Improved production systems for traditional food crops: The case of finger millet in Western Kenya.

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Background

- The dissemination of yield improving and sustainable agricultural practices is critical to close the gap between actual and potential yields and improve food security in rural Africa.
- Small-scale farmers often face barriers to the adoption of improved practices due to poor access to inputs, financial capital, & information.
- While much research has been done on the adoption of improved cropping practices in the production of main staple crops, information on adoption processes in traditional cereal production is scarse.

Finger millet in Western Kenya

- Over the past decades, finger millet has been widely ignored by policy makers and researchers and most farmers have switched from finger millet to maize production.
- In comparison to maize, finger millet offers three main advantages:

Agronomic properties:

Millets are more resilient towards poor soils and erratic weather conditions.

Micronutrient supply:

Finger millet is richer in minerals, vitamins, and essential proteins.

Farm incomes:

Market prices are currently higher for finger millet than for any other cereal.

Research objectives

- We aim to analyze the factors that influence the adoption of improved finger millet practices. In particular,
  - we compare adoption determinants across finger millet and maize production.
  - we focus on the effect of social networks and connectedness.
- Finally, we assess the impact of improved practices on millet yields.

Hypotheses

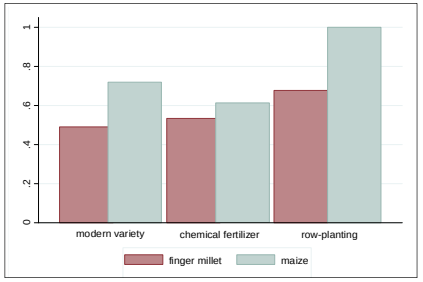
- Social networks and connectedness are of particular importance in the context of neglected crops like finger millet, since formal sources of information are scarce.
- Traditional cereal yields can be substantially improved through the adoption of modern cropping practices.

Data collection

Stratified random sampling to interview 270 farmers in 15 locations:

- In 12 locations the Kenyan Agricultural Research Institute (KARI) had provided finger millet extension to farmer groups.
- Interview with a random sample of 9 group members and 9 non-group members in each KARI location.
- Interview of 18 randomly selected farmers in the external locations.

Adoption rates



Econometric approach

- Multivariate probit model to simultaneously estimate the adoption of several practices in finger millet and maize production.
- Cobb-Douglas production function to analyze the effect of improved finger millet practices on yields (treatment effects model to control for potential selection bias)

Results of adoption analysis (Table does not show the complete regression output.)

	Finger millet			Maize	
Variable	**modern variety**	**row-planting**	**chemical fertilizer**	**modern variety**	**chemical fertilizer**
Farm size	.053 (.043)	.013 (.068)	.013 (.043)	-.051 (.029) *	-.018 (.033)
Nr. of group memberships	.017 (.112)	.265 (.142) *	-.006 (.100)	.239 (.105) **	.123 (.095)
Group purchase of inputs[a]	.5857(.265) **		.229 (.276)	.114 (.261)	.149 (.264)
Contact intensity	.090 (.031) ***	.090 (.032) ***	.084 (.028) ***		
Owns cell phone [a]	.818 (.351) **	-.045 (.460)	.740 (.389) *	.127 (.298)	.123 (.328)
Market distance (walking minutes)	-.002 (.002)	.002 (.002)	-.003 (.001) *	-.000 (.001)	.000 (.001)
Extension on millet[a]	1.291 (.238) ***	1.492(.358) ***	1.022 (.270) ***		
Extension on maize[a]				.011 (.246)	.078 (250)

*** , ** , and * indicates that the result is significant on a 1% , 5%, or 10% significance level, respectively

[a] Variable is a dummy

Values in brackets are standard errors

N	250	Prob>Chi²	0.000
Wald Chi² (78)	449.030	Log pseudolikelihood	-1757.972

- Variables related to social networks and connectedness (e.g. group membership, group input purchases, ownership of a cell phone, extension) have a strong influence on the adoption of improved finger millet practices.
- Except for group membership, these variables do not have a significant effect in the context of improved maize cropping practices.
- The error terms of several equations are positively and significantly correlated, indicating synergies rather than trade-offs between the different practices.

Results of Cobb-Douglas function

Variable	**Coefficient**	**Standard Error**
modern variety[a]	.729 ***	.266
ln chemical fertilizer (kg)	.159 ***	.047
ln seed quantity (kg)	.268 ***	.096
ln soil prep. and sowing labor (days)	.001	.114
ln weeding labor (days)	.156	.096
use of an ox-tractor[a]	.350	.176
early planting[a]	.203	.168
row-planting[a]	.024	.241
zero chemical fertilizer[a]	-.188	.202
organic fertilizer[a]	.104	.180
high soil fertility[a]	-.047	.164
altitude	-.000	.000
constant	4.333 ***	.904

N	267	Log pseudolikelihood	-1805.372
Wald Chi² (12)	104.490	Wald test of indep. Eqns.	3.860
Prob > Chi²	.000	Prob > Chi²	0.050

*** indicates that result is significant on a 1% significance level

[a] Variable is a dummy

- Treatment effects model controls for endogeneity of using a modern variety
- The adoption of a modern variety increases yields by 107% [exp(.729)-1].
- Increasing fertilizer quantity by 1% leads to a yield increase of 16%.

Conclusions and policy implications

- Improved cropping practices for traditional food crops are widely applied once constraints such as lack of information and access to inputs can be overcome.
- Yields of traditional food crops can be substantially increased through the adoption of improved cropping practices.
- Crop-specific extension programs and strengthening of farmer groups is of particular importance for dissemination of improved cropping practices in traditional food crops.

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