Probabilistic Causal Models for Nutrition Outcomes of Agricultural Actions

Eike Luedeling
Cory Whitney
How can we study the Agriculture-Nutrition linkage…?
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…if the link isn’t direct?
How can we study the Agriculture-Nutrition linkage…?

…if the link isn’t direct?

…and involves many “confounding” factors?
The statistical challenge may not look like this:
…but like this:

A serious challenge to our common statistical procedures!

We’ll need deeper systems understanding to study this!
Confronting complexity

• A rather daunting challenge (?)
• Complete, ‘objective’ understanding may not be attainable (or prohibitively costly)
• Fortunately, for deciding whether an intervention works, we may not need to know everything…
• …and we can build on existing knowledge held by locals and experts
• Is existing knowledge sufficient for deciding whether a specific intervention works?
• If not, what do we need to measure?

Decision Analysis answers these questions
Causal decision model development with stakeholders

Kenya
Fruit trees on farms

Uganda
Vision 2040
Homegardens vs. commercial farms
Decision Analysis

Better development outcomes through better decisions

Development decisions

Stakeholders

Transdisciplinary decision model

Participatory analysis

Decision-makers

Identify knowledge gaps

Probabilistic simulation

Risks

Uncertainties

Supporting research

Current state of knowledge

Decision analyst
Conclusions

• Decision Analysis is a useful paradigm for ANH research

• It is important that we consider causality and adequately represent complexity

• Precise knowledge on complex agricultural systems can’t realistically be achieved at scale – fortunately it’s often not needed

• Decision Analysis provides strategies for using our state of knowledge (incl. uncertainty) to compare decision options and evaluate interventions

• Still work to do on adapting Decision Analysis approaches to work on agricultural development contexts
Our IMMANA experience

• Specific program to identify innovative approaches, which are urgently needed!
• Safe space to try new methods
• Fostered a necessary interdisciplinary conversation
• Incubator of innovation and ideas for future work
• Very well managed, incl. flexible where flexibility was needed

Thanks IMMANA!
Bayesian Network modeling

• Causal modeling approach
• Each node is related to its parents through conditional probability tables (if parent = A, then child = B)
• Each table only describes one relationship, which is usually easy to consider
• Probabilistic linkage
• Allows considering uncertainty and risk in a quantitative model
• Value of Information analysis, a capability added by this project, allows highlighting critical uncertainties