C3P

Crop Crisis Control Project

FOOD SECURITY IN EASTERN AFRICA AND THE GREAT LAKES REGION

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Brief 1

Introduction

Catholic Relief Services (CRS) and the International Institute of Tropical Agriculture (IITA), together with various partner organizations, launched the Crop Crisis Control Project (C3P) in 2006 to combat two food crop diseases, Cassava Mosaic Disease (CMD) and Banana Xanthomonas Wilt (BXW), in the Great Lakes region. Cassava and banana are two of the most important staple crops in the region. Both CMD and BXW are responsible for a significant loss in production of these two staple crops, threatening food security in the region.

The food security surveys and analyses commissioned under C3P were intended to help practitioners better understand the relationship between both CMD and BXW diseases and food security. The surveys and analyses were also intended to characterize the type of farming households most vulnerable to these diseases from a food security perspective and to describe the variance in vulnerability across countries. Based on such information, targeting of aid and relief can be improved.

Diagnostic data on BXW and CMD were fed into a Geographic Information System (GIS), together with the data obtained from a food security survey. The resulting GIS data have been used to target and monitor the measures implemented in controlling CMD and BXW.

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CRS CATHOLIC RELIEF SERVICES
USAID FROM THE AMERICAN PEOPLE
COMESA
IITA Research for Nigeria's Africa
ASARECA
Bioversity International

Background and Purpose of the Study

The overall objective of the C3P food security work was to establish a geographical mapping and forecasting system of food security in six East African countries: Kenya, Uganda, Tanzania, Burundi, Rwanda and the DRC. It aims at consolidating information on food security vulnerability, relating it to BXW and CMD, and on the status, characteristics and dynamics of food security of small-scale farmers and their households.

Although CMD and BXW have the combined effect of being the largest natural threat to food security in the Great Lakes region for almost a decade, until the C3P project, no food security survey across the region had been carried out to assess the impact of these diseases.

The special features of this assessment include:

- Specifying the links between food security and pests and disease for bananas and cassava. This requires an in-depth assessment of cropping structures and patterns to determine the overall crop dependence, as well as an assessment of pests and disease affecting these two crops. The data also cover food access and availability as a composite of own food production and purchasing power.
- The need to make a quick food security assessment due to the project duration (18 months), and limited resources available. Other food security assessments tend to have long time lags between data uptake and evaluation. As many development projects seek to use assessment results for project targeting, the methodology used in this study is of high importance for such short-term project purposes. However, a short-term approach requires both methodological validation and validation of results, both of which occurred in the C3P food security work.

Methodology

Study area and sample size

Surveys were conducted in six countries of eastern and central Africa namely Uganda, Kenya, Tanzania, Burundi, Rwanda and the DR Congo between July 2006 and July 2007. Sample sizes and numbers of districts/provinces surveyed are listed in Table 1. The country studies were published in food security briefs on http://c3project.iita.org

Data and data analysis

Data were collected through interviews using a structured questionnaire. The survey obtained quantitative and qualitative data on several variables relevant to the computation of different food security indicators. These included types of foods and food

Table 1: *Countries and districts surveyed*

Country	Sample size	Number of districts/ provinces surveyed[1]
Uganda	1076	22
Kenya	262	6
Tanzania	320	10
Burundi	331	13
Rwanda	402	5
DRC	480	4

[1]Including districts integrated as databases in previous surveys used in the food security assessment in Uganda

groups produced and consumed and their quantities, household incomes and expenditures, respondents' perception of their food security status, months of the year in which households are food-insecure, and food insecurity coping mechanisms. Since the studies also sought to investigate the relationship between the crop diseases, i.e. CMD and BXW and household food security, data were collected as well on households' experience with the diseases and the effect that they have had on households' food security status. Other data collected included households' GPS coordinates, socioeconomic and demographic variables such as household size and composition by age and sex, education level of household head, land holding, labor availability, availability of and accessibility to seed/ planting materials, and constraints to crop production, all of which are thought to influence household food security.

The analytical data framework measured household food security, investigating the factors that influence it, and modeling the likely impact of losses due to CMD/ BXW on food security. Due to the complex and multi-dimensional nature of the concept of food security, these studies used a combination of indicators, which are broadly categorized into quantitative and qualitative indicators.

These include ***quantitative*** indicators:

- dependency on bananas and cassava in the caloric intake of households;
- calorie availability from own production;
- calorie intake from own production;
- cash income and food expenditures.

And a ***qualitative*** indicator:

- households' perception of their food security status.

Two of the quantitative indicators, "calorie availability" and "consumption/intake from own production", were obtained by converting quantities of foods produced and consumed into their kilocalorie equivalents. Average per capita calorie availability and intake were then compared with the FAO/WHO recommended intake of 2100 kcal per day.

Income and food expenditures were surveyed using expenditure tables for food and non-food items, as well as other cash flows (remittances, savings, credits and loans etc.)

The quantitative indicator, "household's perception of their food security status", was based on the food sufficiency question, which required respondents to indicate whether (i) they had enough of the foods they wanted to eat or (ii) they had enough but not always the kind of food they wanted to eat or (iii) they sometimes did not have enough food to eat or (iv) they never had enough food to eat. This variable was translated into temporary and permanent food insecurity.

Data analysis involved a computation of descriptive statistics for socioeconomic and demographic variables as well as the four quantitative indicators of food security. The second stage involved generating statistics from regression analysis, that would show the likely impact on household food security of losses due to CMD and BXW given households' resource constraints.

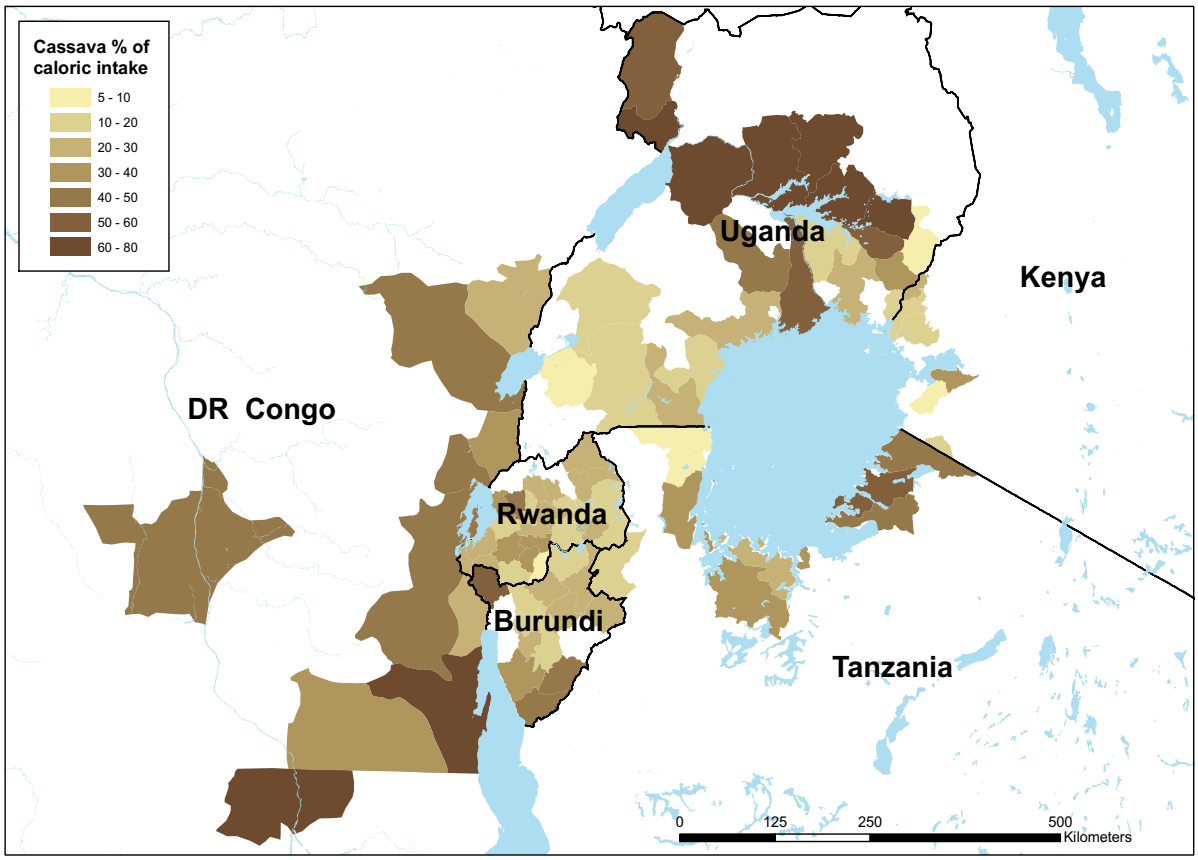
Geographical Information on Food Security in Eastern Africa

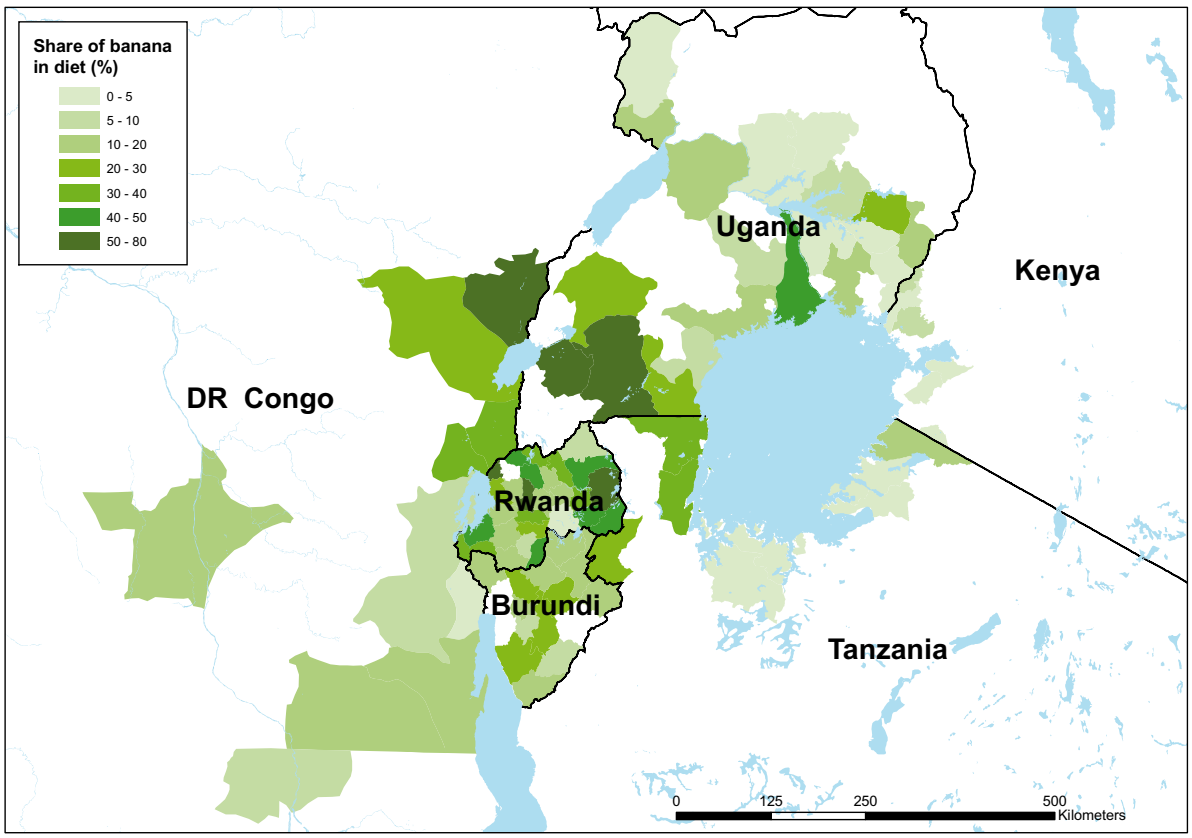
The various dimensions of food security, as described above, are shown in the following GIS maps.

Figure 1 contains two maps showing the share – and hence the importance – of cassava and bananas in people's diets throughout the region. Cassava is of high importance in central Uganda, northern Tanzania and the eastern DRC, as well as in some parts of Rwanda and Burundi. It is of lesser importance in western Uganda – where it is substituted by bananas, as well as in western Kenya, where maize is of higher importance.

This information is highly important for targeting measures to control CMD. The second map shows the respective diet share of bananas. Bananas are of major importance in western Uganda, in Rwanda and Burundi, and parts of Eastern DRC, with decreasing importance at lower altitude in DRC, Kenya, Tanzania and Uganda.

Having depicted the importance of the target crops for diets in the region, we look at overall production and income patterns to depict food security in terms of accessibility and availability, as well as qualitative food security indicators.

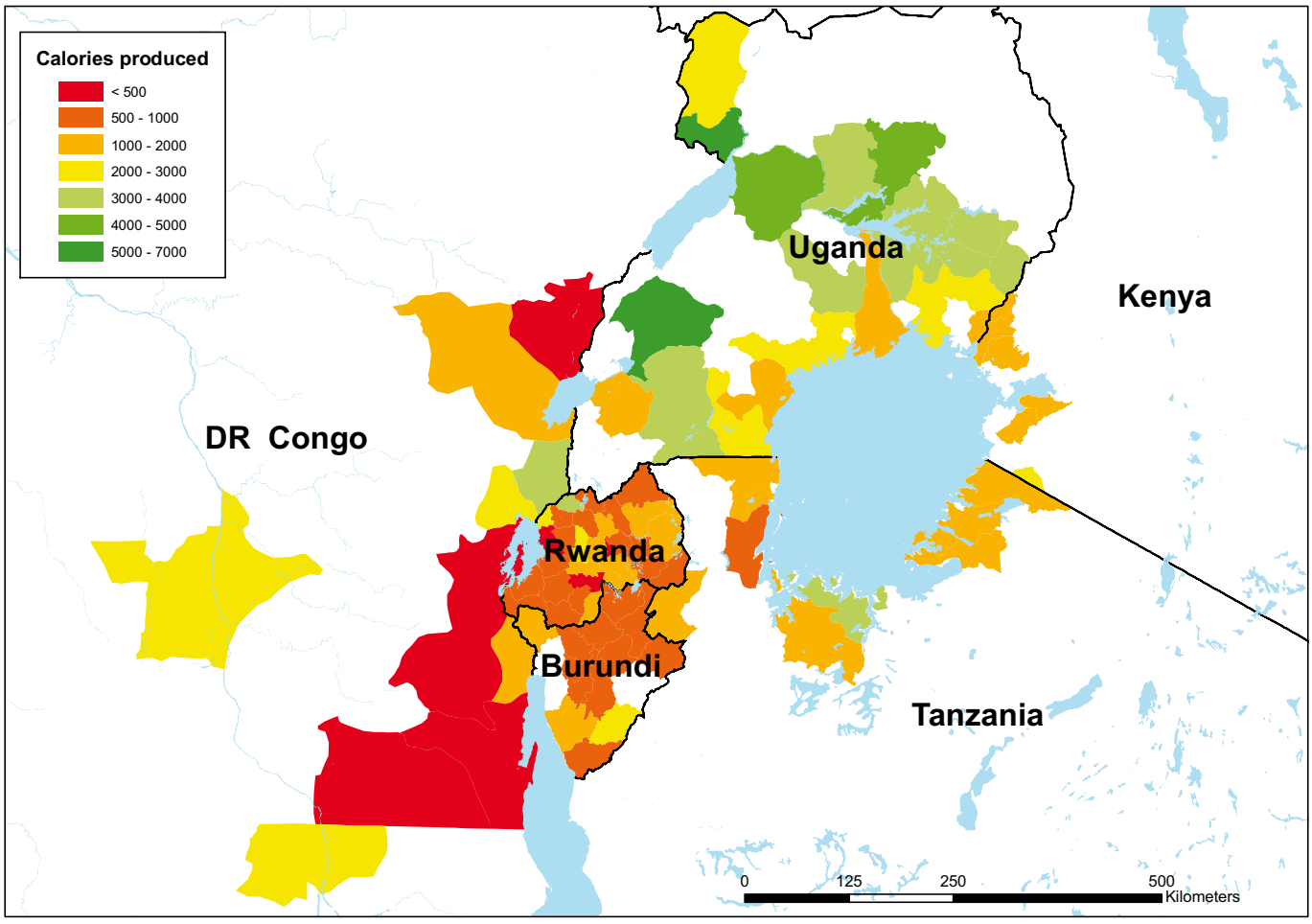




Source: Survey data

Figure 1: *Share of cassava and banana in diets*

Figure 2 shows the calories produced by households in the region on a calorie per capita per day basis. It can easily be seen that Uganda is the most food-secure country in terms of own production, with food-insecure areas only around Lake Victoria, where agricultural production is less important than non-agricultural income. For northern Tanzania and western Kenya, crop production is just about sufficient to cover the calorific needs of the population. However, there seems to be no surplus and thus food security seems to be less stable than in Uganda. It is also clear that food production in Rwanda, Burundi and along the eastern border of the DRC is not sufficient to cover the caloric needs of the population. The situation towards the west in the Eastern DRC seems to be less dramatic: surveys made in Maniema Province show calorie production per capita exceeding calorific needs.

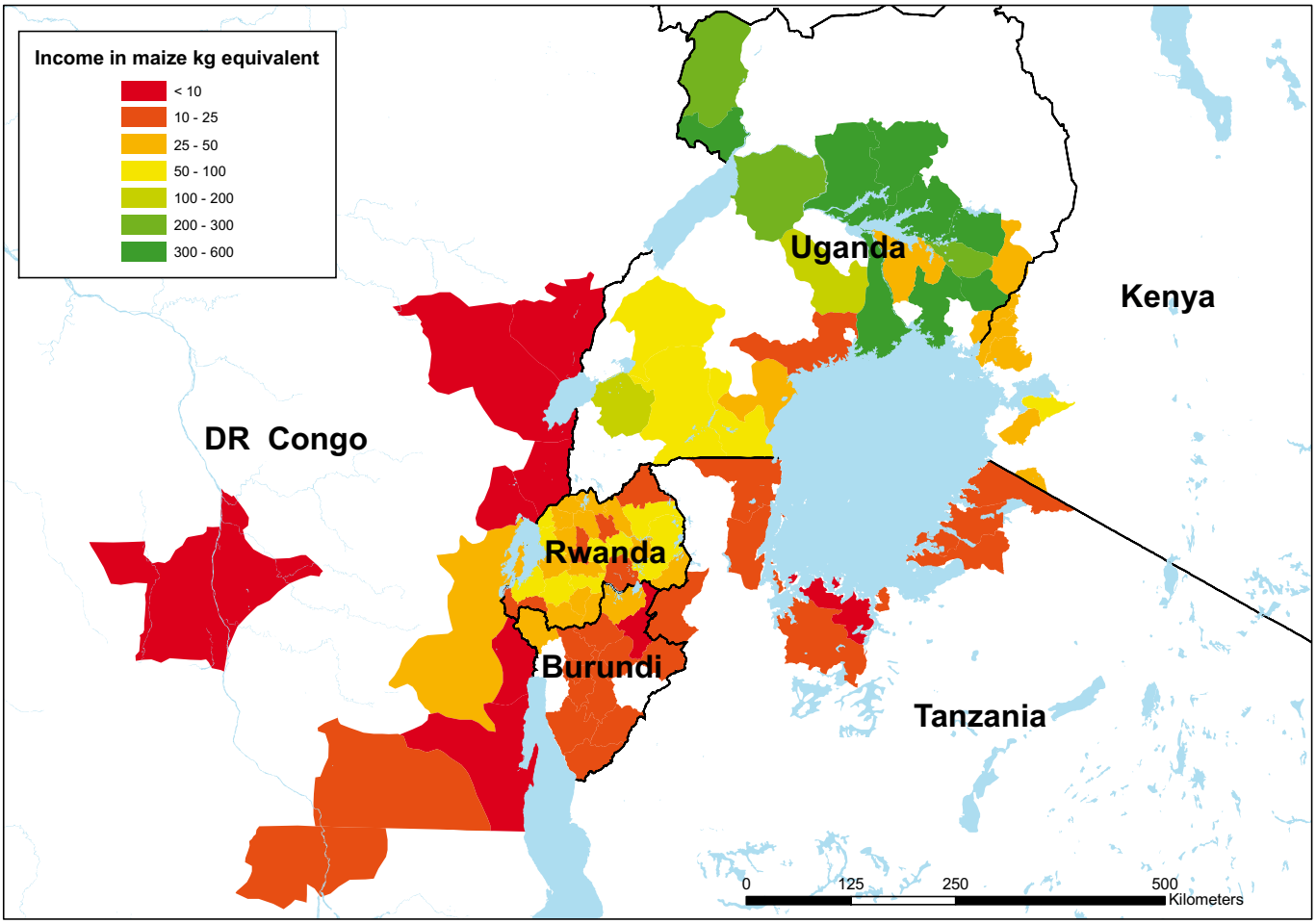


Source: Survey data

Figure 2: *Calories produced*

Figure 3 depicts the cash income situation of households in the region. To make household incomes comparable throughout the region and to further relate them to food security, we calculated maize equivalents from income, based on the cash income and local maize prices. We have chosen maize as the indicator staple due to its high caloric content and its tradability across the region. We assume that in case of severe food shortages due to domestic production failures, maize is the most efficient tradable in terms of calorie content and transportability.

The picture is basically the same as in the crop production, with Uganda having an overall good base of cash income to purchase food, whereas the rest of the region is rather unstable in terms of purchasing power of maize and therefore also in terms of food security. The western part of Eastern DRC, Maniema Province, which is better off in terms of crop production than neighboring Rwanda and Burundi, is worse off than these areas in terms of cash income, which indicates the subsistence orientation of these systems.



Source: Survey data

Figure 3: *Maize equivalents of cash income*

Figure 4 shows the mapping of the qualitative indicator: "people indicating whether they have sometimes or never enough to eat", which is an indicator of temporary or permanent food insecurity. As we are looking for an easy to survey food security indicator, we have tested the correlation between the above-computed two indicators (calorie production and maize equivalent of income) and the qualitative indicator (people claiming to have sometimes or never enough to eat). We assume that if there is a good correlation between an indicator that has been directly asked of people during the surveys and indicators that have been derived from the survey data, the qualitative indicator is a valid indicator for the quantitative indicators and therefore overall food security. Correlation and regression analyses showed that calorie production and income maize equivalent are significantly correlated with temporary and permanent food insecurity, and we conclude that temporary and permanent food insecurity as stated by the households are a valid indicator for food insecurity.

The resulting map (Figure 4) shows a good summary of the previously discussed indicators by means of temporary and permanent food insecurity. In Uganda, most of the people are food-secure, whereas in adjacent western Kenya and northern Tanzania, up to half of the population have temporary or permanent problems to get enough food. The situation gets worse in Burundi and Rwanda, as well as in the Eastern DRC, with, again, better perspectives in Maniema Province, in the west of Eastern DRC.

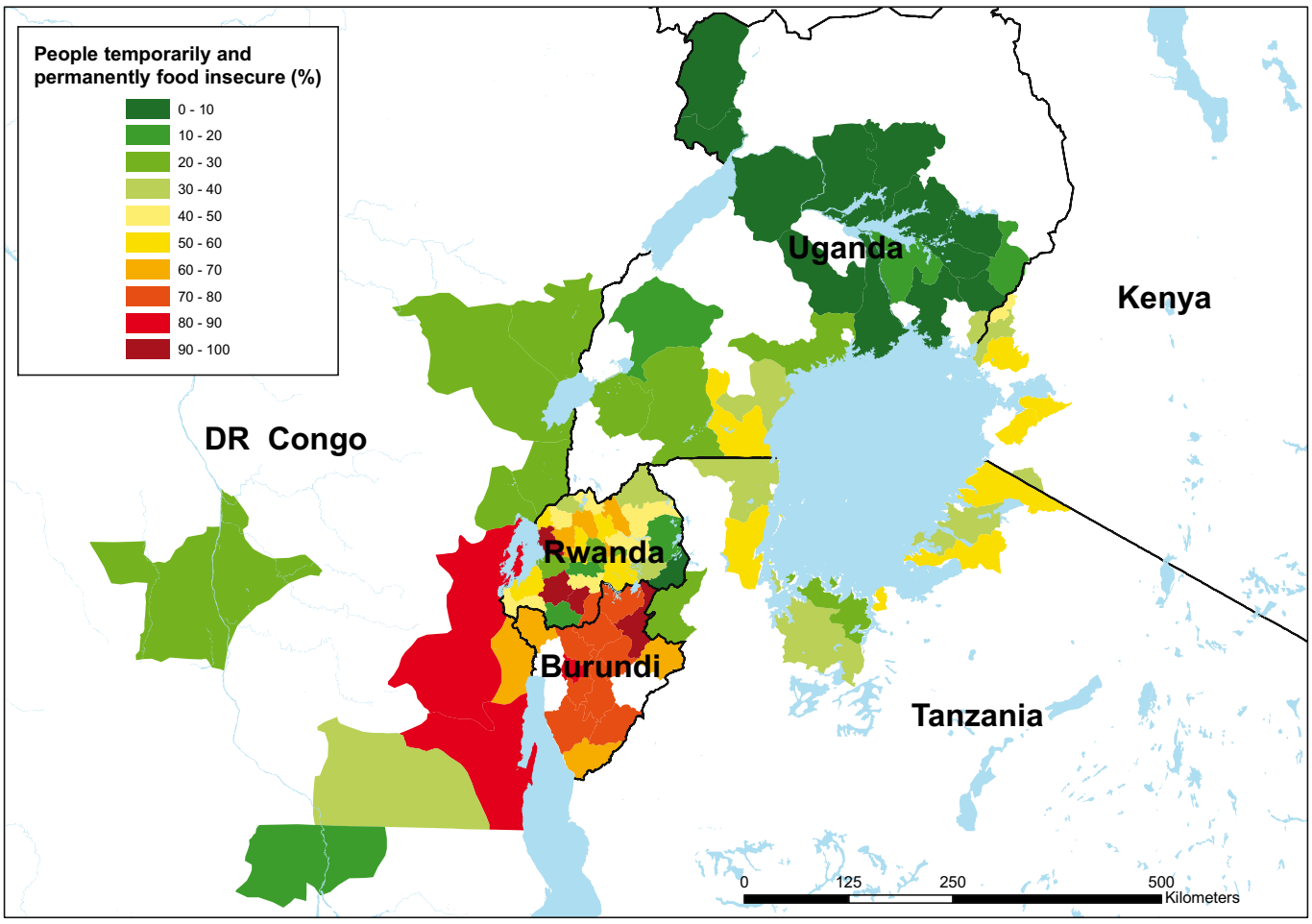


Figure 4: *Temporary and permanent food insecurity*

A Brief Comparison with FEWSNET GIS on Food Security

FEWSNET (United States Agency for International Development (USAID) Famine Early Warning System) has a longstanding and methodologically acknowledged information system on food security worldwide, including some C3P countries in Eastern Africa, namely Kenya, Tanzania, Uganda and Rwanda. For 2007 – the main C3P survey year – FEWSNET forecasts show a good congruence with the C3P food security findings. While it seems to be agreed that Uganda is generally food-secure – with the exception of the political crisis zones in the north (FEWSNET 2007a), there also seems to be consensus that western Kenya is moderately food-insecure (FEWSNET 2007b). Tanzania seems to be food-secure, with some insecurity along Lake Victoria, similarly to the C3P findings, with a slightly negative east-west gradient (FEWSNET 2007c). For Rwanda, both C3P and FEWSNET findings show problematic zones in the northeast, and the northwest, with only the center of Rwanda being fairly food-secure (FEWSNET 2007d).

Food Security and Vulnerable Groups

An important output of the study was to determine particularly vulnerable groups in terms of food security and describe their social and economic characteristics.

The variable for food security in this assessment is caloric intake from own crop production. Explanatory variables are cash income (derived from cash expenditures), losses from diseases like CMD, and farm and household characteristics, both socio-demographic and economic. Table 2 shows the example of Uganda. It can be seen that caloric intake is significantly related to cash incomes, both farm and off-farm – although this caloric intake is from subsistence production. If we see cash income and expenditures as an indicator for economic wealth and market access (as market transactions are mainly characterized by cash flows), it is interesting to see that the more people earn and have access to markets, the more productive their subsistence production is. A handy explanation for this might be that the more they produce, the more they can sell, so that a higher subsistence intake also means more surpluses to sell. But that is not the only explanation, as cash income is not only agricultural, but also non-agricultural income: higher productivity of cash-endowed households might be due to money spent on inputs that have a positive effect on both cash and food crops, or due to market signals that allow more efficient “make or buy” decisions, including the minimization of risk and the optimal exploitation of comparative advantages. As income increases, food consumption from subsistence production decreases, indicated by the negative coefficient of the squared expenditures: high-income households with a large share of off-farm income buy their food instead of producing it.

Table 2: *Determinants of caloric intake in CMD-affected households in Uganda*

Variable	Coefficient	Significance (t-value)
Caloric intake from own production	Dependent variable	
Household expenditures	**5.36**	**2.10**
Square term of household expenditures	**-0.24**	**-1.97**
Education of household head	-0.004	-0.61
Age of household head	-0.006	-0.41
Household size	**-0.79**	**-1.53**
Cassava losses from CMD	-0.02	-3.63
Gender of household head	**0.02**	**2.78**
Household labour employed on farm	0.003	0.39
Land owned by household	**0.05**	**4.81**
CONSTANT	-23.15	-1.79

Source: own calculations

One possible conclusion from the subsistence production/income relation could be that markets and good access to them foster not only commercial but also subsistence production – and vice versa: production surpluses enhance market interactions through sales opportunities.

Beyond the relation between income and subsistence production, the analysis also allows one to determine which kind of households are most food insecure. Criteria for the selection of characteristics are the significance of the coefficients for the respective characteristic, indicated by the t-value in Table 2. In the Ugandan example, the variable "household size" has a negative and significant sign, which means that the larger the household, the smaller is the per capita caloric intake from food production. At the same time, the more land the household owns, the higher is the per capita caloric intake from own food production, implied by the positive sign of the coefficient. Consequently, households with little land and a large number of family members, as well as female-headed households are most vulnerable. All other sociodemographic coefficients are not significant in terms of t-values above one and thus cannot be used for characterizing the vulnerability of the households.

With the same kind of regression having been made for the other five countries, Table 3 below shows that vulnerable groups differ from country to country. While low income classes are vulnerable to food insecurity throughout the region, food security vulnerability characteristics differ from country to country.

In Kenya, for example, households headed by people with low education and labour constrained households are most vulnerable.

In Tanzania, labour constrained households are the most vulnerable, whereas in Rwanda households headed by younger people are vulnerable. In Burundi, low education levels, young household heads, large household sizes and female household heads drive food security vulnerability.

In the DRC, it is the younger headed and low-education headed households that are most vulnerable to food security. Surprisingly, female headed households are better off in terms of food security than male headed ones, probably due to different resource allocation patterns and decision making preferences between female and male decision makers.

Table 3: *Vulnerable groups in the C3P target countries*

Country	Kenya	Uganda	Tanzania	Rwanda	Burundi	DRC
Specific social target groups	Low income low education headed households, labor constrained households	Low income land-poor, large households, female headed households	Low income labor constrained households	Low income low-age headed households	Low income low education headed, low-age headed, large household size, female headed households	Low income low-age headed, low education headed, male headed household

Conclusions

The C3P food security study has yielded valuable results, both methodologically and empirically.

In terms of methods, short-term surveys were carried out, which reduced the assessment time for food security in vulnerable regions significantly. Additionally, effects of crop diseases were integrated into food security assessments, providing quantification of cassava diseases' effects on food security. The model can also be easily applied to other starchy staple crops, such as bananas or other root crops.

On the empirical side, the study provides information on various dimensions of food security in six countries in the Great Lakes Region, in a detailed way that is difficult to find elsewhere, especially for Eastern DRC and Burundi. Statistical tests and validation of results with findings from other studies have confirmed the validity and accuracy of the results. It is hoped that both the methodological and empirical results of the study will be used further in research and development projects.

The complete food security study on which this brief is based can be found at http://c3project.iita.org

Getting ready for the evening meal.

Farmers harvesting cassava.

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