Impact of Adoption of Improved Groundnut Varieties on Factor Demand and Productivity in Uganda

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The study analyzed the impact of adoption of improved groundnut varieties on farmers' input allocation decisions and productivity in Eastern Uganda. The data was collected from a simple random sample of 161 groundnut farmers in Eastern Uganda. Econometric results show significant increase in expenditures on improved seed and labor among adopters relative to the non-adopters. Adoption of improved varieties significantly increased groundnut yields by about 1688% per hectare. Thus, more effort is needed to increase farmers' access to improved varieties. The government and partners should facilitate the development of local seed multiplication systems to reduce the cost of improved seed.

Introduction

Agrarian economies including Uganda have embraced green revolution for increased agricultural productivity. In Uganda, groundnut is one of the most important staple crops targeted by research interventions. The crop accounts for 20% of the national oil crops production (FAO, 2011), and is a principal source of inexpensive protein, vitamins and income to many households (Okello et al., 2010). Several improved varieties of groundnuts such as the Serengeti series (I, II, III and IV) have been developed (Okello et al., 2010). Adoption rates in most of the country have increased from 41% in 2001 to 40% in 2007 (UNHS, 1999/2000; 2005/06) and is projected to reach 50% by 2014 (Moyo et al., 2004). An average farmer indicates about 96% of land area under groundnuts to improved varieties (UNHS, 2010). Despite the observed technological progress, the economic impact of adoption of modern varieties not yet been fully studied in Uganda.

Methodology

The study attempts to examine the impact of adoption of improved groundnut varieties on farmers' input allocation decisions and productivity in Eastern Uganda.

Research Questions

How do farmers’ input allocation decisions change with technological progress? Are there yield advantages gained from adopting improved groundnut varieties?

Study Area:
The study was conducted in Tororo and Kumi districts in Eastern Uganda. The districts are, respectively, the leading groundnut growing areas in the country.

Data Collection and Analysis:
The study used cross-sectional data collected from 161 randomly selected groundnut farmers in 2004. The impact of adoption was examined by estimating a yield function and a system demand functions for the major variable inputs used in the crop production including: human labor, animal draft power and planting seed. Potential endogeneity of adoption decision was corrected using instrumental variables approach. The price of seed and distance to markets are instruments. The elasticities of substitution and factor demand are also estimated from the coefficients of the cost share equations.

Descriptive results:
About 57% of the farmers planted improved varieties. Low levels of input usage were found among farmers in both adopters and non adopter. None of the farmers used fertilizers in groundnut production. Average yield of adopters was 19% higher than that for non adopters.

Econometric results:
The coefficient on adoption variable in the share functions for labor and seed is positive and significant suggesting increased expenditure on the inputs by the adopters compared to the non-adopters (Table 1). The results are expected because improved seed is expensive in Uganda and is one of the major constraints to adoption. Higher expenditure share of labor among adopters can be explained by the higher demand for labor due to increased crop care by the adopting households—e.g. pesticides application, row planting. Elasticities of substitution and cross price elasticities of factor demand are positive and negative for substitutes and complements, respectively (Table 2). The dummy variable for improved varieties in the yield function is positive and significant suggesting that adoption of improved seed generates economic gains (Table 3). The estimated coefficient for improved varieties implies that adoption of improved seed increases groundnut yield by 1668% per hectare.

Table 1. Estimates of the input demand system

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor demanded</td>
<td>1.01***</td>
<td>0.010</td>
<td>94.33***</td>
<td>1%</td>
</tr>
<tr>
<td>Draft power</td>
<td>0.36***</td>
<td>0.010</td>
<td>37.49***</td>
<td>1%</td>
</tr>
<tr>
<td>Seed demand</td>
<td>0.21***</td>
<td>0.010</td>
<td>21.53***</td>
<td>1%</td>
</tr>
<tr>
<td>Constant</td>
<td>1.204***</td>
<td>0.161</td>
<td>7.52***</td>
<td>1%</td>
</tr>
</tbody>
</table>

Adoption of improved variety (1=yes; 0=otherwise) x 10

Table 2. Derived elasticities estimates

<table>
<thead>
<tr>
<th>Share function/piece</th>
<th>Wage</th>
<th>Price of draft power</th>
<th>Price of seed</th>
<th>Price of pesticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 0.001</td>
<td>-0.86</td>
<td>7.54</td>
<td>-0.93</td>
<td>-0.97</td>
</tr>
<tr>
<td>Seed 0.001</td>
<td>-0.10</td>
<td>0.10</td>
<td>0.00</td>
<td>-0.10</td>
</tr>
<tr>
<td>Nut 0.001</td>
<td>0.10</td>
<td>0.10</td>
<td>0.00</td>
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Table 3. Estimates of the groundnut yield function

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Adoption of improved variety (1=yes; 0=otherwise) x 10

Conclusion

Adoption of improved varieties leads to a positive shift in groundnut productivity. The productivity gains are however, associated with increased expenditure on labor and seed input. These findings underscore the need to identify and implement appropriate strategies to increase dissemination of improved agricultural technologies, increase optimal input allocation and yields. Interventions to develop multiplication and distribution of improved seed are needed to reduce expenditure on the input.

References