

## ***Agri-food*; a diet modelling software to examine trade-offs and support decision-making in nutrition sensitive agriculture programmes.**

### **OVERVIEW**

- *Agri-food* is a diet modelling tool to help programme planners decide which foods to promote for consumption and/or production in nutrition and agriculture interventions.
- It was designed to support the identification and prioritisation of food options when there are multiple, possibly conflicting, criteria for the decision and to foster consensus building across different stakeholders.
- In addition to nutrition criteria, *Agri-food* can consider relevant agriculture, environmental and gender criteria, and the value that different stakeholders place on these.
- The web-based tool is open access and was designed to be user-friendly so that it can be rapidly applied for participatory programme design.

### **Why the *Agri-food* tool was developed:**

Criteria for selecting foods to promote to improve dietary adequacy often include the nutrient density, local availability, acceptability and cost of foods (1,2). Conversely, criteria for selecting crops or other products to promote for production in agriculture programmes often include yield, income potential, suitability to local conditions and workload implications. For long-term sustainability and family welfare, gender and environmental criteria, such as women's time and water footprint, may also be important (3). Thus, a combination of criteria from different sectors is relevant when designing nutrition-sensitive agriculture interventions for smallholder farmers and it is important to identify and understand possible trade-offs across these criteria to build consensus across stakeholders (4).

Despite a recognised need, there is a shortage of tools to guide decisions on which foods to promote when criteria from nutrition, agriculture and other sectors are relevant. Existing diet modelling tools can guide the selection of foods based on nutrition criteria, but they do not consider agricultural constraints or goals (2,5). Likewise, while tools and processes from the agriculture sector can inform the selection of products or varieties to produce, they do not explore the nutritional impacts of this selection in the context of whole diets (6-11). Other tools designed to consider nutrition, agriculture, gender and/or environment either focus on the selection of programme approaches, rather than food combinations (12,13) or do not systematically compare trade-offs (14-16). *Agri-food* was therefore developed to meet a demand from the Agriculture-Nutrition community for diet modelling tools that consider trade-offs across decision criteria from diverse stakeholders, and facilitate consensus building using a transparent, rapid, and flexible approach.

Table 1: Example decision criteria and stakeholder weights for each criterion (1= least important, 8=most important)

Decision Criteria	Stakeholder Weights		
	Nutrition Programmers	Agriculture Programmers	Smallholder Committee
1. Nutritional adequacy potential (in context of local diets)	8	2	3
2. Local acceptability of food/s	7	3	4
3. Availability of quality inputs to produce food/s	4	4	6
4. Potential (of food) to contribute to women's income	6	7	8
5. Relative yield possible from this product/crop	3	8	5
6. Drought susceptibility of crop/product	2	6	7
7. Resilience to locally prevalent pests or diseases	1	5	2
8. Seasonal availability of food produced	5	1	1

## Data Requirements

- Food composition table** (internal to *Agri-food* but it can be expanded to include new or custom foods).
- Nutrient reference values** (internal to *Agri-food* but they can be customised).
- Cost** per 100g (optional) of each food selected for modelling.
- Food Pattern Data**, for the selected target population, on the average serving size of each food modelled and the frequency per week it could be recommended to be consumed.
- Data (quantitative or semi-qualitative) on the '**scores**' against each criterion for every food modelled (see example in figure 1).  
Depending on the criteria selected, scores can be obtained from secondary data, expert opinion or stakeholders. At minimum, scores should be discussed with stakeholders, for maximum transparency and understanding of methods and results.

## How the *Agri-food* Tool works

*Agri-food* is based on Multi-Criteria Decision Analysis (MCDA), a structured decision-support method for comparing different options (e.g. food combinations) based on a selected set of criteria, while considering the amount of value different stakeholders place on each criterion (17). Users are encouraged to actively involve stakeholders in the analysis, to increase understanding of results and priorities of other stakeholders and build decision consensus (17).

To begin, users define their decision (for example, selecting foods to include in a homestead food production intervention) and decision objectives. Stakeholder involvement is achieved by asking key stakeholders to:

- Select criteria for the decision (table 1).
- Identify options for the decision (potential foods).
- Provide weightings to reflect the level of importance that stakeholders or stakeholder groups place on each criterion.
- Contribute to defining scores for each food (option) against every criterion. Guides for assigning scores (figure 1) are provided within the software.

In the second step the analysis is set up in *Agri-food*. A target group is selected for the analysis and the model parameters are set-up in *Agri-food* including the foods, the criteria, criteria weights and scores. Next the software identifies every feasible combination of individual foods and aggregates normalised criteria scores across combinations. Each combination represents the recommended foods in the context of a whole diet for selected target group/s, identifying nutrient gaps for diets based on different food combinations and trade-offs across the selected criteria.

The MCDA analyses is done in the third step. Aggregate scores are adjusted according to stakeholder weights and summed across criteria to generate a final score for each feasible food combination.

The final ranking of options (food combinations) expresses ‘preferred’ options given the selected criteria and stakeholder values (i.e., criteria weightings). Results can be compared across stakeholder groups to facilitate a discussion about differences in food combination rankings given stakeholder values. In-built sensitivity testing allows real-time assessment of the degree to which rankings would change if inputs, such as stakeholder values or individual food scores varied.

Finally, users can also explore the trade-offs implicit in different combinations. For example, the highest ranked food combination may score well on nutrition, yield and women’s empowerment potential but poorly on ‘water usage’, prompting users either to accommodate this risk in their implementation design or consider other options.

### What decision criteria can be considered?

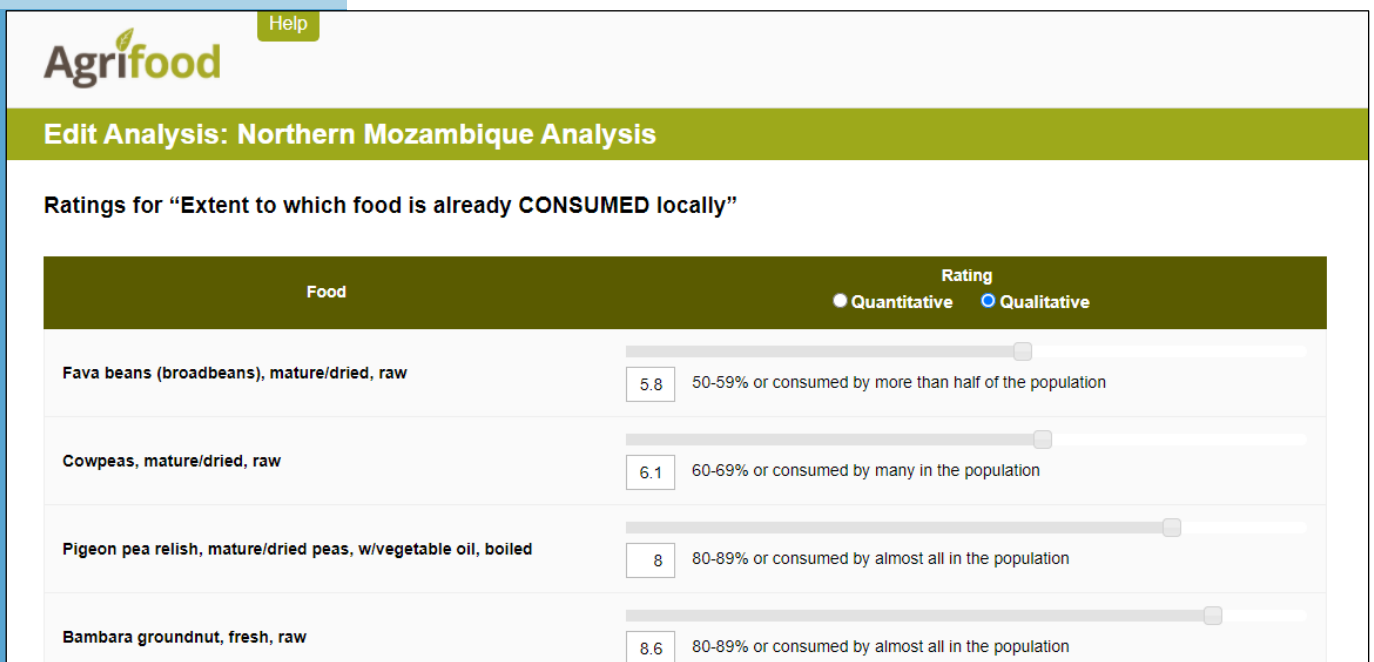
*Agri-food* contains 25 nutrition, agricultural, environmental and gender criteria, identified via a literature review and qualitative research with nutrition and agriculture programmers, researchers and government officials. Additional criteria can be added upon request. It is recommended that users select a maximum of 8-10 criteria for their analysis. An overview of criteria headings is provided in table 2.

### What decisions can *Agri-food* inform?

*Agri-food* has been designed to inform decisions relevant to the selection of foods to promote for production, value chains and/or consumption. Examples of these decisions include:

- Which crops or other products to promote for production in a homestead food production programme with nutrition objectives?
- What food-based recommendations would be realistic to promote, in a nutrition programme, given the local agricultural, environment and market context?
- Which foods should local agricultural extension officers promote to help meet both nutrition and agriculture goals?
- What food value chains should be strengthened to improve nutrition?

Figure 1: Screenshot showing the assignment of criterion scores for each food.



## CONTACT

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## Planned applications of *Agri-food*

Throughout 2020, *Agri-food* will be applied in the following pilot projects:

- Community-led decision-making workshops in rural Malawi to decide on foods to promote via the Government Agricultural Extension Services, in partnership with LUANAR University and The Malawi Ministry of Agriculture and with funding via the McKnight Foundation.
- Online Workshops with the International Potato Centre in Kenya to inform decisions regarding which foods to promote for production and consumption alongside Biofortified Orange-Flesh Sweet Potatoes to further improve nutrient adequacy of target communities.
- Online workshops with the United Nations World Food Programme to inform an evaluation of a fresh-food voucher programme in Ethiopia and Mozambique, specifically focusing on selecting a feasible combination of foods to improve nutrient intake of pregnant and lactating women and infants.

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