



# Integration of Fruit Trees into Agricultural Landscapes of Kenya can Help to Enhance Nutrition Security



*Photo 1. Experts and stakeholders went through a training where they learned how to provide accurate model estimates by assessing their own uncertainty and overcoming biases. Photo by C. Whitney*

## Key Messages

- Fruit trees can provide many benefits and contribute to Kenya's national nutrition goals
- A number of interacting factors influence fruit tree planting and subsequent nutrition outcomes for farmer households in Kenya
- Appropriate support to guide in understanding the probable outcomes of nutrition-related policy decisions in the region is lacking
- Decision analysis tools can be applied to estimate the household nutrition benefits of policies related to planting fruit trees in Kenya

## Fruit Trees can Provide Nutrition Benefits in Kenya

It is widely understood that planting more fruit trees can improve household nutrition for smallholder farmers in Kenya. Examples can be drawn from the extensive work of the World Agroforestry Centre (ICRAF) and the

Biodiversity for Food and Nutrition Project. Planting of more fruit trees could also help to meet Kenya's goals of improving national nutrition, especially for the country's many rural farming families who often suffer from hunger and malnutrition. These goals are outlined in the long-term development agenda, Vision 2030, in the Constitution of Kenya and in the resulting policies, including the Agricultural Sector Development Strategy (ASDS), National Food Security and Nutrition Policy (NFSNP) and National Agricultural Sector Extension Policy (NASEP), among others, as well as Kenya's global commitments. However, there is a lack of scientific support to anticipate the likely outcomes of any specific policy decisions that support farmers to plant fruit trees.

The results of a recent study indicate that planting fruit trees can improve the nutritional status of households, thus decreasing chances of hunger and micronutrient deficiency. Smallholder farmers' decisions to plant fruit trees on their farms can have a substantial impact on nutrition outcomes at the household level. Planting fruit trees may result in a lower per person dietary gap for provitamin A, iron, zinc and energy.

## Tools to Support Nutrition-Related Policy Decisions

A recent paper titled ‘Probabilistic Decision Tools for Determining Impacts of Agricultural Development Policy on Household Nutrition’ outlines a holistic approach for determining the nutritional impacts resulting from agricultural development policy. It proposes an approach that uses available data and expert knowledge rather than requiring hard data from costly long-term fieldwork and experiments. It allows for the incorporation of disparate data sources and what might be considered ‘imprecise’ inputs to create a representation of the current understanding of cause and effect relationships within the target system.

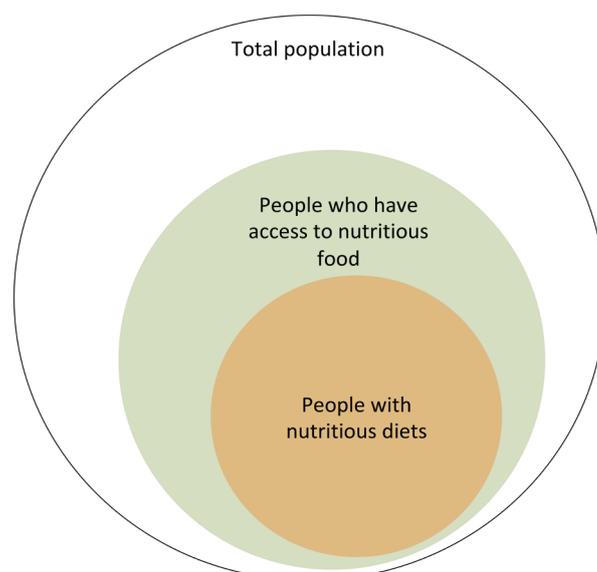
### **Embrace uncertainty in holistic models**

Figure 1 illustrates the knowledge that some proportion of a country’s total population will have access to nutritious food, and of those, some proportion will have nutritious diets. The overlap of these circles represents the knowledge that diets can only be nutritious if people have access to nutritious foods, but that not all people have access, and this access does not necessarily guarantee nutritious diets.

Together, scientists and other local experts can easily determine the factors that influence the areas of these circles (their probability) and the amount of overlap. For example, with abundant diverse agricultural production the green circle may come close to covering the white (nearly everyone will have access to nutritious food). Likewise, with effective national nutrition education the green circle might be almost totally covered by the orange circle (everyone will have access to nutritious diets). However, where nutrition habits are poor, the orange circle might be much smaller.

By working with local experts who understand all the influencing factors, it is possible to generate a more complex graphical model of the interactions that influence these outcomes within a nutrition-related policy decision.

Using the approaches described here, both qualitative and quantitative data about a decision can be incorporated to produce a description of probable outcomes. This is especially useful for supporting complex nutrition-related policy decisions, because it allows for the inclusion of disparate data sources and uncertain inputs.



*Figure 1. Illustration of the proportion of a population with access to nutritious food and those with nutritious diets. The area of each of the circles represents the probability of people having access to nutritious food (green) and diets being nutritious (orange) as a proportion of a given population (white).*



*Photo 2. Experts and analysts worked together to collaboratively build a model and create forecasts for the potential impacts of fruit trees on smallholder farms in Kenya. Photo by C. Whitney*

The approach is outlined in the ICRAF working paper, ‘Decision analysis methods guide; agricultural policy for nutrition’.

## Decision Analysis Tools to Support Policy

In order to apply these tools to support policy related to fruit trees in Kenya, a week-long workshop was organized in Nairobi, Kenya in 2017, supported by the UK’s, Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA). The aim of the workshop was to gather experts and analysts to collaboratively model and create forecasts for the potential impacts of fruit trees on smallholder farms. Twenty experts were present at the workshop, including representatives of government and non-government organizations, agricultural technicians and practitioners, academics and analysts,. Workshop

participants created a qualitative illustration of the interaction of factors related to household composition, farm management and production, and their influence on household dietary intake and consequent nutrient gaps (Figure 2). This model was designed to determine the difference in nutritional status of farming households who planted fruit trees and those who did not. Read more about this workshop on the IUCN CEESP News ‘Decision modelling for trees, nutrition, and livelihoods’. The model is available in the Harvard DataVerse (Luedeling and Whitney 2018).

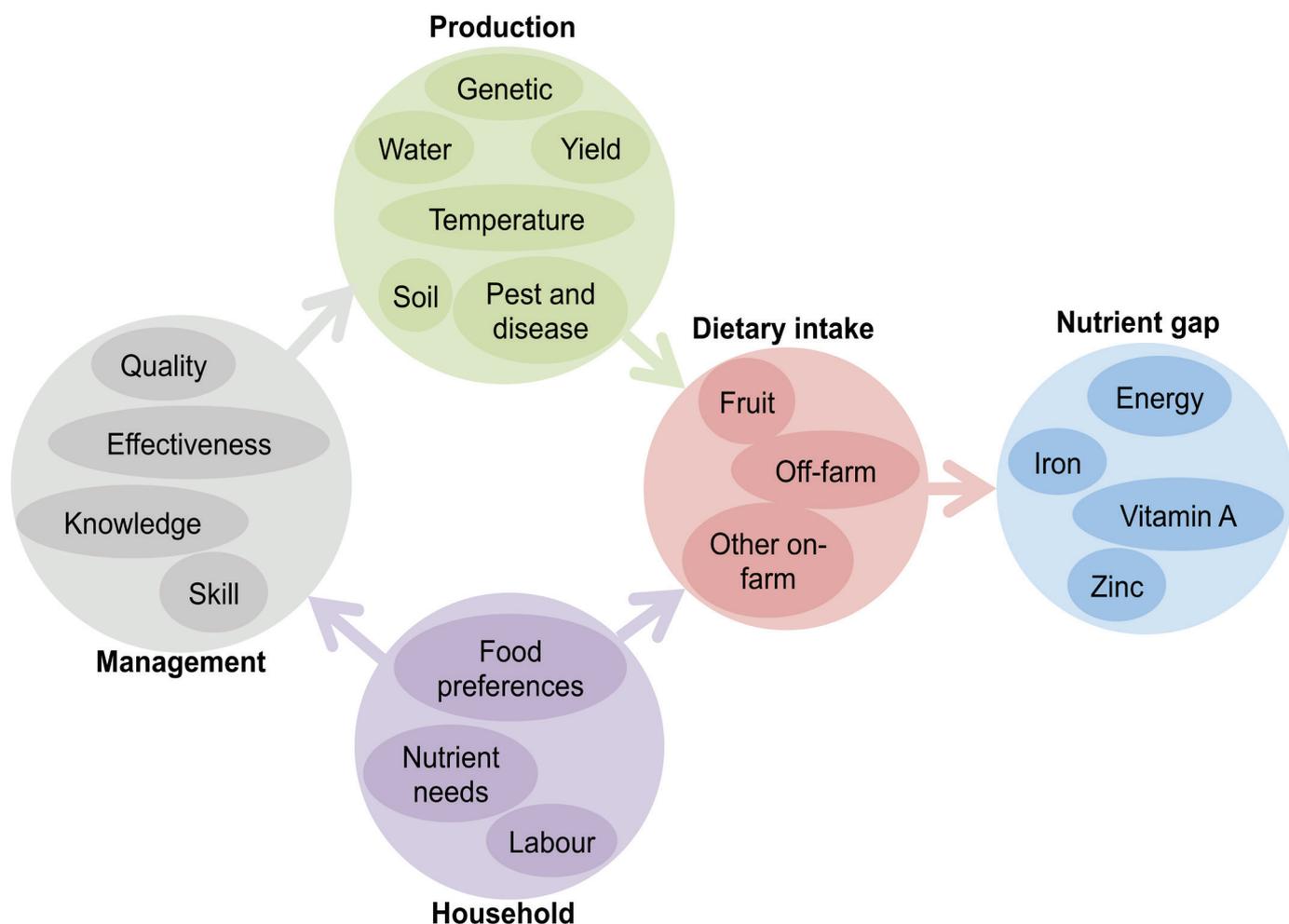


Figure 2. Model to qualitatively illustrate the production, management and household composition factors influencing household dietary intake and consequent nutrient gaps in energy, iron, provitamin A and zinc for farming households in Kenya. This model is used to compare farming households with fruit trees to those without.

## Decision Analysis to Address Uncertainty

Decision analysts then used the qualitative illustration to program a Bayesian Network model to help determine the probable outcomes of tree planting. Estimations on variables and relationships were generated from expert knowledge and available data to show that planting fruit trees may result in a lower per person dietary gap for provitamin A, iron, zinc and energy.

The model produced through this process has the additional benefit that it can be adapted to new scenarios where policy related to fruit trees will be implemented. It can help policy makers anticipate the likely outcomes of any specific policy decisions that support farmers to plant fruit trees and to identify specific interventions that

could effectively have an impact on household nutrition in rural communities; for example, encouraging smallholder farmers to plant fruit trees near their homes and on their farms. The model can provide scientific support for the role of fruit trees in supporting nutrition-related goals in Kenya's Vision 2030, Constitution and any resulting policies, including ASDS, NFSNP and NASEP, among others. It would also help Kenya fulfill its global commitments, such as the United Nations Sustainable Development Goals, especially SDG2, which calls for governments to 'End hunger, achieve food security and improved nutrition, and promote sustainable agriculture'.

## References

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