EGERTON UNIVERSITY

TEGEMEO INSTITUTE OF AGRICULTURAL POLICY AND DEVELOPMENT

Willingness to Pay for Soil Test on Smallholder Farms in Kenya

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Outline

- Background and problem
- Research objectives
- Research design, methods and data
- Results
- Key findings and implications for policy

Key Takeaway

- Soil testing services may not be within reach for a broad base of smallholder maize farmers in Kenya
  - Limited number of soil testing labs
  - Unaffordability?
    - Only 20% of farmers would pay the minimum current market price (KES 1,350) for basic soil test

Background and Problem

Persistently low agricultural yields in Kenya despite increased use of inorganic fertilizers

- Land management practices that deplete soil organic matter
- Improper application of chemical fertilizer has led to widespread soil acidity
  - Soil pH is below 5.5 most areas important in maize production
- Consequence is low crop response to inorganic fertilizers

Soil acidity problem in Kenya – example from previous soil tests

- 30% of soil samples from 4,800 farms in major maize growing areas had pH<5.5

- Soil pH in the 3.8 – 5.0 range in most parts of Trans Nzoia and Uasin Gishu counties – the most important in maize production

But research show that farmers are doing little to address the soil acidity problem!

- Is it a failure on the part of farmers to understand the specific needs of their soils?
  - Soil testing is uncommon, and few farmers know the condition of their soils (Olwande, 2018):
    - Less than 0.5% of farmers had their soils tested
    - No farmer applied lime despite the data showing that 46% of the plots had soil pH below 5.5, while 6% were very strongly acidic (pH<5.0) (Olwande (2018)
- Is it more a matter of contextual conditions in which farmers face overwhelming soil management constraints?
- Are lime and appropriate fertilizer blends available or is there major unmet demand and supply shortfall?

Research objectives

1. Characterize farmers' awareness of soil testing services and soil acidity condition on their farms

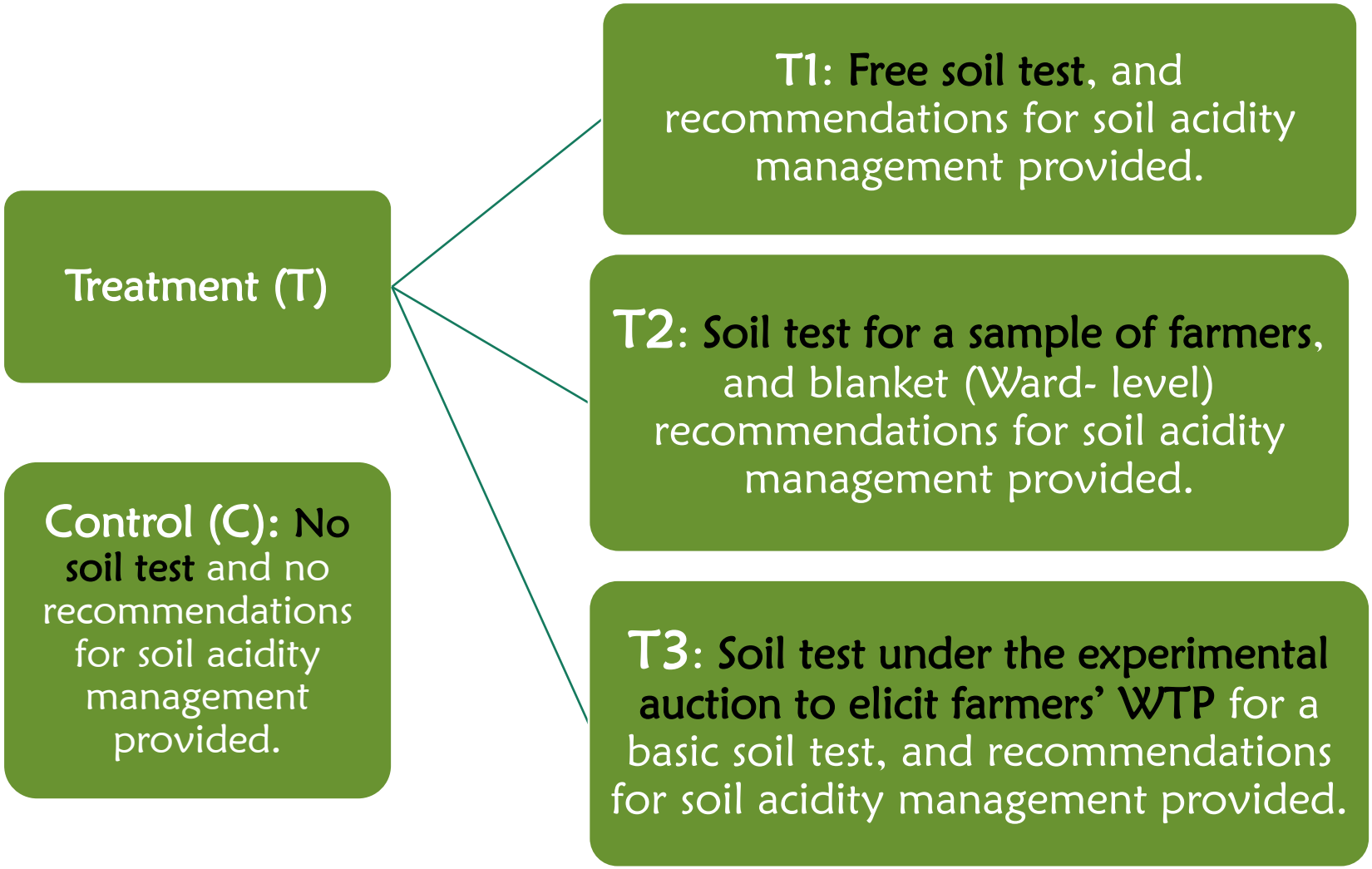
2. **Estimate farmers' willingness to pay for soil testing**

3. Evaluate the impact of soil test information on willingness to pay for and use of soil acidity management technologies and practices

Research design, methods & data

Research design - based on objective 3

- Randomized cluster design – 3 treatment arms and a control



Sample size

	T1	T2	T3	Control	Total
No. of counties	4	4	4	4	4
No. of wards (clusters)	8	8	8	8	32
No. of villages	40	40	40	40	160
No. of households	400	400	400	400	1600

Data

- **Baseline household survey** on 1600 households in June 2022
- **WTP experiment** on 370 farmers in Jan/Feb 2023
  - Experimental auction to elicit WTP for a basic soil test - soil pH, macro-elements (N, P and K), and soil organic carbon).
  - Becker-De Groot-Marschak (BDM) method (Becker et al., 1964)
    - A game of bidding, which provides strong incentives for farmers to reveal the true maximum price they are willing to pay for a one-time basic soil test
    - Provided endowment of KES 1700 (about USD 14 in Jan 2023) to participants which they could use to bid
    - Auction practice round conducted with a bar of soap to ensure participants understood the procedure before implementing WTP for soil test. Participants given KES 50 (about USD 0.41 in Jan 2023) which they could use for the practice round.
  - Focus on a farmer's largest (or most important) maize plot

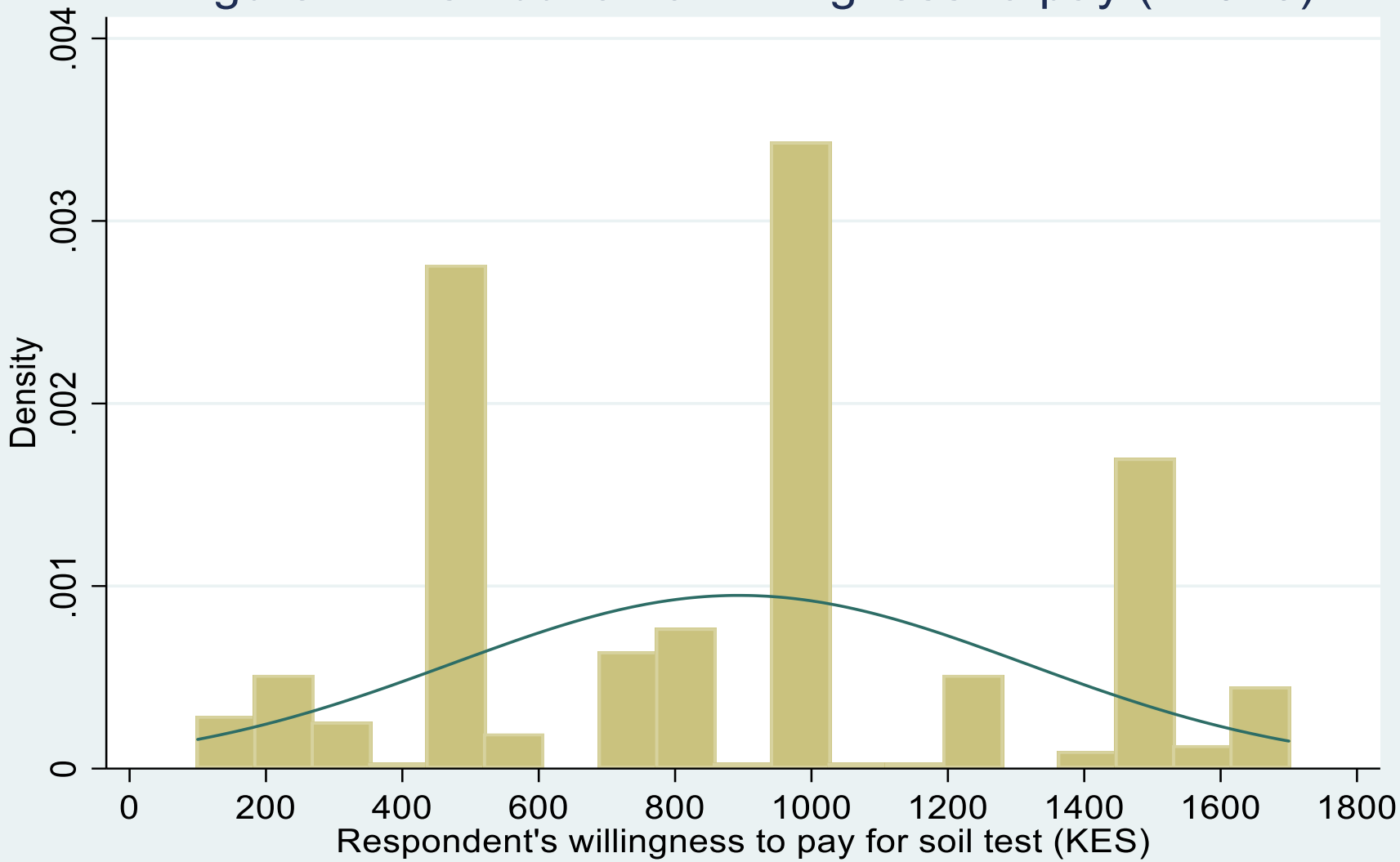
Results

#1: Only a few farmers have had their soils tested

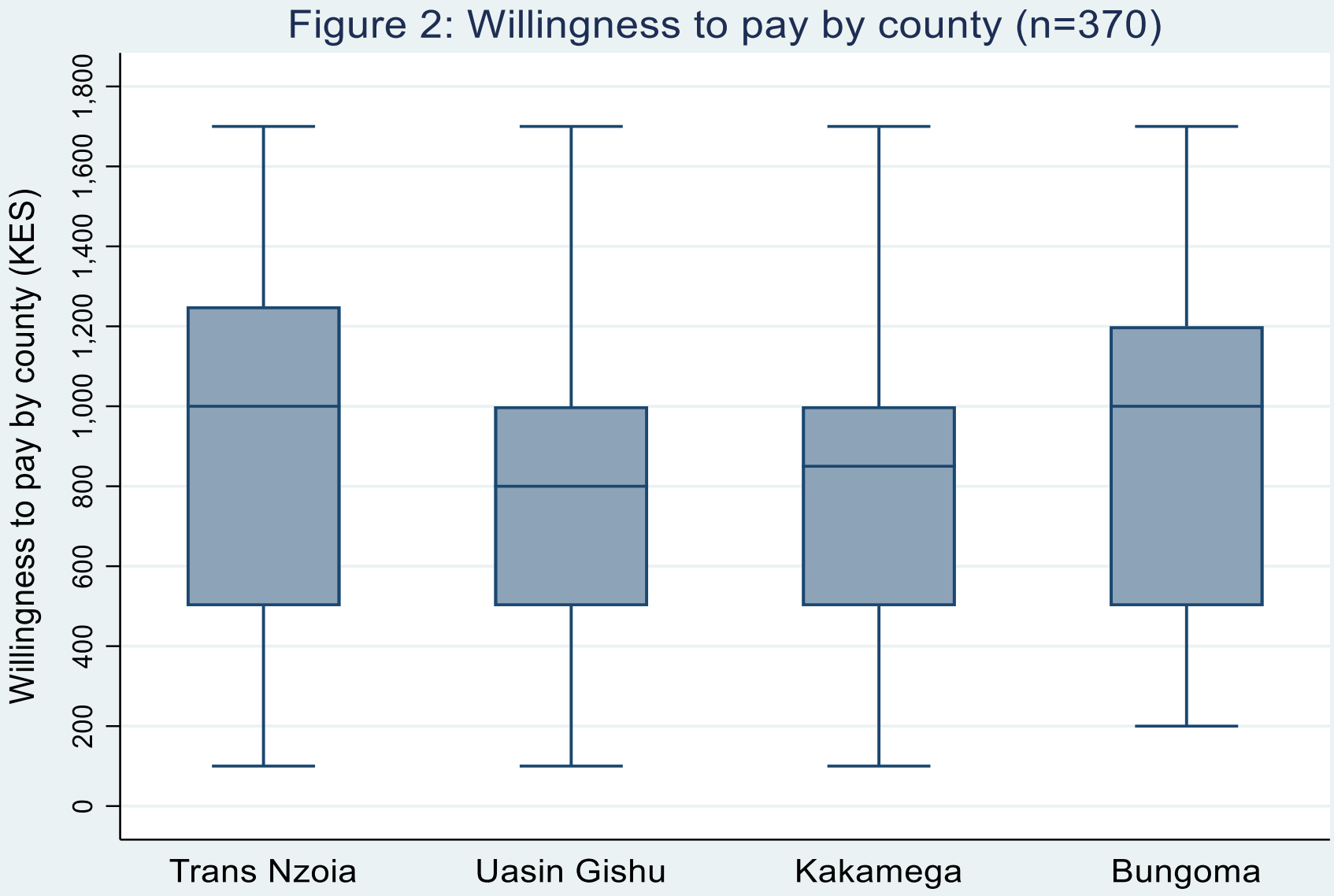
Has heard about soil testing (1=yes)	0.71
	(0.46)
Has had soil test done for the farm (1=yes)	0.079
	(0.27)
Knows where to obtain soil testing services (1=yes)	0.074
	(0.26)
Average distance from village to nearest soil testing facility/lab (km)	8.6
	(94)
Observations	**1600**

Standard deviation in parentheses

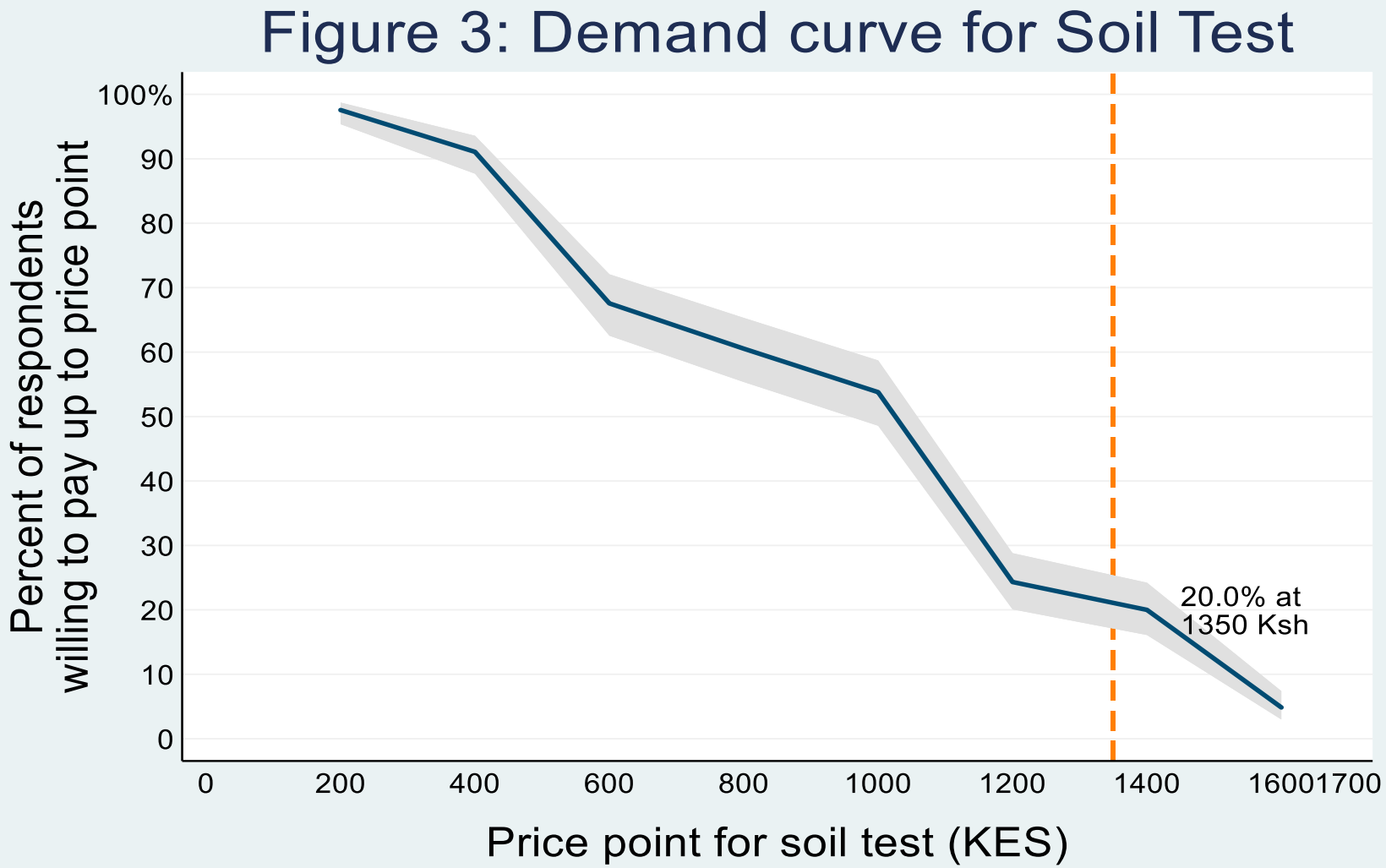
#2: Distribution of willingness to pay for soil test



#4: Willingness to pay for soil test, by county



#5: Demand curve for Soil Test



N = 370. These estimates represent the proportion of respondents willing to pay at or above a given price. The region shaded gray represents 95% confidence interval.

#6: Correlates of WTP for soil test

Variables	OLS coefficients	Tobit average partial effects
Age of household head (years)	-3.49*	-3.40*
Household landholding (acres)	23.01*	25.79**
Share of maize area to total area cultivated	172.31*	182.09*
Maize yield (tonnes/acre)	56.92***	57.23***
Observations	366	366
R-squared/ Pseudo R-squared	0.174	0.013

*** p<0.01, ** p<0.05, * p<0.10

Key findings

- Less than 8% of farmers have had their soils tested and less than that share know where to find soil testing service
- Mean WTP for basic soil test is below the current market price range (KES 1,350 – KES 2,500); only 20% of farmers would pay the minimum market price (KES 1,350)
- Larger landholding, greater intensity of maize cultivation and higher maize yield individually are associated with higher WTP for soil test
- Younger farmers are willing to pay more for soil test than older farmers

Implication for policy

- Soil testing services may not be within reach for a broad base of smallholder farmers
  - Limited number of soil testing labs
  - Unaffordability?
- Increasing use of inorganic fertilizers may be ineffective to raise maize yield if farmers do not apply soil management practices that match the needs of the soils

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Thank you

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