# What works where and for whom?

## Farm Household Strategies for Food Security across Uganda

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## Objectives

1. Understand how on- and off-farm activities of Uganda's rural households contribute to their food availability.
2. Identify how food availability and its relationship with different activities vary across Uganda.

## Methods

*Data sources*

Agricultural household survey data from the World Bank LSMS-ISA with 1927 households across Uganda (Figure 1)

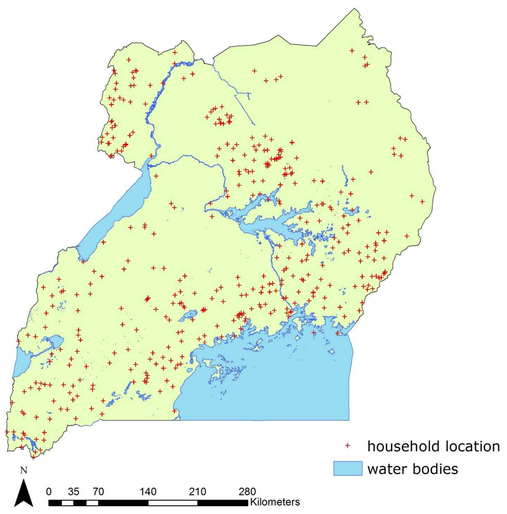


**Figure 1:** Locations of the households in Uganda

*Data analysis*

*1. Household food availability*

We used a production and cash balance based food availability (FA) indicator (Figure 2):

$$FA = \frac{\text{produce consumed \& food purchased}}{\text{household energy need}}$$

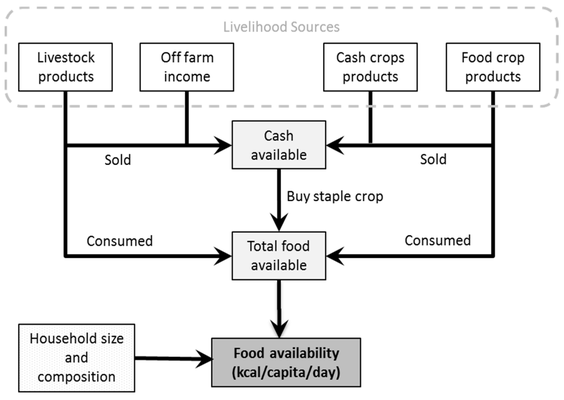


**Figure 2:** Components of the food availability indicator

*2. Regression analysis*

Regression models (linear & zero-inflated beta distribution) explain variability of food availability and contributing activities using environmental factors as explanatory variables

*3. Spatial interpolation*

Kriging of regression residuals identified spatial patterns

## Results *(Objective 1)*

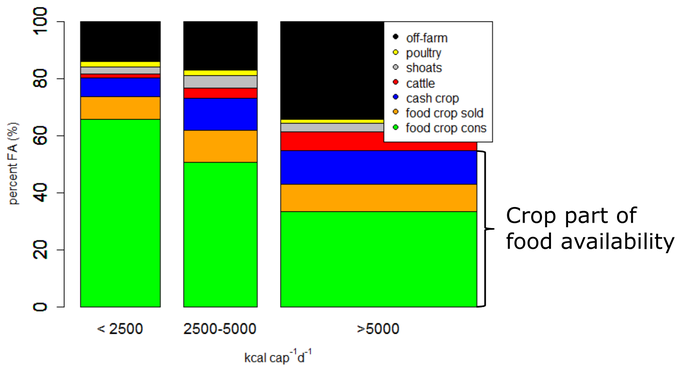


**Figure 3a:** Relative contribution of household activities to food availability per FA Class

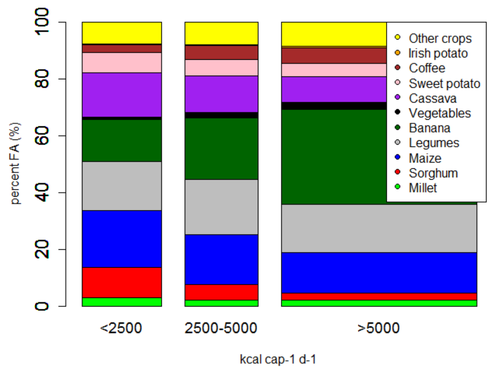


**Figure 3b:** Relative contribution of crops to the crop part of food availability per FA Class

*Class 1: not enough food available < 2500 kcal cap$^{-1}$ d$^{-1}$; Class 2: roughly enough food available between 2500 and 5000 kcal cap$^{-1}$ d$^{-1}$; Class 3: more than enough food available >5000 kcal cap$^{-1}$ d$^{-1}$ ; Thickness of bars represents relative size of households in FA class*

## Results *(Objective 2)*

**Table 1:** Performance table of the regression (explained variables Figure 4-7)

| | Explained variable Y | Explaining variables* | Squared correlation fitted & observed Y | ΔAIC** ($AIC_{final}$ - $AIC_{ini}$) |
|---|---|---|---|---|
| 1 | Food availability | LGP, $T_{max\ of\ warmest\ month}$, $P_{seasonality}$ | 0.076 | -*** |
| 2 | Off-farm income contribution | PopDen, $C_{mean}$, $Distrib_{chicken}$, $Distrib_{pigs}$, $P_{seasonality}$ | 0.028 | 77 |
| 3 | Banana contribution | $T_{max,a}$, $P_{annual}$ | 0.36 | 979 |
| 4 | Maize contribution | $T_{min,\ coldest\ month}$, LGP, $P_{warmest\ quarter}$, $P_{driest\ quarter}$ | 0.037 | 146 |

*LGP = length of growing period, T = temperature, P = precipitation, $C_{mean}$ = mean carbon stock, PopDen = population density, $Distrib_{chicken}$ = distribution of chicken, $Distrib_{pigs}$ = distribution of pigs*

*1) forward selection; 2-4) forward & backward selection
**AIC: Akaike information criterion. $AIC_{final}$: indication for relative quality of the final model compared to initial model (model without explaining variables, $AIC_{ini}$).
***optimized by R-Squared

- Temperature and precipitation explain part of the variability of banana contribution to food availability (Table 1)
- Food availability and off-farm income contribution (Figure 4 & 5): Spatial patterns but a high uncertainty (*data not shown*)
- Banana and maize contribution (Figure 6 & 7): Strong spatial patterns and a lower uncertainty (*data not shown*)

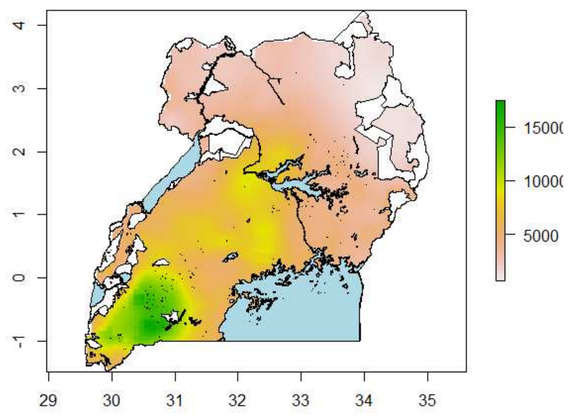


**Figure 4:** Interpolation of household **food availability** (kcal cap$^{-1}$ d$^{-1}$)

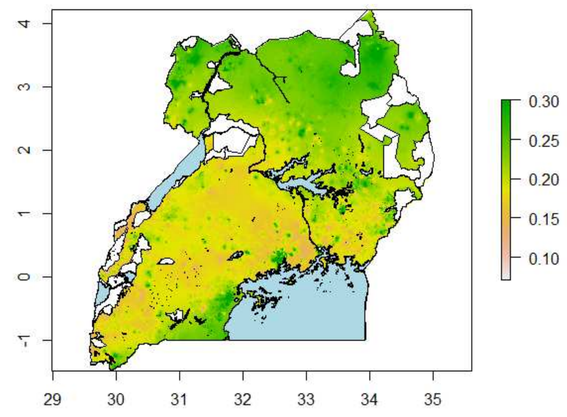


**Figure 5:** Interpolation of relative contribution of **off-farm income** to food availability (upper threshold = 0.3)

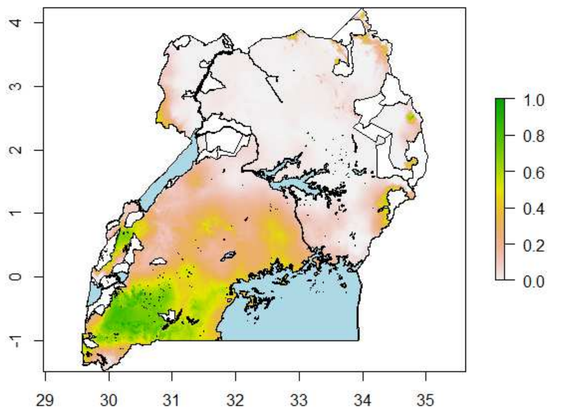


**Figure 6:** Interpolation of relative **banana** contribution to the crop part of food availability

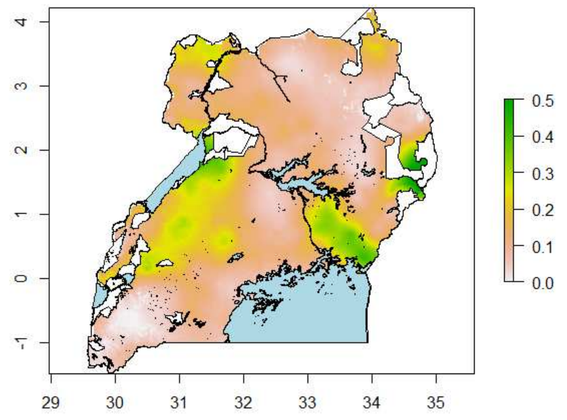


**Figure 7:** Interpolation of relative **maize** contribution to the crop part of food availability (upper threshold = 0.5)

## Conclusions

- Contributing off-farm activities increase in importance with increasing food availability, while contributing crop consumption decreases (Fig. 3)
- Food crops (banana and maize) show larger scale patterns, while short-distance variability of food availability and of off-farm income contribution is large introducing uncertainty in the maps (Fig. 4-7)
- **Next step:** Use spatial information to determine the effects of agricultural interventions on food security across Uganda

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