



Fuzzy Cognitive Mapping, a tool for participatory systems analysis

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Background

Fuzzy Cognitive Mapping (FCM) is believed to have the potential to strengthen participation and ownership in stakeholder groups, e.g. participants in innovation platform processes. In FCM, knowledge of individual participants is combined. By drawing causal relationships between developments around a certain problem, a system is mapped and analysed.

Objective

To test the feasibility of FCM in Humidtropics Innovation platforms, we held workshops (June 2014) in two platforms in Uganda: Mukono-Wakiso (MW; consisting of two peri-urban areas) and Kiboga-Kyankwanzi (KK; consisting of two rural areas). Participants in the platform represented local authorities, extension services and the private sector. Both platforms were initiated early 2014.

Introduction to FCM

The graphical representation of FCMs consist of concepts (nodes) with causal connections in between (edges). Values between -1 and 1 are allocated to the connections to represent the strength of the relationship (Table 1).

State values of concepts and weights of relationships are used as inputs for simulating the dynamics of the fuzzy cognitive map.

Table 1: Fuzzy logic key used in the workshops to transform words into symbols and values.

Neg./pos.	strength	symbol	value
positive	very strong	++++	0.8
positive	strong	+++	0.6
positive	moderate	++	0.4
positive	weak	+	0.2
negative	weak	-	-0.2
negative	moderate	--	-0.4
negative	strong	---	-0.6
negative	very strong	----	-0.8

Workshop format

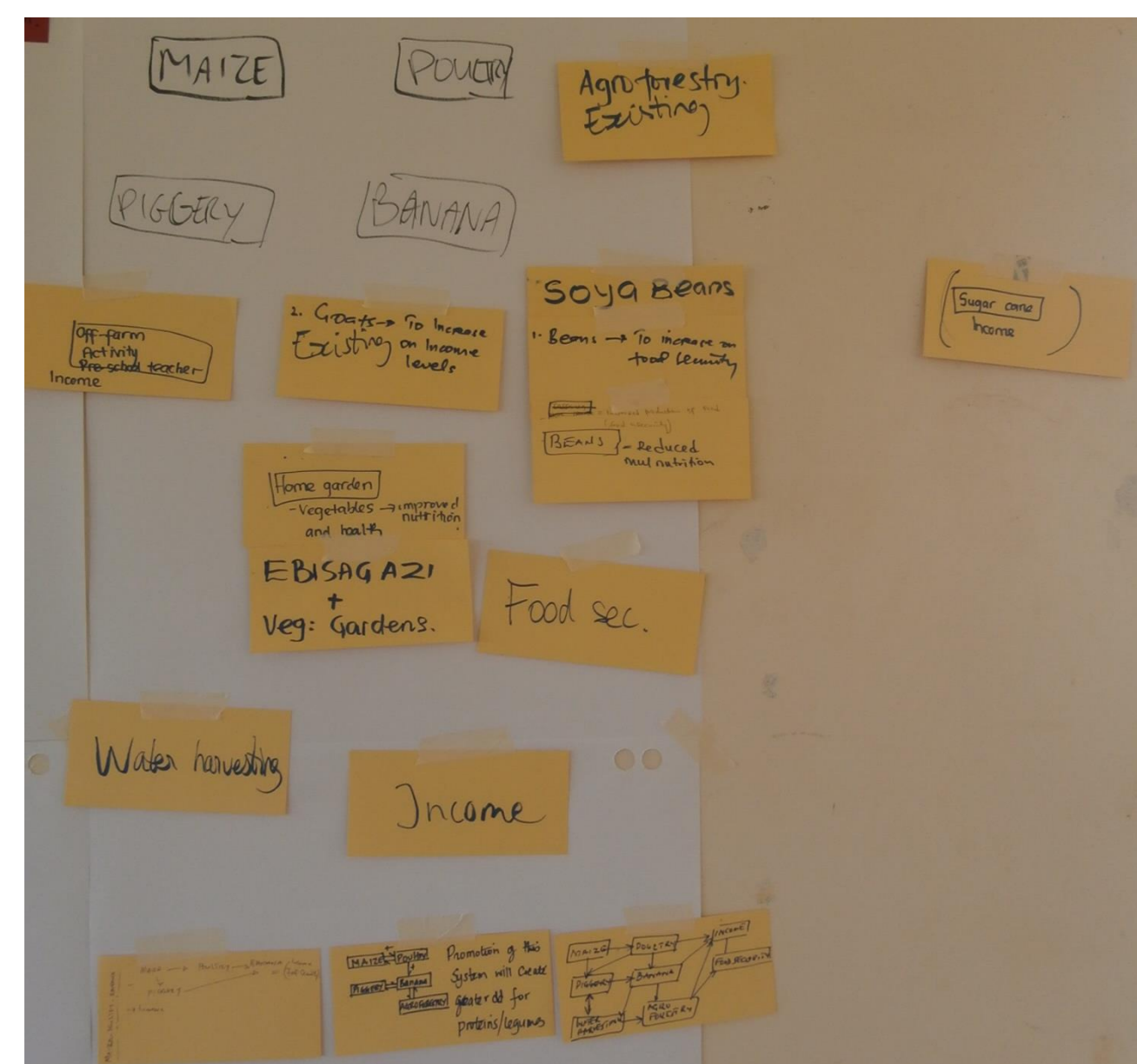


Figure 1. Individual concepts grouped (KK)



Figure 2. Drawing of relationships in small groups (MW)

In the one-day workshop, concepts were gathered from individual participants. These concepts were grouped into main concepts for the cognitive map (Figure 1). After that, small groups (+/- 5 persons) drew relationships between the concepts (Figure 2). In a plenary session, the eventual maps were discussed. Two types of maps were constructed: maps solely including on-farm concepts and maps that mainly included off-farm concepts.

Results (maps)

- The on-farm cognitive maps did not present a high degree of causality (Figure 3 and Figure 4). However, based on the map, we could identify where strong (perceived) interactions were expected in MW (Figure 4).
- There was a higher degree of causality between components in the maps that included off-farm components (Figure 5 and Figure 6).
- In regard to drivers of the system, MW included population pressure, where KK did not. This can be explained by the peri-urban and rural nature of respectively MW and KK.
- Development of maps in the two IPs was similar, though the map of KK was slightly more hierarchical, suggesting a higher perceived dependency of participants in KK.

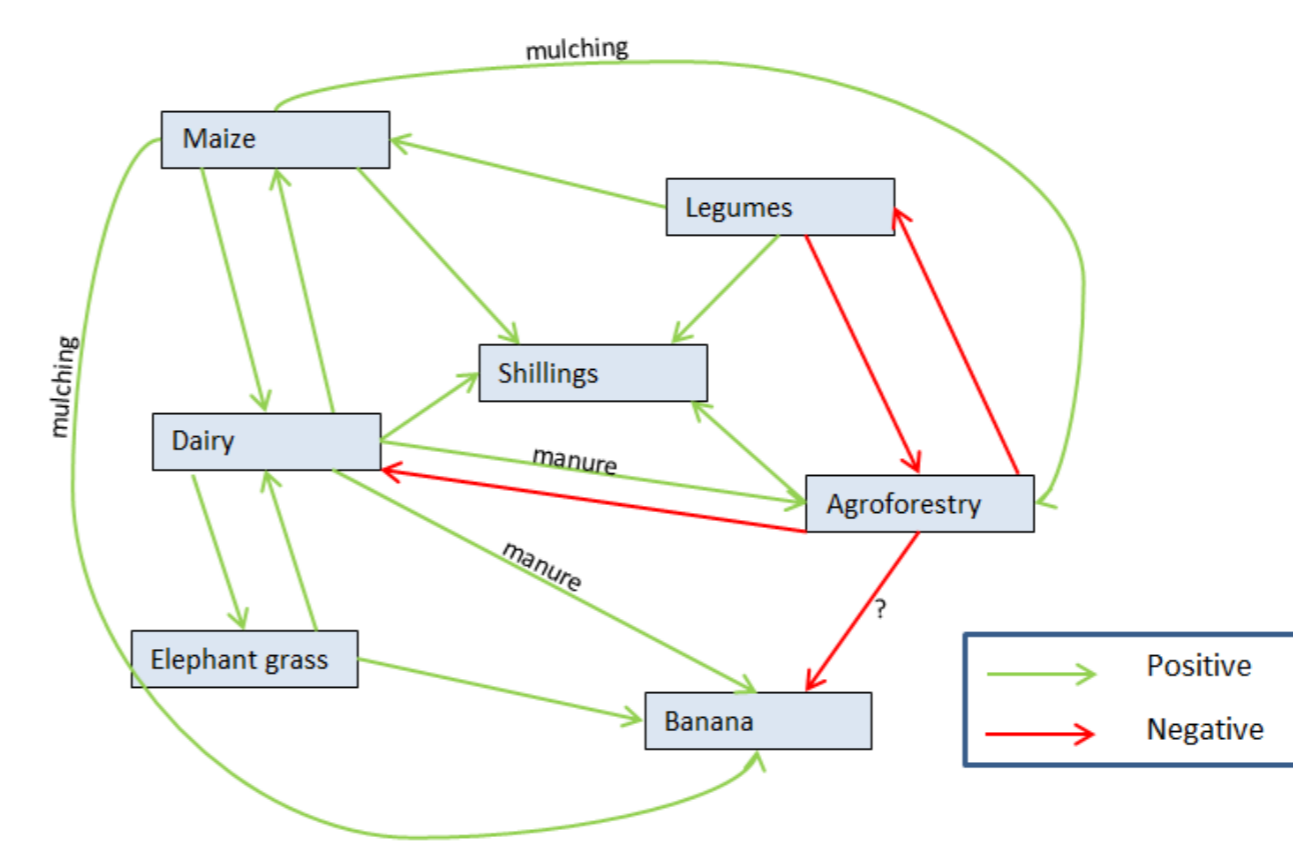


Figure 3. Cognitive map including on-farm components in KK.

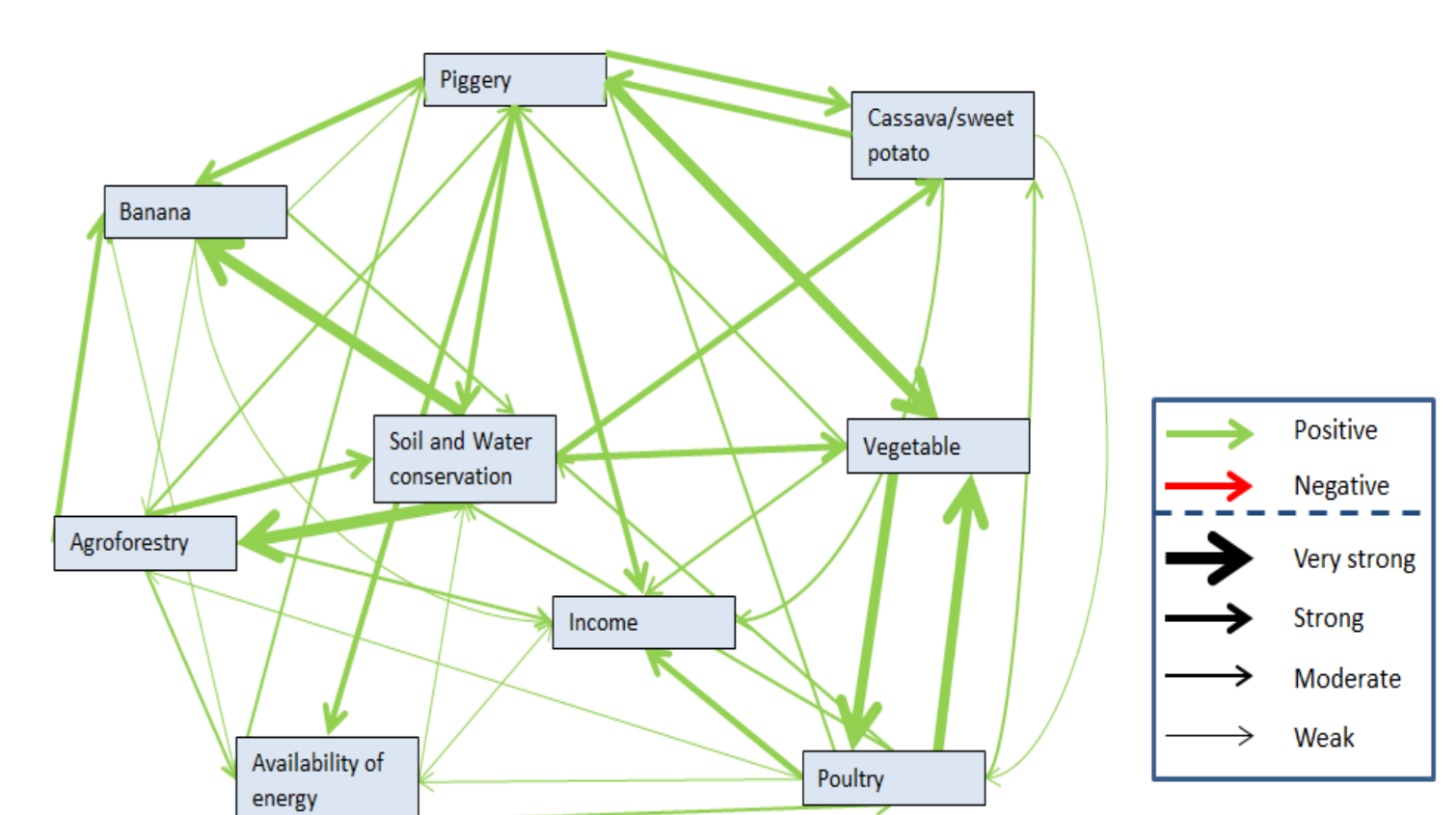


Figure 4. FCM including on-farm components in MW.

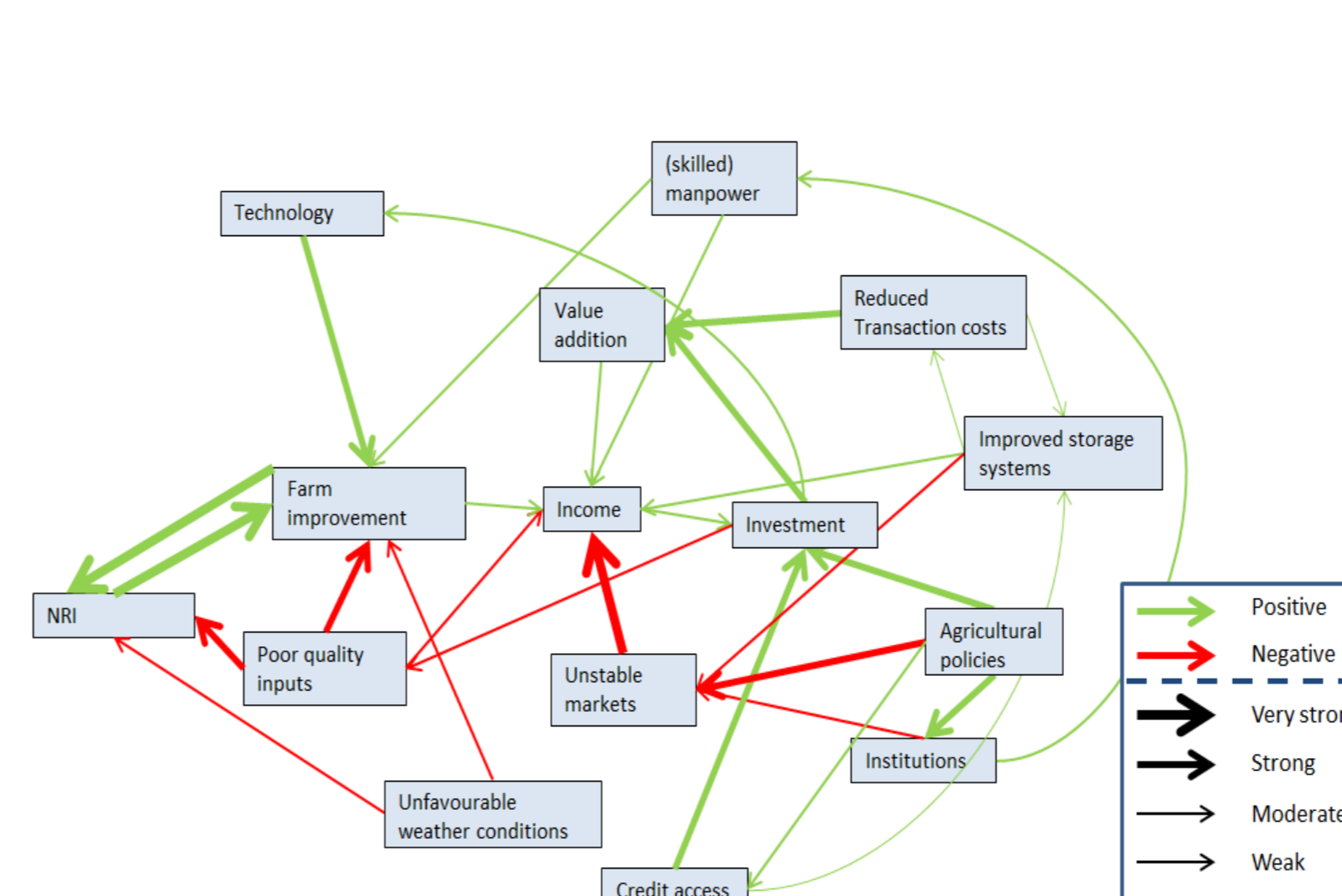


Figure 5. FCM including off-farm components in KK.

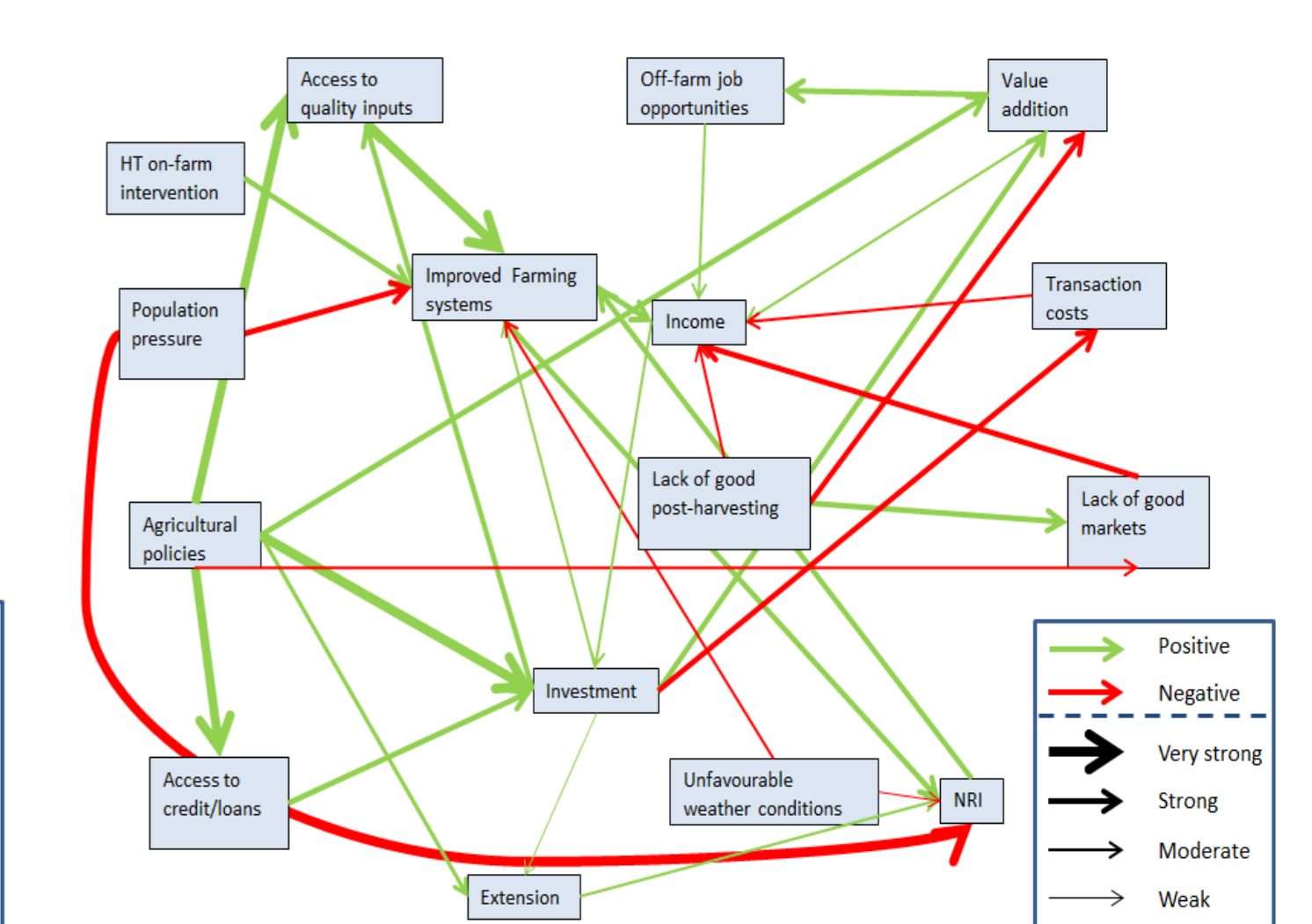


Figure 6. FCM including off-farm components in MW.

Results (learning)

A full FCM evaluation, with iterative feedback to further stimulate systems thinking did not take place during the workshop, due to time constraints. Still, participants in MW and KK indicated to have learnt about interactions and connectedness of developments in their area.

Preliminary conclusions

- The drawing of cognitive maps can be used to facilitate thinking in stakeholder processes and to identify important drivers of change.
- More testing and experience building is needed to evaluate the potential of FCM to support participatory systems analysis.
- This can be done by analysing cognitive maps that are constructed by stakeholders during small time slots in participatory meetings.

Acknowledgements

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