

# Using *Fuzzy Cognitive Maps* for Effective Participatory Research in Agricultural Leadership, Education, and Communication

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## Introduction

- Contemporary agricultural problems call for innovative solutions that effectively integrate human dimensions and enhance participatory research.
- Modeling is an emerging tool, and Fuzzy Cognitive Maps (FCMs) is a form of modeling based on cognitive map theory (Gray et al., 2014) used to explore various socio-environmental issues, especially when there is a need to integrate shareholders' knowledge into the decision-making process (Kafetzis et al., 2010).

## How it Works

- Participants must identify the topic, its relevant concepts, and themes (nodes) of the problem or system.
- Participants should weigh the edges between the nodes on a scale of -1 to 1 (for example, -1 = strongly negative, 0 = neither negative or positive, 1 = strongly positive). Data is transformed from Qual to Quant (quantizing).
- FCMs are aggregated and digitalized using the Mental Modeler Software.
  - Digital View
  - Relationship Matrix  $\longrightarrow A_{it+1} = f(\sum_{j=1}^n A_{tj} \cdot W_{ji})$
  - Forecasting Scenarios  $\longrightarrow f(x) = 1 / (1 + e^{-\lambda x})$

## Results to Date

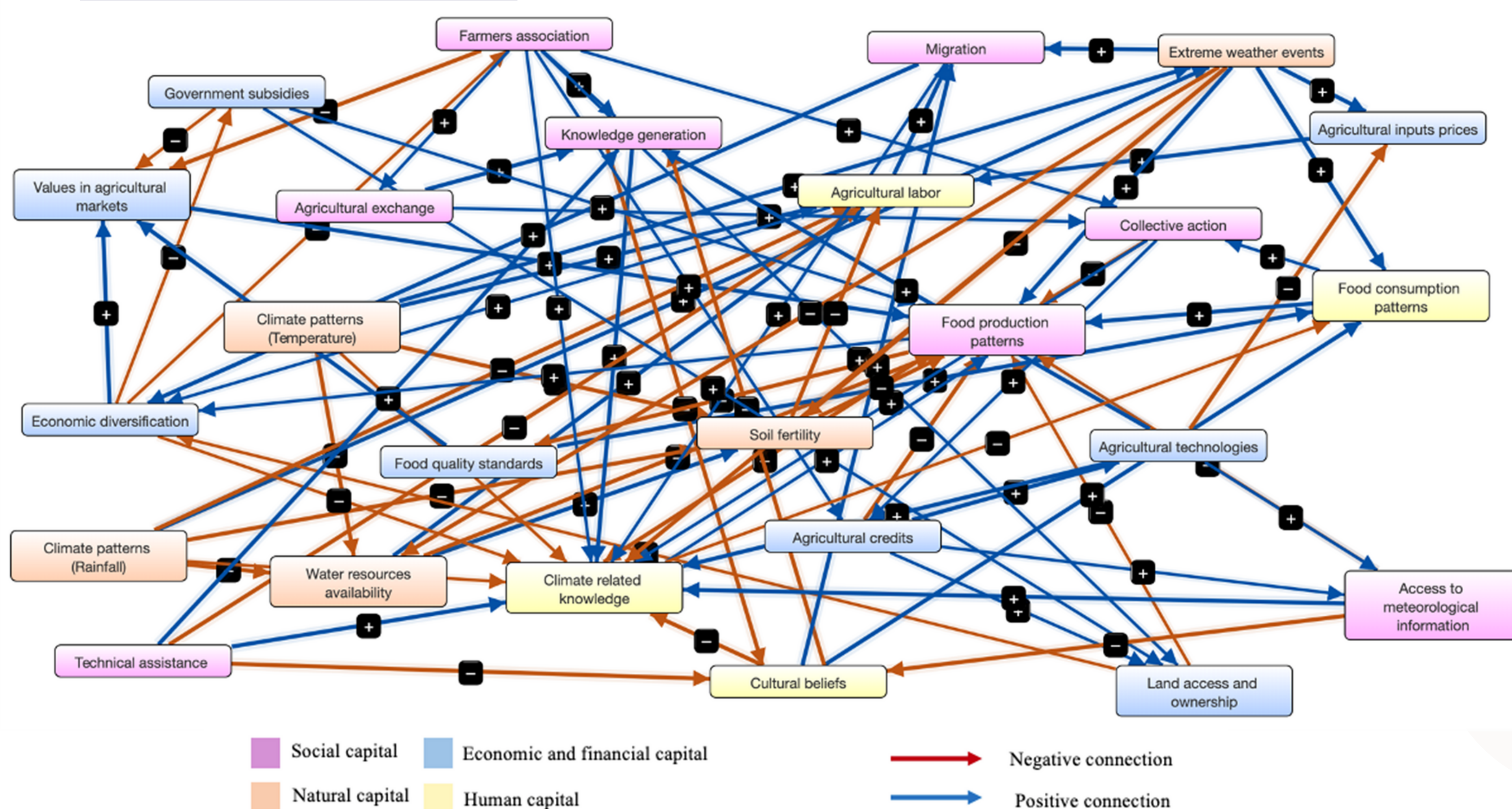


Figure 1. Fuzzy Cognitive Map-Peruvian Farmers Climate Adaptation.

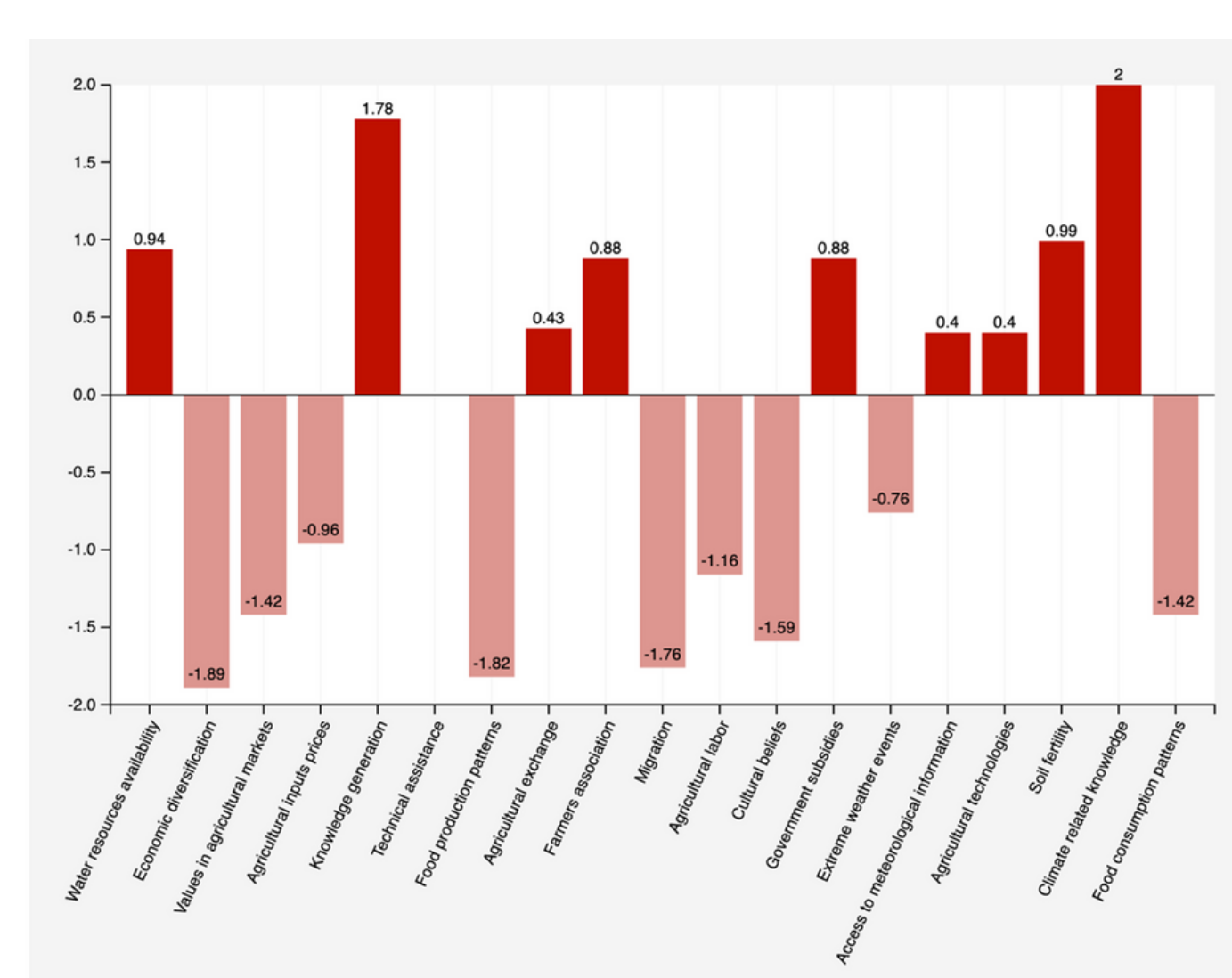


Figure 2. Model 1-Precipitation.

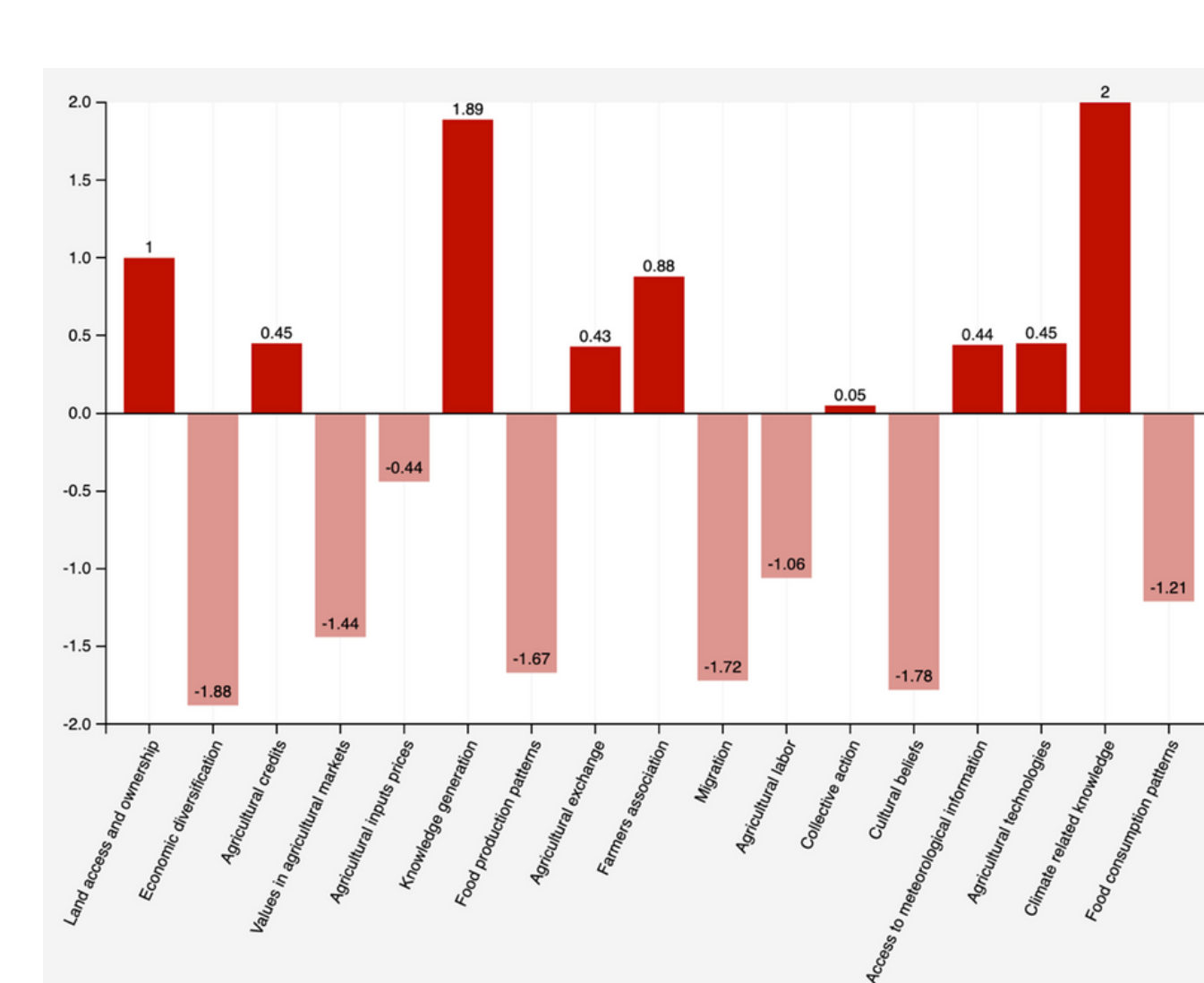
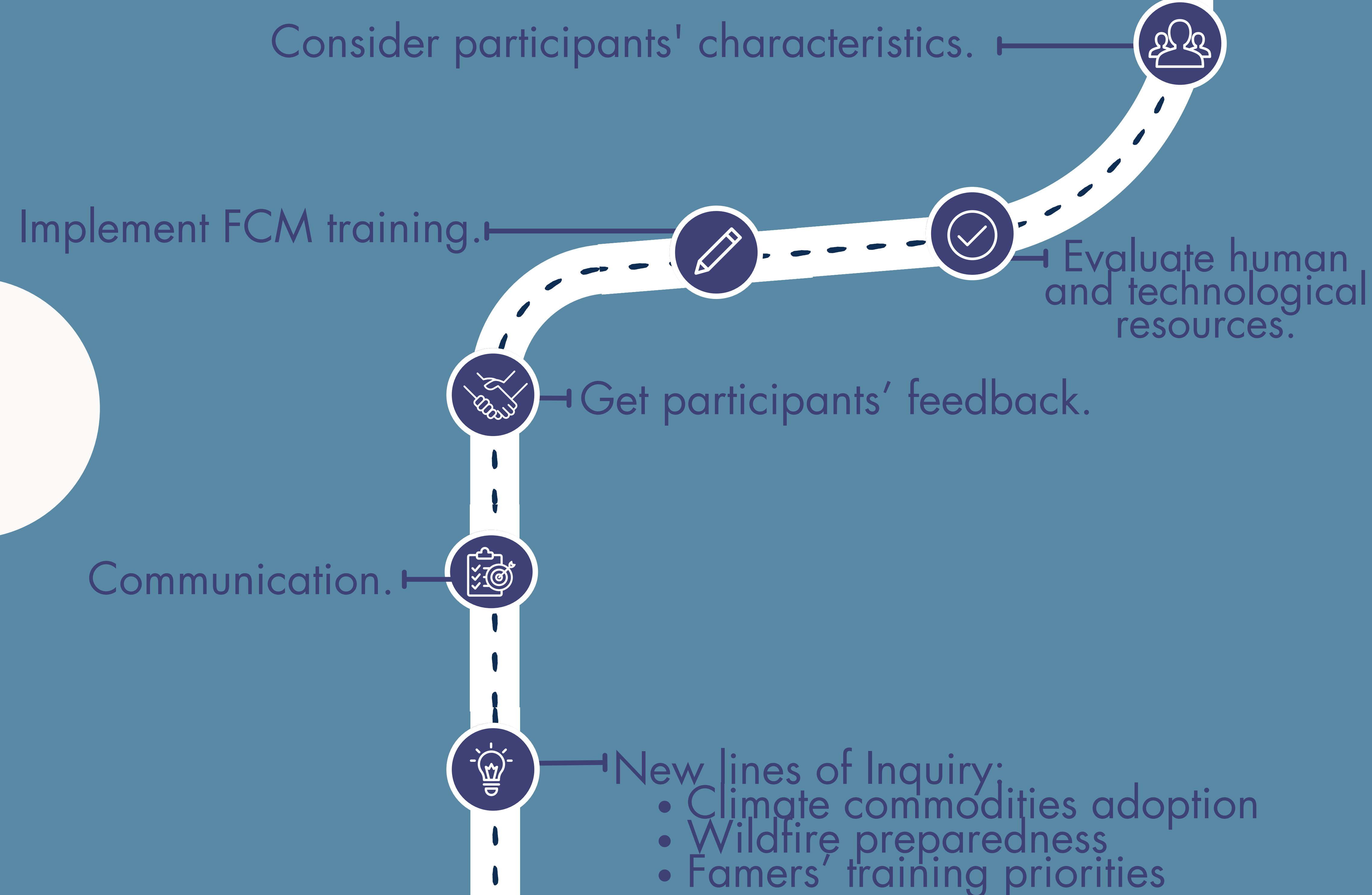


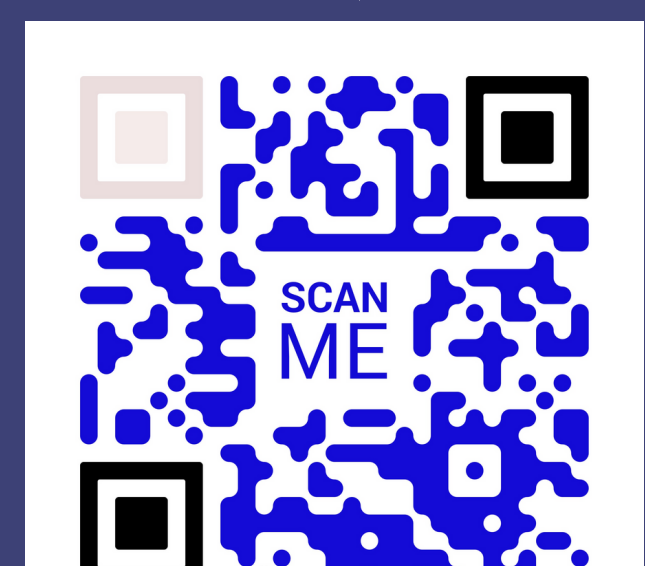
Figure 3. Model 2-Technical Assistance.

## Future Plans/Advice to Others



References

Mental Modeler



Our innovation: *Bringing a new participatory methodology to ALEC research*