



Decision Analysis to Support Agriculture for Nutrition

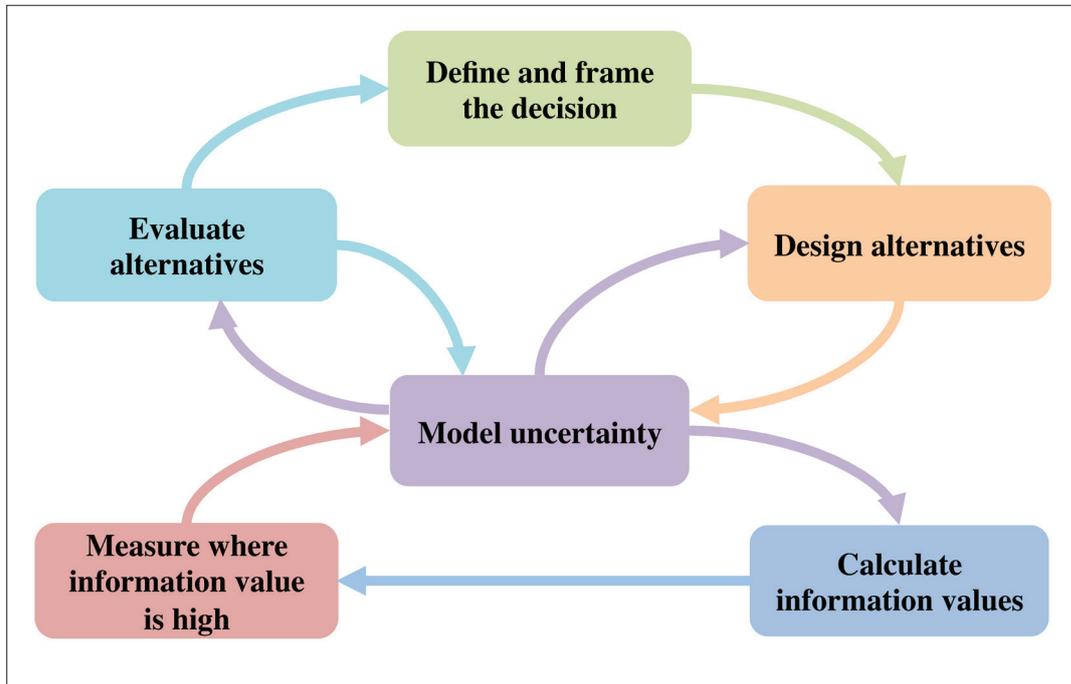


Figure 1. The Decision Analysis modelling process involves a sequence of activities from identifying and framing the decision to calculating uncertainty and high value variables in the resulting model. The process is implemented in cooperation with key stakeholders and experts to improve the design of policy and interventions, and monitor their impacts. The loop in the top half of the diagram describes the process that evaluates different alternatives in relation to the decision goals, whereas the lower loop uses value of information analysis to determine what should be measured to clarify the decision. There are iterative feedback loops throughout the process.

Key Messages

- There is need for new approaches in the analysis of impacts of agricultural interventions on food and nutrition systems.
- Making decisions on how to promote agriculture for nutrition requires approaches that can accommodate complex relationships and translate agricultural activities into probable nutritional outcomes.
- Decision Analysis is a set of methods designed to assess decisions and offer a recommended course of action for decision makers.
- Decision Analysis can be used to meet the challenges of system complexity and data scarcity, inherent in development decisions. The methods have been designed to support decision-making with imperfect information and limited research budgets.
- Bayesian Networks are a probabilistic decision modelling tool that can be used to integrate

expert knowledge, considering system complexity and uncertainty to anticipate the future impacts of decisions.

- Decision modelling with Bayesian Networks can be applied to quantify the pathways from agricultural policies to their impacts on nutrition.

The Challenge

The Sustainable Development Goals include the commitment to end hunger and food insecurity and to improve global nutrition by 2030 (SDG 2; United Nations 2015). Several possible interventions that might help to achieve these ambitious goals have been identified.

Many of the identified interventions target agricultural production. The challenge for governments and institutions is to select the most effective among all of the possible interventions. The danger is that some of the proposed interventions may not produce positive outcomes at all, for instance certain foods may never reach vulnerable groups such as the rural poor.

Decision-Making for an Uncertain Future

Research supporting development decisions related to agriculture for nutrition often fails to consider the range of ecological, socioeconomic, cultural and political factors that influence agriculture. This often limits decision makers' ability to rationally decide on the best course of action in developing and implementing agriculture for nutrition interventions.

The basic steps in the Decision Analysis process aim to address both why and how decisions are formulated and decision-relevant factors are measured. This approach follows the basic premise that if something has an effect, this effect must be observable and if it is observable, it must be measurable.

Through the stochastic and iterative modelling process Decision Analysis can supply decision makers with information about probable impact pathways of agricultural interventions and thereby help them prioritize for the best nutrition outcomes.

Use of local expert knowledge

Decision Analysis techniques can help to accommodate complex relationships and integrate the knowledge of local experts for model construction and calculation. These can be used to build and parameterize Bayesian Networks.

Once a decision has been identified, the modelling process begins by breaking the decision down into several important questions in plenary discussions. Random interchanging working groups of experts are then led through the various stages of collaborative thinking regarding these questions.

The process is designed to help experts interact, brainstorm and reach a common understanding about impact pathways. Through this approach, they can explore details of the expected impacts, disaggregate the impact pathway into intermediate steps and identify all the influencing factors that they consider important to the decision.

Bayesian Networks to Support Decisions

A Bayesian Network is a modelling tool that can be used together with Decision Analysis methods to supply decision makers with information about the probable impacts of particular interventions. By capturing the interactions of a complex range of factors, these models can produce probabilistic projections of system outcomes. Bayesian Network models are particularly useful where exact data are limited but extensive expert knowledge is available, as is often the case in agricultural development.

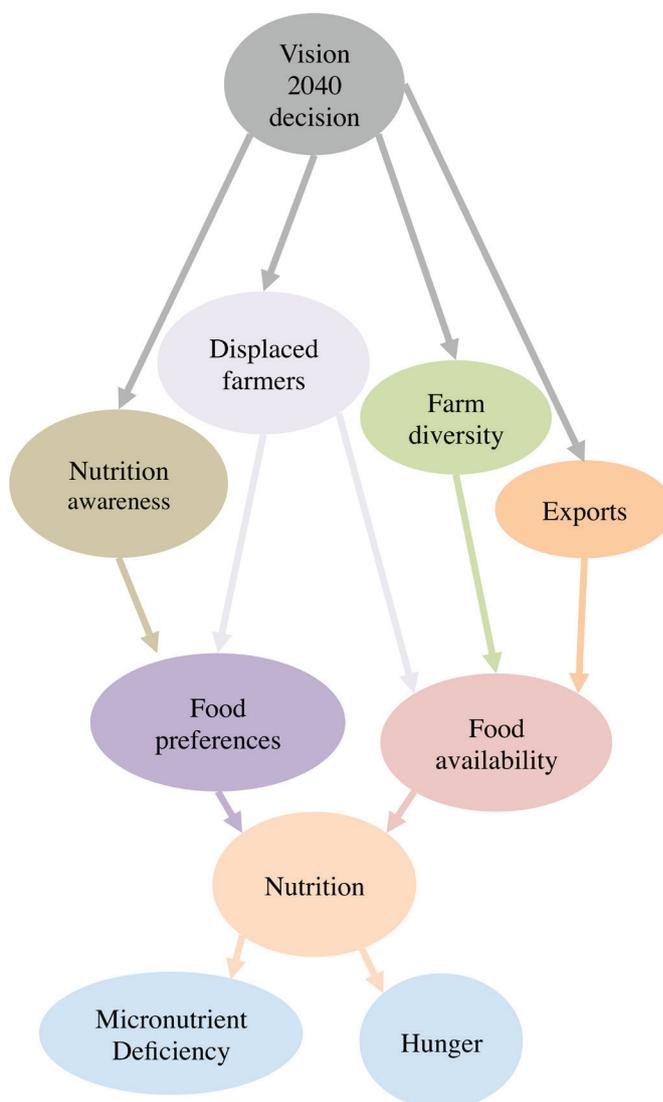


Figure 2. Example of an agriculture-for-nutrition-focused Bayesian Network describing the nutrition impacts of Uganda's Vision 2040 development decision for a nationwide transition from small-scale farming systems to industrial agriculture. The model results indicate that implementation of Vision 2040 creates a worrying increase in the probability of a household experiencing hunger and micronutrient deficiency. The data and model are available on the Harvard DataVerse (Luedeling and Whitney 2017).

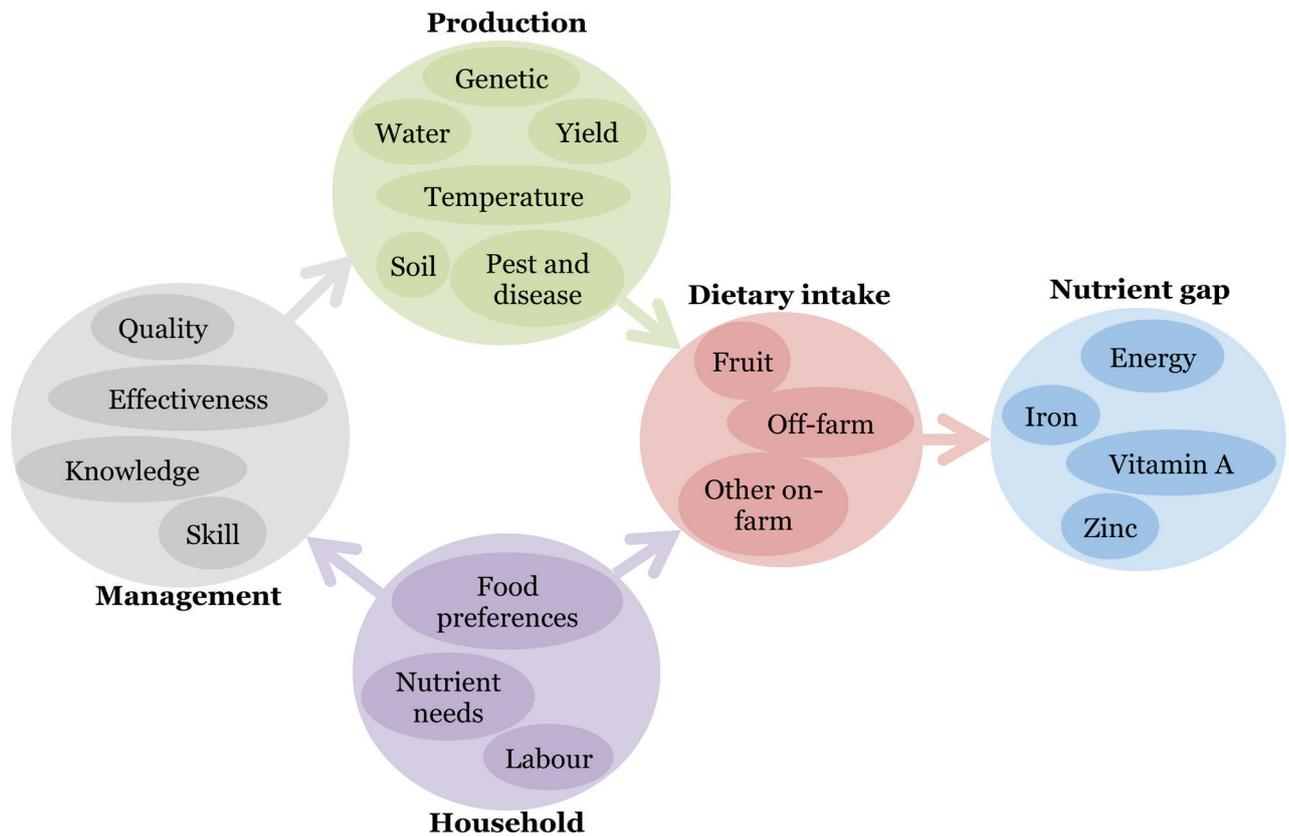


Figure 3. Example of an agriculture-for-nutrition-focused Bayesian Network describing the impact pathway for farmers' tree-planting related management decisions on diets on smallholder farms in Kenya. The decision to plant trees was found to improve households' intakes of dietary energy, iron, vitamin A and zinc. The data and the model are available on the Harvard DataVerse (Luedeling and Whitney 2018)

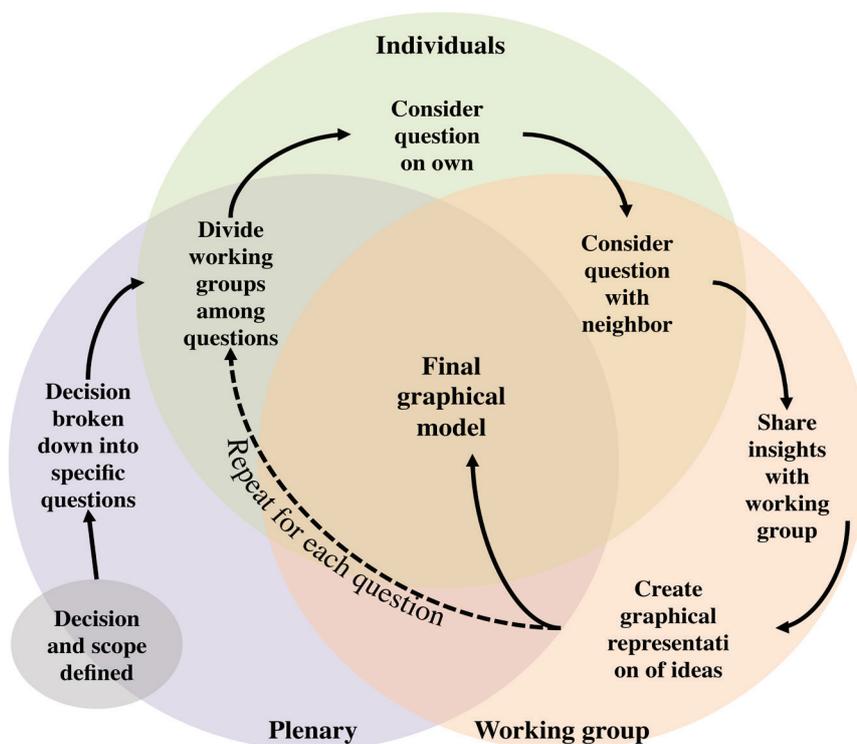


Figure 4. There are a number of steps that can be followed for collaborative building and calculating of decision impact pathways. This process can be performed in a workshop where expert knowledge holders and analysts are brought together to construct an impact pathway model of a particular decision (more information on this process can be found in Whitney et al. 2018).

Decision Analysis to address uncertainty

Decision Analysis models can help to address the inherent uncertainty in policy-related decision-making regarding linkages between agriculture and nutrition. By applying these methodologies, it is possible to create locally specific decision models that include relationships that may be difficult to capture in other modelling approaches.

This approach demonstrates a way to involve local

knowledge systems in decision analysis of nutrition impact pathways of agricultural production interventions. The approaches offer an alternative to ignoring factors that are difficult to measure when considering complex systems.

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