Introduction

- Lack of access to formal information sources in rural areas of developing countries[1]
- Spread of information through social networks[2,3]
- Information important for innovation adoption[4,5]
- Policy-makers only inform subset of population initially and rely on them to disseminate information[6,7]
- Seeds: individuals who obtain information first

Research question: Which is the optimal set of seeds to improve information spread in a social network?

Data

Project: Food Security in Rural Zambia (FoSeZa)

- Use of social networks to promote innovations such as diversified food systems

Data set

- FoSeZa household census 2018: socio-economic survey of 264 households in eight villages

Methodology

- ABM: computational model for simulating interactions of autonomous agents to assess effects on micro- and macro-level
- Agent-based model (ABM)
  - Purpose: simulation of information diffusion by word-of-mouth communication to predict impact of varying seed sets on diffusion
  - Entities: households represented by household heads, connected via links
  - Household variables: state of information, administrative affiliation
  - Link variables: occurrence and frequency of agricultural discussion
  - Scale: one simulation run = 52 weeks
  - Output: number of informed households after each month
  - Input: household survey data
  - Replication of observed patterns

Systematic evaluation of strategies.

Scenario 1: seed selection criteria
- Random
- Degree centrality
- Betweenness centrality
- Eigenvector centrality
- Closeness centrality
- Hierarchy (Village heads)

Scenario 2: number of seeds
- From 1 to 10% of whole population
- Randomly chosen

Scenario 3: interaction effects between seed selection criteria and number of seeds

Results & Discussion

Scenario 1
- Degree: direct influence improves spread
- Betweenness: bridging function in sparse network
- Random: seeds can be in several components
- Village heads: well connected
- Eigenvector and closeness: indirect influence hinders spread

Scenario 2
- Higher number of seeds leads to faster and more widespread reach due to greater transmission in the early stages
- Decreasing marginal effects of additional seeds

Scenario 3
- Interaction effects significant
- Results robust for betweenness-, degree-, and random-based seeds
- Performance of closeness- and eigenvector-based seeds depend on seed size

Conclusions

- Seeding strategies have high potential to improve information diffusion
- Best results under degree-based seed selection, followed by betweenness-, random-, and hierarchy-based seed selection
- Higher number of seeds has positive effect with declining marginal effects
- Effect of number of seeds robust for random-, betweenness-, and degree-based selection, but performances of closeness- and eigenvector-based selection depend on number of seeds

Further research

- Assessment of social constraints, rivalry of information consumption, and decreasing information values
- Evaluation of options to improve transmission process

References