Adoption of Improved Seed, Varietal Diversity and their effects on Maize Productivity in Kenya

Brian Chiputwa¹, Genti Kostandini², Olaf Erenstein³ and Girma T. Kassie⁴

¹GlobalFood Program, Department of Agricultural and Rural Development, University of Göttingen, Germany
²Department of Agricultural and Applied Economics, University of Georgia, Athens, Georgia 30602.
³International Maize and Wheat Improvement Center (CIMMYT), Addis Ababa, Ethiopia
⁴International Maize and Wheat Improvement Center (CIMMYT), Harare, Zimbabwe


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1GlobalFood Program, Department of Agricultural and Rural Development, University of Göttingen, Germany
2Department of Agricultural and Applied Economics, University of Georgia, Athens, Georgia, USA.
3International Maize and Wheat Improvement Center (CIMMYT)

1. Introduction

• Production risk in Agriculture is a prominent threat to farmers’ livelihoods.
• Factors contributing to production risk and uncertainty include adverse weather, input and output prices, pests and diseases.
• In most developed countries systems are in place to cushion farmers from against risk exposure e.g. crop insurance and futures markets.
• Due to imperfect and incomplete markets in developing countries, farmers manage risk by controlling levels of input use like land, fertilizer, and seeds.
• Seed management can involve adoption of improved varieties or growing multiple varieties simultaneously.

2. Objectives

Main objectives of this paper:
• To estimate the effects of improved varieties and maize diversity on the three moments of production (mean, variance and skewness).
• To draw insights on how improved seeds and maize diversity affect exposure downside risk by maize farmers.

3. Methodology

• A multi-stage random sampling was used to select 349 households in Machakos and Makueni districts in Kenya.
• A structured questionnaire was used and survey districts are classified in the 20-40% medium drought risk zone.
• For full survey details, refer to Muhammad et al. (2010).
• The surveys were conducted by the International Maize and Wheat Improvement Centre (CIMMYT) under the Drought Tolerant Maize for Africa (DTMA) initiative and supported by the Bill & Melinda Gates Foundation and Howard G. Buffett Foundation.

4. Results & Discussion

• To express maize diversity, we use the Margalef Index calculated as follows:

\[ M = \frac{S - 1}{\ln N} \]

Where \( M \) = Margalef Index, \( S \) = # of maize varieties & \( N \) = Area under maize
• We used a Generalized Method of Moments (GMM) to generate the three moments of maize production (Mean, Variance and Skewness).
• We then used a Three Stage Least Squares Regression to model the effects of improved varieties and diversity on the three moments.

5. Conclusions

Econometric Results:
• Mean function: Land, fertilizer and improved seed have the greatest positive influence on mean yields,
• Variance function: Variables household size, altitude, and diversity contribute to the highest variability with elasticities of 0.39, 0.34 and 0.11, respectively.
• Skewness function: Higher maize diversity and farm altitude both negatively in their linear form, both increase farmers’ exposure to downside risk.
• However, high levels of maize diversity in areas of higher altitude and low rainfall reduces farmers’ exposure to downside risk.
• Use of Improved seeds also reduces exposure to downside risk.

Observations
7.757*** 0.165*** 0.150***
0.00740** 0.0372*** 0.0486***
0.0119 0.0508 0.00859
0.0111 1.555** 0.453***
0.0222 0.4960*** 0.689

Significance level: *** = 1% and ** = 5% Source: DTMA Survey data Interaction terms

R-squared 0.868 0.751 0.689

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Contact information: Brian Chiputwa Brian.Chiputwa@agr.uni-goettingen.de