

# Explaining Cropping Choices under Extreme Uncertainty: Evidence from Conflict Prone North Kivu, DR Congo

Naureen Fatema

PhD Candidate,

McGill University

Email: [naureen.fatema@mail.mcgill.ca](mailto:naureen.fatema@mail.mcgill.ca)

Shahriar Kibriya

Center on Conflict and Development

Email: [shahriar@tamu.edu](mailto:shahriar@tamu.edu)

Department of Economics

McGill University

Leacock Building, Room 414

855 Sherbrooke Street West

Montreal, Quebec, H3A 2T7

Tel.: 514-398-3030

Fax: 514-398-4938

Selected Poster prepared for presentation at the 2015 Agricultural & Applied Economics Association and Western Agricultural Economics Association Joint Annual Meeting, San Francisco, CA, July 26-28.

Copyright 2015 by Naureen Fatema and Shahriar Kibriya. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies.



# Explaining Cropping Choices under Extreme Uncertainty: Evidence from Conflict Prone North Kivu, DR Congo

Naureen Fatema

Shahriar R Kibriya

naureem.fatema@mail.mcgill.ca

shahriar@tamu.edu

## Abstract

Much of the literature on developing countries has investigated ways in which farming households choose different cropping systems to hedge against uncertainty caused by weather and production shocks (e.g. Dercon, 1996 and Morduch, 1990). Very few studies have extended the analysis to examine the effects of uncertainty arising from violence or prevailing socioeconomic challenges. In this study we test whether cropping decisions of small stakeholder farmers living in the conflict prone agrarian province of North Kivu are rational and can be explained by the level of exposure to conflict, social empowerment and access to markets and information. We further investigate if contracts or guaranty from buyers through market access can partially act as a buffer against the uncertainty brought upon by conflict. We find that increased exposure to social conflict increases cultivation of conflict-resistant crops and crop diversification; low access to markets and information as well as the lack of contracts reduces cultivation of conflict-resistant crops and crop diversification; we find mixed results for social empowerment.

## Problem Statement

Do households in conflict prone North Kivu behave rationally when making farming decisions?

## Research Approach and Data

- We collect data from household surveys of 2258 small stakeholder farmers from 50 groupments in Beni, Lubero, and Rushuru regions of North Kivu, Eastern DR Congo.
- The sampling methodology was designed to ensure each village in the selected regions have equal selection likelihood. We implemented a grid based sampling methodology. Each region was divided into 5kmx5km squares.
- We gathered information on household and farm level characteristics, asset information, land access and entitlements, food security, social conflict, access to markets, knowledge and technology, social cohesion, empowerment and voice, etc.
- Given the cross-sectional nature of our dataset, we cannot control for unobserved heterogeneity within households. Nor can we find a suitable and valid instrument that would be partially correlated with our explanatory variables, but uncorrelated with unobserved heterogeneity.
- To mitigate any bias this might introduce, and in order to capture at least some heterogeneity across groups of households, we use OLS estimation with ethnic groupement fixed-effects.

## Variable Definitions

**Dependent variables:** Choice of different cropping systems - food crops, cash crops and conflict resistant crops; and crop diversification.

- Food crops are defined as crops that households primarily grow for their own consumption (e.g. maize, millet, wheat) while cash crops are crops which are grown primarily for selling (e.g. coffee, cocoa, sugarcane and rubber).
- From a list of 29 crops commonly grown in the study areas farming households were asked to choose which they grow for consumption and which were grown primarily for selling.
- Conflict-resistant crops are defined as crops which are difficult to loot, such as root crops (e.g. cassava, yam and plantain) as well as crops that households reported were never looted (e.g. palm oil).

**Choice variables:** Exposure to social conflict, social empowerment and market access.

- Social conflict categories include conflict with neighbors and fellow villagers, border conflict with landholders, conflict over community resources, land or resource conflict with government and rebel forces, etc. Over 14 such categories were identified. The Conflict Level variable was constructed depending on the different categories of conflict faced by households.
- Access to markets and information include communication with crop buyers, government and non-government institutions regarding production, sales or markets, farmer trainings, credit and insurance services among others.

**Control variables:** Household income, size, education, groupement, territory and village, access to technology, land rights, food security, cooperative membership.

## Discussion

Based on our results, the following conclusions may be drawn:

- Exposure to conflict increases conflict resistant crop cultivation** for both food crops as well as cash crops and leads to **greater crop diversification**. This seems logical since households that are more prone to social conflict need to hedge against this uncertainty by diversifying their crops more and by cultivating conflict-resistant crops.
- Farming households that have **low market access and information** (such as information on production, sales or markets, trainings, credit and insurance services) from crop buyers, government and non-government institutions tend to **grow less conflict-resistant crops**. Low market access and information also leads to **lower crop diversification**. It appears that households that have contracts with buyers tend to grow less conflict-resistant food crops and diversify crops less. A potential explanation for this may be that pre-determined contracts with buyers acts as a form of insurance against the uncertainty arising from conflict, providing less need to diversify or grow conflict resistant crops.
- Households with **greater social empowerment grow less conflict-resistant food crops and diversify less**. Further research is need to determine the channel through which social empowerment may reduce the incentive to cultivate conflict-resistant crops or diversify more.

## Regression Results

Dependent Variable VARIABLES	Conflict Resistant Food Crops		Conflict Resistant Cash Crops		Crop Diversification	
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict Level	0.156*** (0.0278)	0.137*** (0.0268)	0.0781*** (0.0215)	0.0814*** (0.0206)	0.477*** (0.0752)	0.445*** (0.0698)
Low Market Access and Information	-0.299*** (0.0745)	-0.0871 (0.0747)	-0.267*** (0.0576)	-0.102* (0.0572)	-1.465*** (0.201)	-0.822*** (0.194)
Contract with Buyer	-0.403*** (0.125)	-0.199* (0.119)	0.0155 (0.0969)	0.0197 (0.0909)	-1.329*** (0.339)	-0.635** (0.308)
Empowerment	-0.706*** (0.148)	-0.902*** (0.144)	-0.112 (0.115)	-0.0647 (0.111)	-1.992*** (0.400)	-2.035*** (0.375)
Social Cohesion	0.0950 (0.0780)	0.0862 (0.0722)	0.101* (0.0603)	0.127** (0.0553)	0.389* (0.211)	0.377** (0.188)
Cooperative Membership	-0.196** (0.0812)	-0.0601 (0.0772)	-0.166*** (0.0627)	-0.104* (0.0591)	0.142 (0.219)	0.361* (0.201)
Household Size	0.0478*** (0.0142)	0.0319** (0.0145)	0.00394 (0.0110)	-0.0161 (0.0111)	0.188*** (0.0383)	0.146*** (0.0376)
Income	-3.93e-10 (8.06e-09)	1.10e-09 (7.30e-09)	-1.21e-09 (6.23e-09)	1.69e-09 (5.59e-09)	8.03e-09 (2.18e-08)	1.33e-08 (1.90e-08)
Education	0.00208 (0.00797)	0.00293 (0.00745)	0.00244 (0.00616)	0.00345 (0.00571)	-0.0133 (0.0215)	0.00885 (0.0194)
Access to Technology	0.280*** (0.0822)	0.163** (0.0772)	0.226*** (0.0636)	0.0856 (0.0591)	0.785*** (0.222)	0.401** (0.201)
Constant	2.816*** (0.335)	1.757*** (0.614)	0.705*** (0.259)	0.692 (0.471)	5.303*** (0.905)	4.499*** (1.597)
Observations	1,440	1,440	1,440	1,440	1,440	1,440
R-squared	0.208	0.378	0.158	0.352	0.253	0.459
Controls	YES	YES	YES	YES	YES	YES
Groupement FE	NO	YES	NO	YES	NO	YES

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Note: For the sake of brevity, not all Control variables are shown in the regression table.

## Conclusion and Suggestions

From this study we conclude that farming households in conflict prone areas of North Kivu display rational behavior when making farming choices in the following ways:

- Conflict resilient farming practices are adopted by the farmers who experience a higher level of violence.
- Higher exposure to conflict also causes farming households to greater crop diversification.
- Farmers with greater access to markets and information invest more in conflict-resistant farming practices and diversify more.
- Farmers who do not have contracts with or guaranty from buyers invest more in conflict resilient crops and crop diversification.
- In most cases farmers with lower social empowerment and cohesion tend to invest more in conflict resilient farming practices and crop diversification.

The policy implications that can be drawn from this study are that improving access to markets and information as well as increasing social cohesion can help farming households in conflict prone agrarian societies such as North Kivu to adopt conflict resilient farming practices. This in turn might help them to cope better with the adverse effects of long term conflict and social unrest that has become an integral part of their life and livelihood.

The authors are grateful to USAID, the Howard G. Buffett Foundation, Natalia Gonzalez, Edwin Price and Graham Savio, and other researchers of the Center on Conflict and Development for their financial and intellectual support.