Potential Spillover Effects of Farmer Field Schools in Sub-Saharan Africa: The Case of Cocoa

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INTRODUCTION

Background:

Impacts of historically low levels of cocoa research and extension services in Sub-Saharan Africa include:
- Yield loss due to pests and diseases
- Outdated farming techniques and low input usage
- Limited availability of improved varieties
- Limited organizational support
- Yields are 22% below the world average

The Cocoa Livelihood Program (CLP), a World Cocoa Foundation (WCF) program was implemented to double the income of approximately 200,000 smallholder cocoa-growing households.

Main program components
- Farmer Field Schools (FFS)
- Farmer Business Schools (FBS)
- Input Credit Program (ICP)

Countries: Nigeria, Ghana, Côte d’Ivoire, Cameroon

CLP Phase 1 (CLP-I) (2009-2012) Yield Impacts:
Tsiboe et al. (2015) used Difference-in-Difference model with covariates and weather data to estimate that CLP-I increased yields by 49%, 38%, 36%, and 35%, respectively in Nigeria, Côte d’Ivoire, Ghana, and Cameroon.

Study Objectives:
A Farm Household Model (FHM) is used to evaluate the cocoa market outcome and the spillover effects of CLP in Ghana. We:
1. formulate and calibrate a FHM for cocoa producers in Ghana;
2. quantify the effects of CLP-I on equilibrium price and quantities in the cocoa export market and domestic food markets for maize, rice, cassava, and yam; and
3. undertake an ex-ante analysis of CLP Phase II (CLP-II) under different CLP expansion outcomes based on the known results for farmers participating in CLP-I.

METHODOLOGY

Key Assumptions for FHM
1. Production input prices taken as given
2. Composite consumption good price taken as given
3. Cocoa price endogenous to households
4. Cocoa demand expanding
5. Cocoa households do not produce staple food crops

FFM for Ghanaian Cocoa Farming Households
Maximize utility from the consumption of staple foods (c_i) a composite good (c_i) consisting of all non-stable food and non-food consumption, and leisure (c_i), according to the Stone-Geary utility function:

where: subject to wage (2), production, labor use (3), and total time availability (4) constraints:

subject to income (2), production, labor use (3), and total time availability (4) constraints:

RESULTS

Table 1: Simulation results (Percentage changes)

<table>
<thead>
<tr>
<th></th>
<th>Cocoa</th>
<th>Maize</th>
<th>Rice</th>
<th>Cassava</th>
<th>Yam</th>
<th>Leisure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>0.193</td>
<td>0.031</td>
<td>0.009</td>
<td>0.027</td>
<td>0.024</td>
<td>-</td>
</tr>
<tr>
<td>CLP</td>
<td>1.445</td>
<td>0.587</td>
<td>1.441</td>
<td>1.102</td>
<td>1.928</td>
<td>-</td>
</tr>
<tr>
<td>Non-CLP</td>
<td>0.026</td>
<td>0.017</td>
<td>0.029</td>
<td>0.023</td>
<td>0.065</td>
<td>-</td>
</tr>
<tr>
<td>Rest of Ghana</td>
<td>-0.051</td>
<td>-0.025</td>
<td>-0.050</td>
<td>-0.038</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Rest of the world</td>
<td>4.723</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>CLP</td>
<td>31.564</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-CLP</td>
<td>0.904</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rest of Ghana</td>
<td>0.013</td>
<td>0.59010^{-2}</td>
<td>0.014</td>
<td>0.011</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Ex-ante analysis of CLP-II
1. Cocoa price responds negatively to CLP participation rate and positively to world cocoa demand expansion
2. Producer benefits to CLP households are higher than those of the non-CLP households at participation rate greater than 2%
3. The participation rate necessary for net gains from CLP to equal zero is estimated at about 45% in Ghana
4. World gains from CLP are always positive regardless of its participation rate

RECOMMENDATIONS

- CLP should be expanded from its current rate of 12% to about 45% while noting that any increase in cocoa productivity must be met by demand expansion on the world cocoa market, else cocoa farming households will lose.
- If demand is inelastic (as most agricultural goods are), expanding production will lead to a revenue loss, unless demand also increases. Therefore, agricultural development programs should focus on marketing and demand expansion as well as production expansion to increase rural farm household income.

FIG. 3: Sensitivity analysis – Demand Expansion
The red vertical line shows the results for the spillover effects of CLP-II.

FIG. 4: Sensitivity analysis - ex ante analysis of CLP-II
The red vertical line shows the results for the spillover effects of CLP-II.