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

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## Background

Å 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.

Å Small-scale farmers often face barriers to the adoption of improved practices due to poor access to inputs, financial capital, & information.

Å 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

Å 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.

Å 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

Å 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.

Å Finally, we assess the impact of improved practices on millet yields.

## Hypotheses

Å Social networks and connectedness are of particular importance in the context of neglected crops like finger millet, since formal sources of information are scarce.

Å Traditional cereal yields can be substantially improved through the adoption of modern cropping practices.

## Data collection

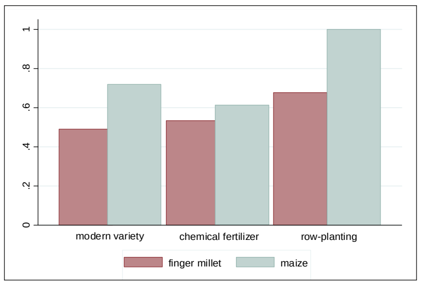
Stratified random sampling to interview 270 farmers in 15 locations:

Å In 12 locations the Kenyan Agricultural Research Institute (KARI) had provided finger millet extension to farmer groups.

Å Interview with a random sample of 9 group members and 9 non-group members in each KARI location.

Å Interview of 18 randomly selected farmers in the external locations.

## Adoption rates




## Econometric approach

Å Multivariate probit model to simultaneously estimate the adoption of several practices in finger millet and maize production.

Å 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 | $Prob>Chi^2$ | 0.000 |
| Wald $Chi^2$ (78) | 449.030 | Log pseudolikelihood | -1757.972 |

Å 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.

Å Except for group membership, these variables do not have a significant effect in the context of improved maize cropping practices.

Å 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 $Chi^2$ (12) | 104.490 | Wald test of indep. Eqns. | 3.860 |
| Prob > $Chi^2$ | .000 | Prob > $Chi^2$ | 0.050 |

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

[a] Variable is a dummy

Å Treatment effects model controls for endogeneity of using a modern variety

Å The adoption of a modern variety increases yields by 107% [exp(.729)-1].

Å Increasing fertilizer quantity by 1% leads to a yield increase of 16%.

## Conclusions and policy implications

Å Improved cropping practices for traditional food crops are widely applied once constraints such as lack of information and access to inputs can be overcome.

Å Yields of traditional food crops can be substantially increased through the adoption of improved cropping practices.

Å 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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