Sustainably intensified futures for diverse smallholder farm and household types using FarmDESIGN, Q Methodology and FarmMATCH

Carl Timler, Isaac Jambo, Godlove Kirimbo, Joseph Kimisha, Katrien Descheemaeker and Jeroen Groot

Key messages

Farms are very diverse in size, structure and production orientation. Farmers differ in their strategies towards sustainable intensification (SI). Moreover, the roles of the farm enterprise in relation to off-farm activities and income differs. These differences have implications for:

- ✓ The window of opportunities for farm households to adjust their farm configuration and management, and the trade-offs that they face.
- ✓ The most appropriate sequence of steps to implement new practices and technologies to build up human, economic and natural capital.
- ✓ For the Africa RISING project, the farm households that need to be targeted to be efficient and effective in obtaining the desired project outcomes and to reach adoption and systems improvement at scale.

Objectives and approach

Objectives: Characterize the existing smallholder diversity
Identify innovation pathways for different farm(er) types.

Phase 1: Analysis of smallholder diversity using typologies and analysis of trade-offs and synergies, using multi-objective optimization in FarmDESIGN.

Phase 2: Participatory work with farmers in Babati and Dodoma in Tanzania using scenario-studies in FarmDESIGN. Analysis of farmers' strategic notions towards SI trajectories of change through Q Methodology in Dedza and Ntcheu districts in Central Malawi.

Key results and Evidence

Farmers understood and responded enthusiastically towards the results from FarmDESIGN (Figure 1), indicating that the model is a useful discussion generating tool for cycles of participatory extension. Three distinct strategic notions towards SI (Table 1) were found amongst smallholder farmers in Malawi indicating strategies different farmers might take.

Significance and scaling potential

The classifications that have been developed and the analyses that are performed allow targeted innovation in smallholder farms, based on an understanding of requirements, possibilities and potentials. The FarmMATCH approach will inform project members, extension workers, researchers and policy makers about scaling and supports large-scale data collection (Figure 2).

Proposals for the future

1) Model-based trade-offs analysis: final farmer interactions & paper writing; 2) Trajectories: Final analysis and farmer feedback in Malawi & paper writing; 3) Student project: Increasing farmers' income and strengthening human and environmental health; 4) FarmMATCH: prototype development Tanzania

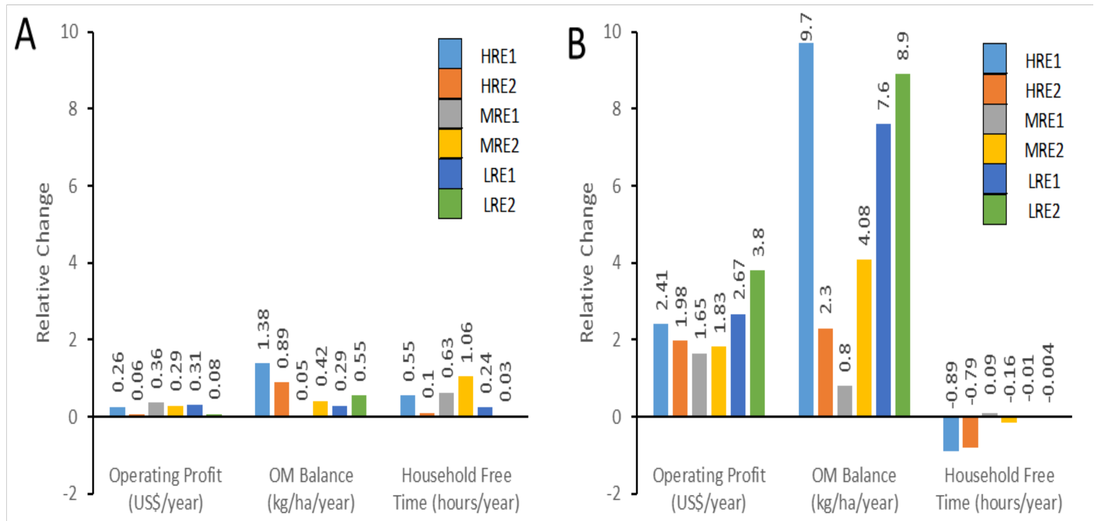

Figure 1. After optimization in FarmDESIGN using the three objectives; Operating Profit, Organic Matter Balance and Household Free Time, without (A) and with (B) proposed intensification practices, the relative change between the current situation and the highest value within the solution set is presented. The six different coloured bars represent two examples of three different types of farmers: High-, Medium- and Low-resource endowed types in the Babati District in Tanzania.

Table 1. Results from a Q Methodology study performed in Dedza and Ntcheu districts in Central Malawi to examine the strategic notions of smallholder farmers towards Sustainable Intensification. Distinguishing statements for each factor (strategic notion) are presented. Numbers to the left of each statement indicate the factor scores for each statement for each factor. A factor score of 5 indicates a very strong agreement, zero indicates a neutral opinion, while -5 indicates a very strong disagreement.

'Aspirant Modern Farmers'		'Seed Saving Peasants'		'Entrepreneurial Business(wo)men'	
4	To produce more food I only need to use more fertilizer	5	Saving seeds to replant them the following season is a good strategy for me to save money	1	Hiring extra labour means I can work less
3	A lack of access to extension prevents me from making any changes in the way I farm	2	Using PICS grain storage bags is something I would do to reduce post-harvest losses	1	Using post-harvest storage chemicals (like Actellic) is something I would do to reduce post-harvest losses
3	I think that hybrid maize seed is a good way to produce more food or earn more money	2	I think that digging a pit for manure storage and building a roof over it, is worth the labour and material costs it requires as the manure will have better quality	-1	I would plant Orange Fleshed Sweet Potatoes on my farm
0	A lack of (family) labour prevents me from making any changes in the way I farm	1	I would invest extra labour to incorporate maize residues into the soil because it improves the soil quality	-1	If I earned money from non-farm work I would invest it in my farm
0	Growing doubled up legumes (e.g. Groundnuts and Pigeon peas planted together in the same field) is something I would do	0	If I have no money to invest in my farm, I will work on other farms	-2	Spending more of my time weeding (more than what I already do), is something I would do to improve yields
-2	Keeping pigs would be a good business to run and is something I would do	-2	I would rather plant local maize varieties than hybrid maize varieties		
-4	If I produced more maize, I would rather sell it, than use it to feed my family	-4	Investing my money in buying new hybrid maize seed every year is something I would do		
-5	Planting a crop like tobacco to sell for cash is a better way to ensure food security than growing a food crop	-5	I would rather burn my maize residues than incorporate them into the soil as this saves me labour		

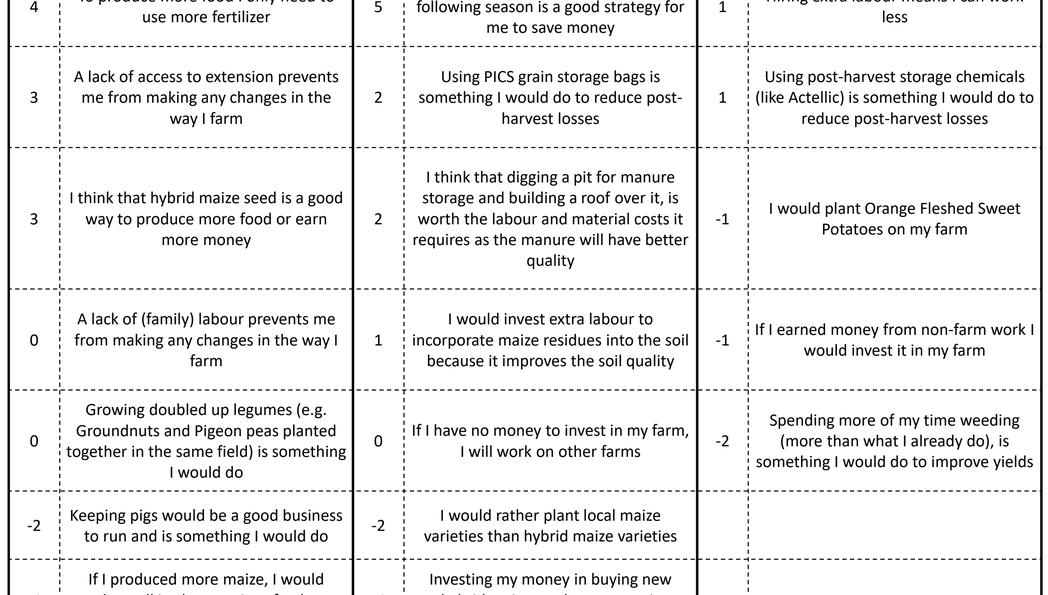

Figure 2. Technical structure of FarmMATCH, indicating the core of the framework (shaded yellow) and interactions with external data sources.

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