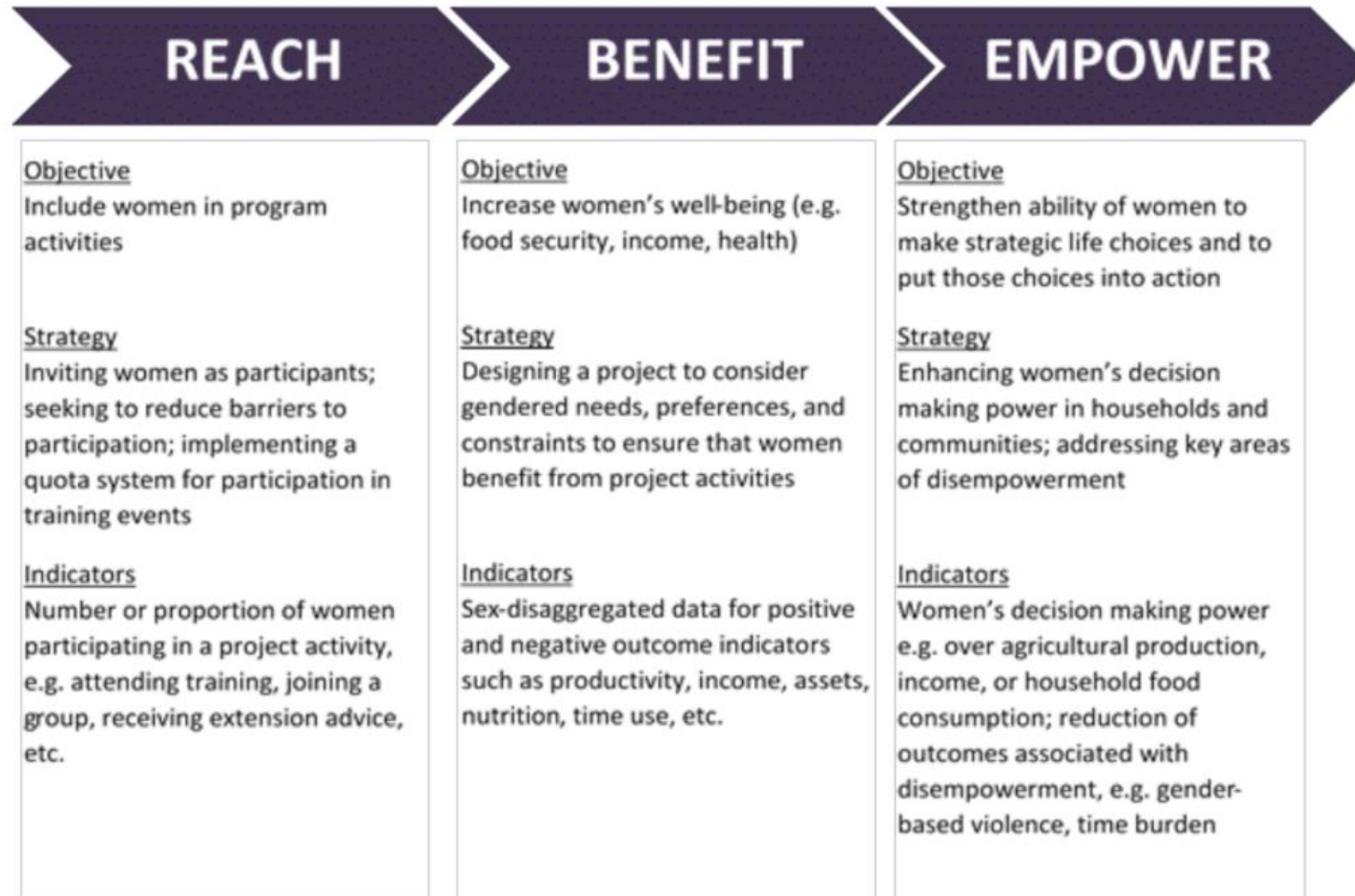
Moving inside the household

Women's Empowerment in Agriculture Index - WEAI (Alkire et al. 2013)

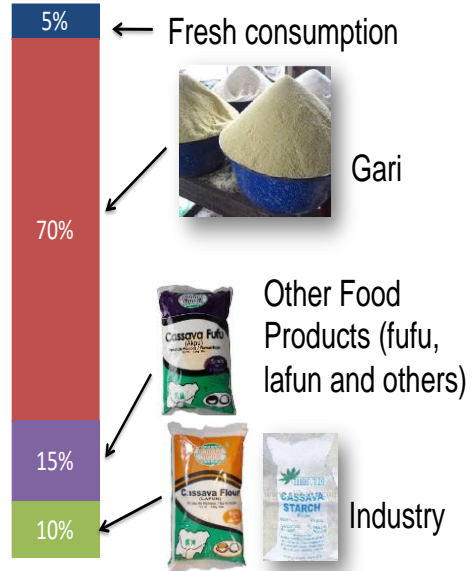
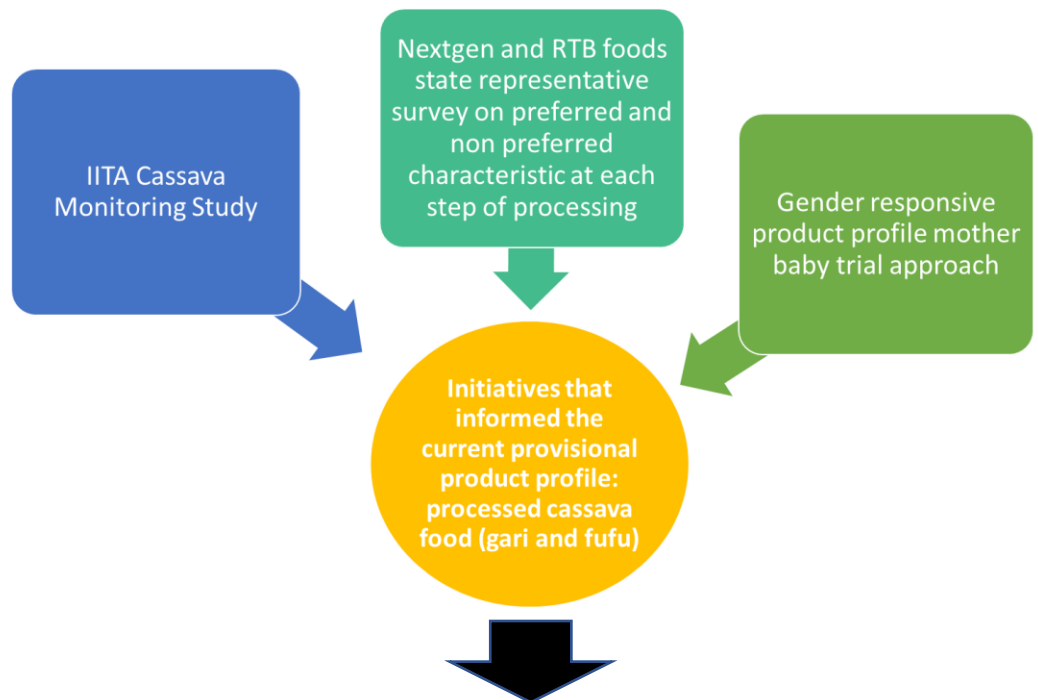
- A survey-based index
- Measures the roles and extent of women's engagement in agriculture in five domains:
 1. Decisions about agricultural production
 2. Access to and decision-making power over productive resource
 3. Control over use of income
 4. Leadership in the community
 5. Time use
- A gender parity index is computed from the data collected across the five domains
- The index compares women's empowerment scores to men's scores within their homes
- Identifies areas where empowerment-focused interventions can be strengthened
- Enables projects to track progress implementing their interventions over time

Moving inside the household

Reach-Benefit-Empower Framework (Theis and Meinzen-Dick 2016)

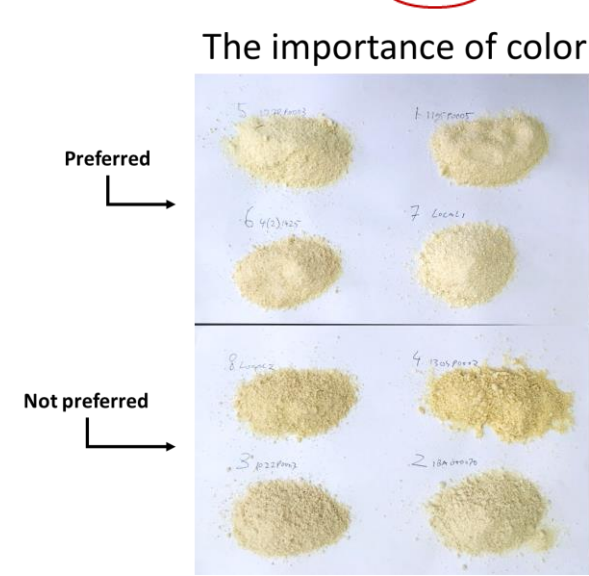


Gender-responsive cassava breeding



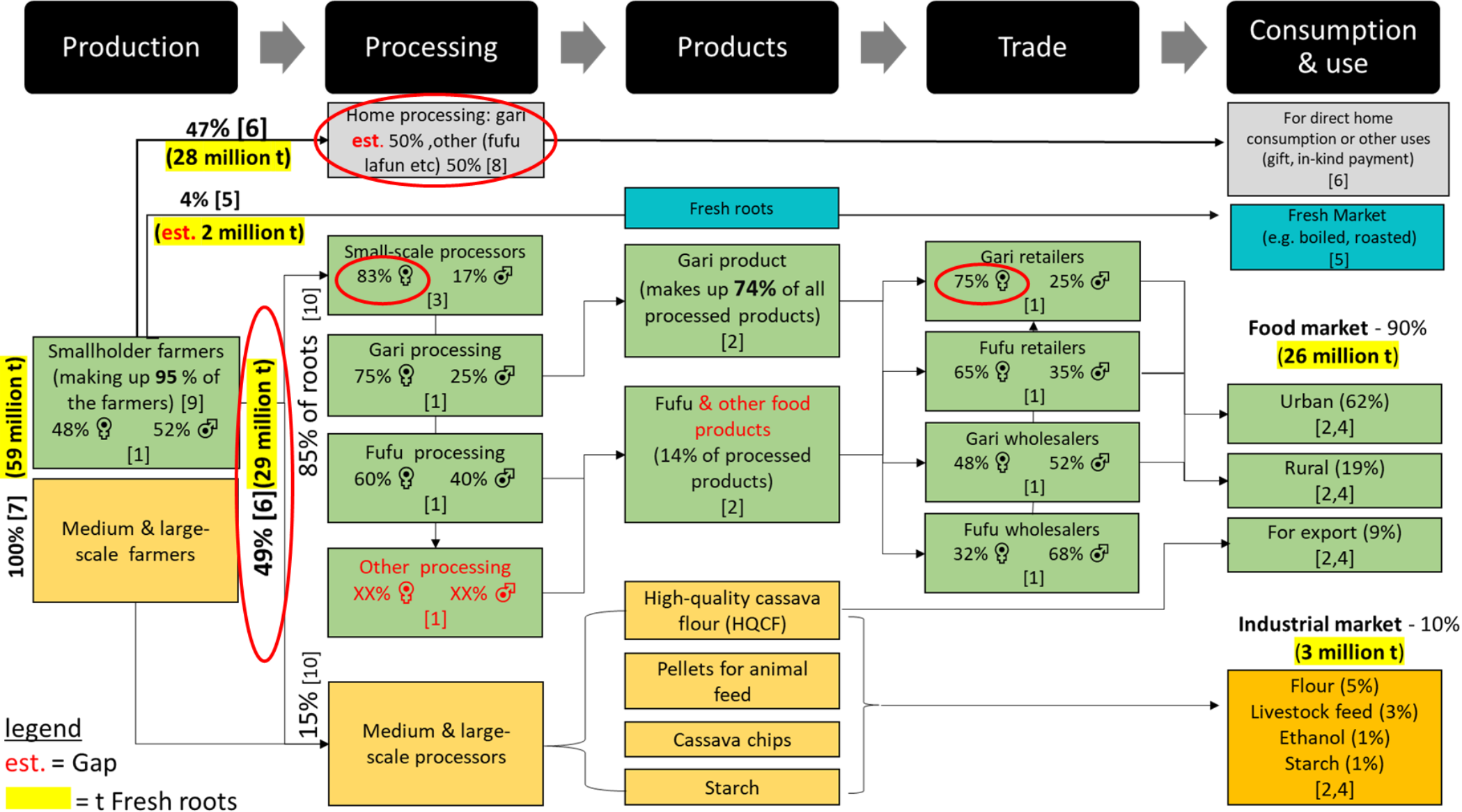
Traits	Frequencies (%)			
Overall	All respondents	Women	Men	P-value
High yield	73.3	72.2	74.4	ns
Root size	60.0	68.1	52.6	0.053
Early maturing	55.3	54.2	56.4	ns
Dry matter content/swells	42.7	43.1	42.3	ns
Cooking / processing quality +	40.0	48.6	32.1	0.039*
Flesh color	38.0	31.9	43.6	ns
Post harvest shelf life	38.0	38.9	37.2	ns
Poundability	37.3	34.7	39.7	ns
Fast cooking	32.0	29.2	34.6	ns
Good price/marketability	29.3	26.4	32.1	ns
Agronomic characteristics++	26.0	18.1	33.3	0.033*
Taste	24.7	30.6	19.2	ns
Resistance to pest and diseases	20.7	18.1	23.1	ns
Adaptation to extreme weather condition	10.0	9.7	10.3	ns
Labor requirement	4.7	5.6	3.8	ns
<i>Southwest</i>				
Flesh color	30	19	39	0.023*
Good price/marketability	22	14	28	0.050
Agronomic characteristic++	20	8	30	0.003*
<i>Southeast</i>				
Fast cooking	13	25	0	0.047*

Participatory processing with Nigerian women processors



The importance of color

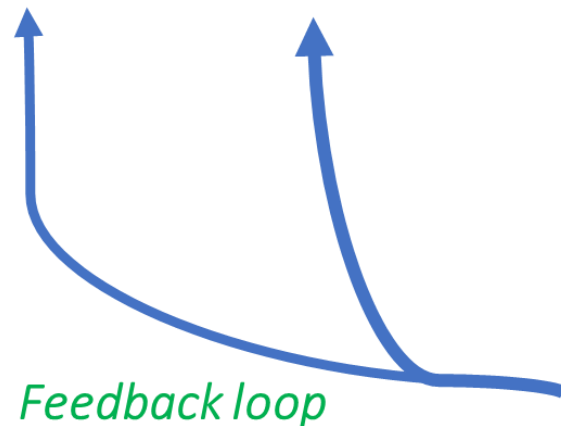
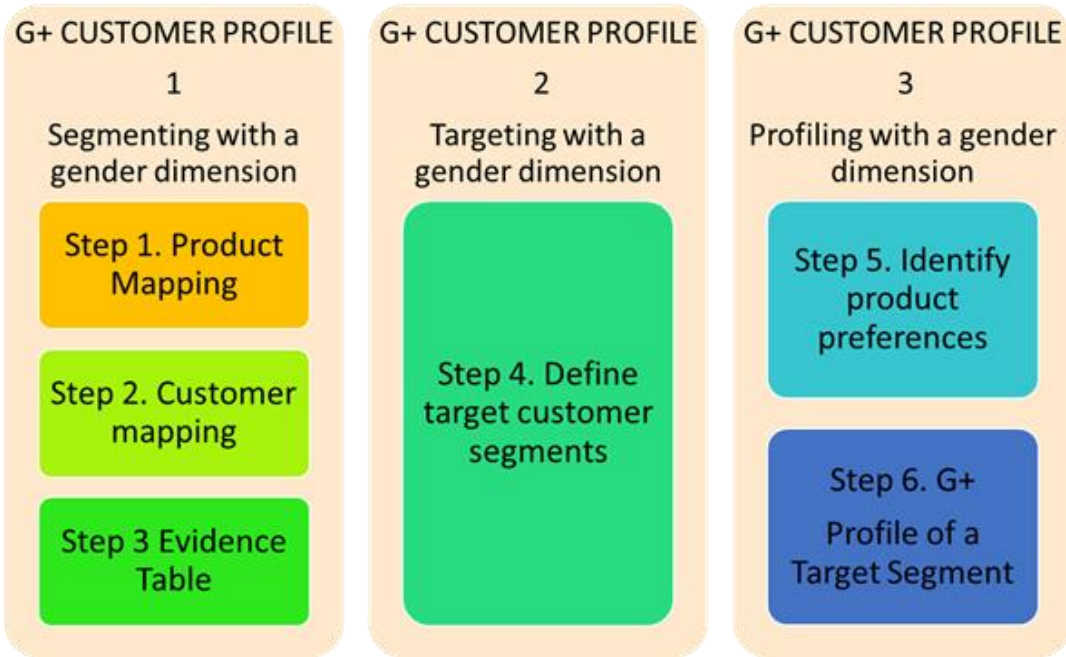
Gendered cassava product map of Nigeria



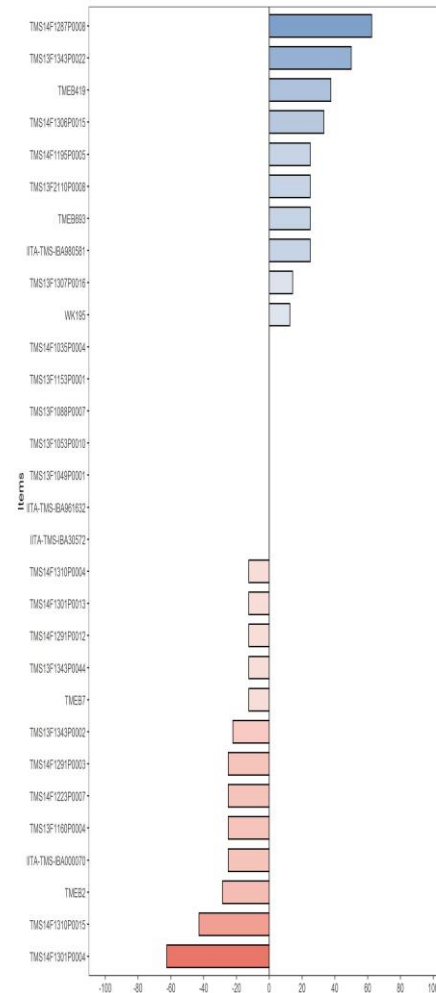
Systematic inquiry of end users (customers) of cassava and what they prefer (G+ tool)

&

Scaling feedback from farmers on newly bred varieties using a **TRICOT citizen science approach**



- **300** farmers, **30** varieties
- Each farmer testing 3 varieties (of different combinations)



- Preference ranking of varieties and processed food product + **traits**
- Compare rankings by sex and region (and other variables)

Discussion questions

- What is the value of bringing social and biophysical sciences together to better inform the design of agricultural technologies and interventions?
- What could be some of the key challenges with setting up such collaborative work when implementing development programs that aim to be socially inclusive?
- How could farm household typologies be developed to better appreciate intrahousehold dynamics?
- How do you see using these various tools (e.g., typologies, gender research methods, etc.) in your research and/or development areas of interest?

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