What works where and for whom? Farm Household Strategies for Food Security across Uganda

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RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security







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)

Data analysis

1. Household food availability

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

FA = produce consumed & food purchased household energy need

2. Regression analysis

Regression models (linear & zeroinflated 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

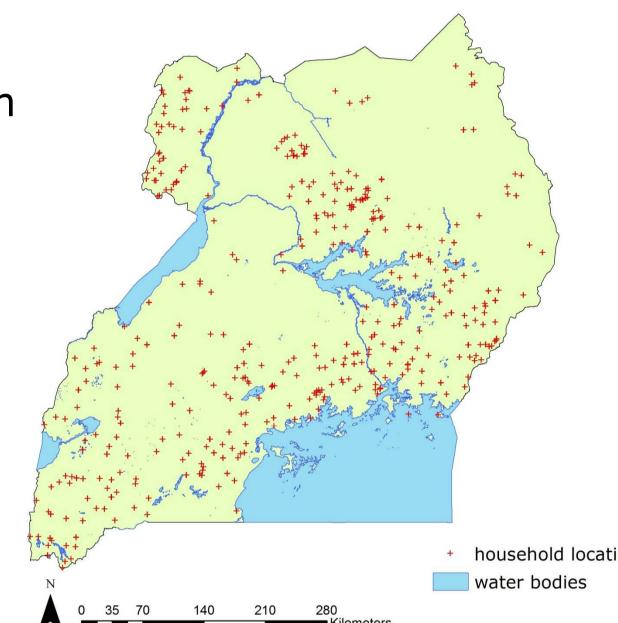


Figure 1: Locations of the households in Uganda

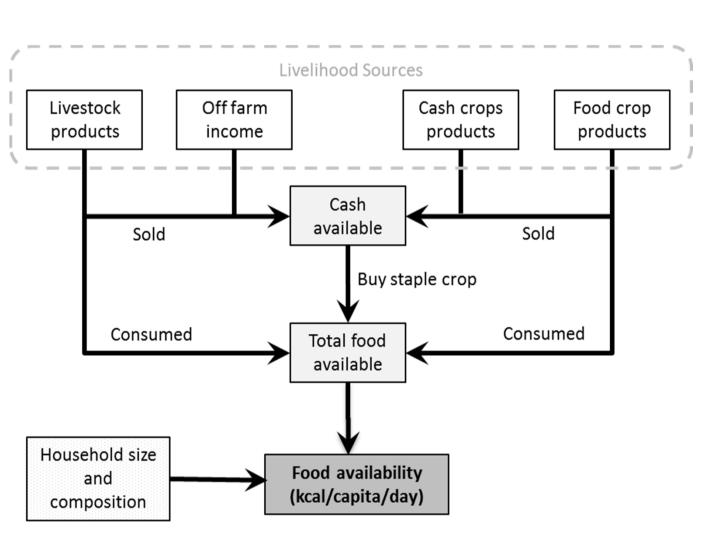


Figure 2: Components of the food availability indicator

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	ΔΑΙC** (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)

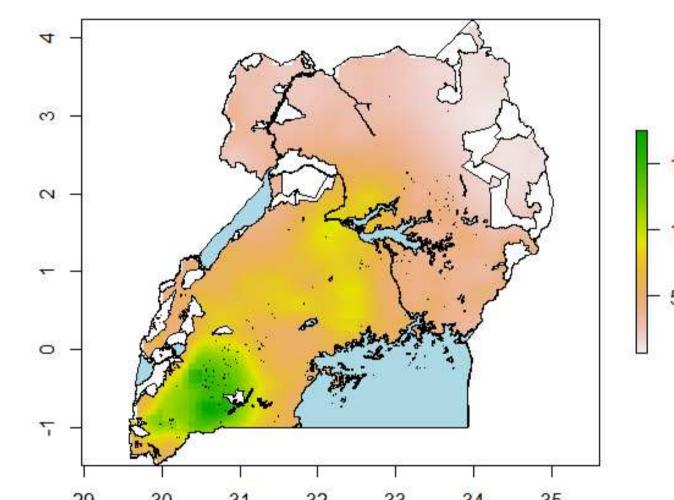


Figure 4: Interpolation of household food availability (kcal cap-1 d-1)

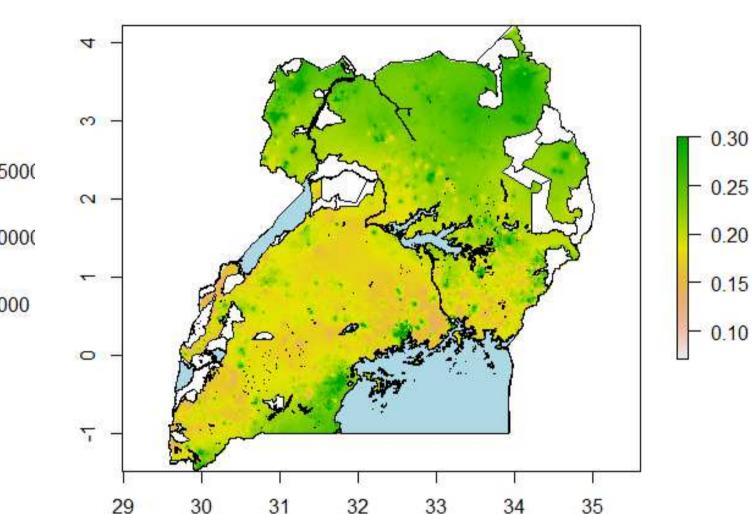


Figure 5: Interpolation of relative contribution of **off-farm income** to food availability (upper threshold = 0.3)



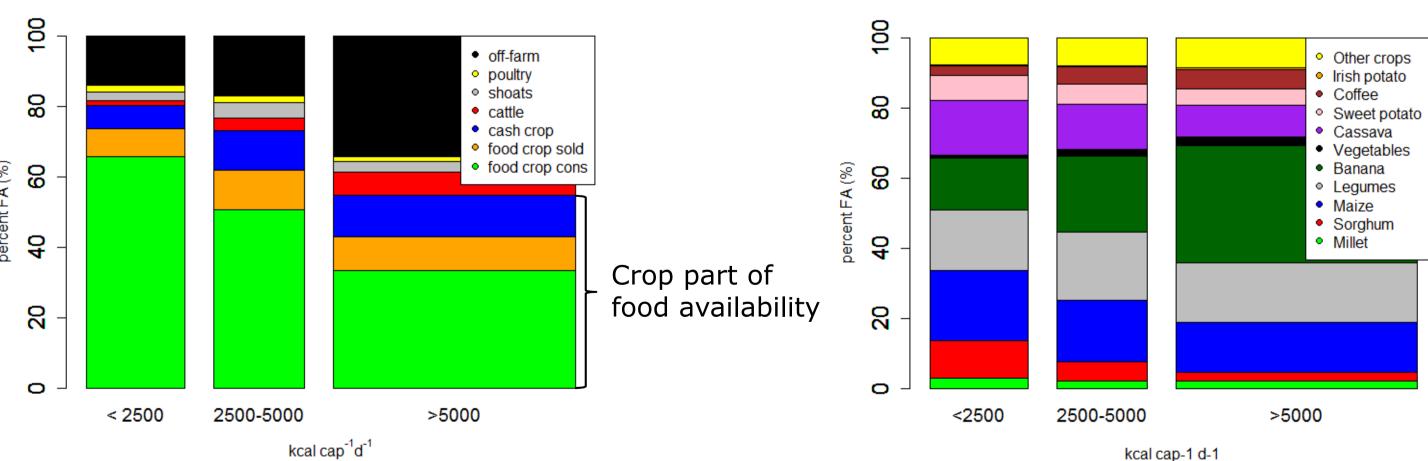


Figure 3a: Relative contribution of household activities to food availability per FA Class

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

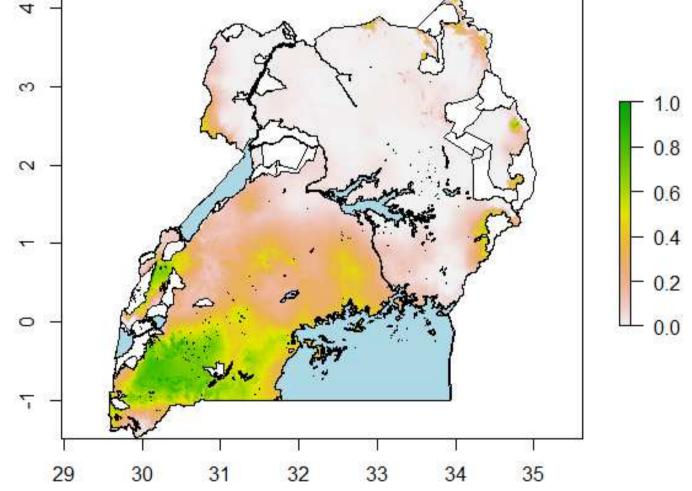


Figure 6: Interpolation of relative **banana** contribution to the crop part of food availability

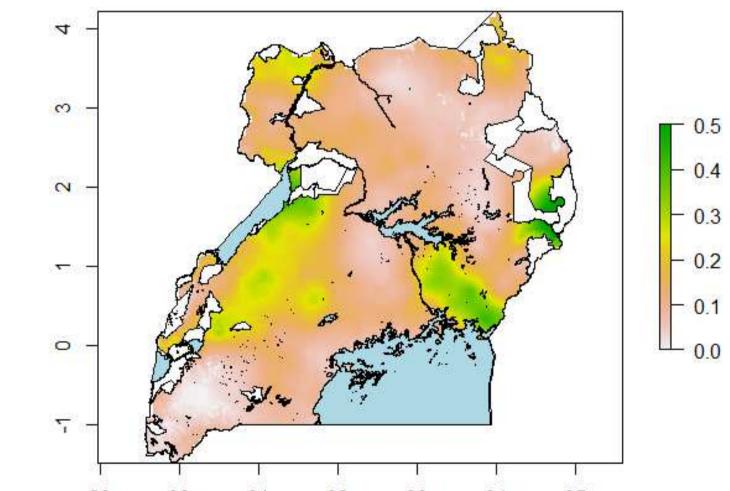


Figure 7: Interpolation of relative **maize** contribution to the crop part of food availability (upper threshold = 0.5)

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