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MULTIVARIATE AND NON-PARAMETRIC METHODS FOR IDENTIFICATION OF FACTORS THAT DECIDE THE ADOPTION OF FERTILIZER USE BY RWANDAN FARMERS

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Fertilizer Use Statistics

China: 256 kg ha^{-1} India: 98 kg ha^{-1}
Sub-Saharan Africa: 9 to 11 kg ha^{-1}
Rwanda: 4 kg ha^{-1} (Before 2008)
Rwandan government and international agencies started to promote fertilizer use in 2008

Objective

Identification of factors that explain the decision of adopting fertilizer use by small-scale farmers in Rwanda

Methodology

1. Survey n=2022

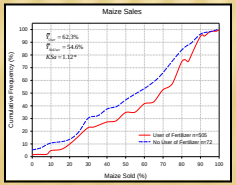
2022 farm households from 30 districts (4 provinces).
37 questions (variables): Demographics, socioeconomics, crop management

2. Factor Extraction

Principal Factor Analysis
$\mathbf{Y}=\boldsymbol{\mu}+\boldsymbol{\Lambda}\mathbf{f}+\boldsymbol{\varepsilon}$
Where **Y**: matrix of question scores; **μ**:vector of question means; **Λ**: matrix of factor loadings ; **f**: matrix of unknown uncorrelated factors;
ε: matrix of errors ~ $N_p(0,\psi)$
Sufficient estimators of μ and Σ are ȳ and S from sample.
Initial estimate of **Λ** by principal components of S – ψ
Final selection of **Λ** by Varimax rotation of **f**

3. Output Markets: % Maize Sales; % Vegetable sales
Area: Full Farm; Cropping area

Explanatory Variables of Principal Factors identified through high values of factor loadings associated with Survey Questions

4. 

Significance of Explanatory Variables

Fertilizer Users Vs. No F. Users tested with
Kolmogorov-Smirnov Test
Non-parametric test based in the largest difference between two distribution functions

RESULTS

Extraction of factors and Identification of explanatory variables:
9 factors explained 94% of the total variability contained in the survey answers matrix
Factor1: Percentage of Maize sales from total produced
Factor 2: Percentage of vegetable sales from total produced
Factor 3: Farming Area
Factor 4: Interest on increasing maize and vegetable production
Factor 5: Interest in obtaining credit to buy fertilizers for maize and vegetables
Factor 6: Understanding of fertilizer effect on maize and vegetable production
Factor 7: Interest on increasing potato production
Factor 8: Fund sources
Factor 9: Awareness of conditions that limit access to fertilizers

Testing of Explanatory variables:
All the above explanatory variables showed significant differences between fertilizer users and non fertilizer users using the K-S test. **This is evidence of the variables affecting the decision of using fertilizers**

The above variables are used as foundation for policy development in the areas of:
- privatization of fertilizer distribution
- development of credit systems
- development of output markets
- training of smallholder farmers for appropriate use of fertilizers

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