Estimating fertilizer demand for rice production around the Palo Verde National Park, Costa Rica
Land cover in Palo Verde

Legend

- OTS Station
- Palo Verde Lagoon
- Piedra Blanca Lagoon
- Older Secondary Forest
- Primary Forest
- Poza Verde Lagoon
- Virgin Lagoon
- Xeric Forest
- Flooded Forest
- Young Secondary Forest

Map of land cover in Palo Verde National Park showing different types of land cover areas such as lagoons, forests, and floodplains. The map includes the Tempress River and Bebedero River, with a scale of 1:100,000.
Arenal-Tempisque Irrigation Project
What is Currently Unknown?

- The details of the current rice production.
  - Level of profitability.
  - Variation of profitability among farmers.
  - Determinants of profits.
- The specific variables that explain their demand.
Research Questions

- What is the typical rice farmer?
- What are the differences among farmers?
- What drives the level of fertilizers use?
- What are the policy levers that seek the reduction of fertilizer consumption?
Study Site
Study Sampling

- 40 households of Bagatzi, Falconiana and La Soga randomly selected.
- Structured interviews were used to collect information.
- Data of the agricultural production unit, the rice production practices, the chemical inputs use, the labor allocation and the farm incomes were collected.
### Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fert</td>
<td>Fertilizer used in the last harvest (Colones/quintal46Kg)</td>
</tr>
<tr>
<td>pricseed</td>
<td>Seed price (Colones/quintal46Kg)</td>
</tr>
<tr>
<td>pricfert</td>
<td>Fertilizer price (Colones/quintal46Kg)</td>
</tr>
<tr>
<td>harvtot</td>
<td>Rice production last 12 months (quintal46Kg/ha)</td>
</tr>
<tr>
<td>landarea</td>
<td>Owned land (ha)</td>
</tr>
<tr>
<td>irriga</td>
<td>Irrigation payment (Colones/ha*semester)</td>
</tr>
<tr>
<td>famsize</td>
<td>Family size</td>
</tr>
<tr>
<td>landprep</td>
<td>Land preparation cost (Colones/ha)</td>
</tr>
<tr>
<td>dumfalc</td>
<td>Community dummy (Falconiana)</td>
</tr>
</tbody>
</table>
No statistically significant differences among farmers of Bagatzi, Falconiana and La Soga (seed, fertilizer, hired labor, yield and net returns).

Statistically significant differences of use of seeds↑ and fertilizers↓, and net returns↑ with San Ramon and Playitas.
### Fertilizer Demand Function Results

\[
\ln F = \ln C + \zeta c D_c + \Omega \ln Y + \sum_{i=1}^{2} \alpha_i \ln W_i + \sum_{i=1}^{4} \Psi_i \ln Z_i
\]

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Estimated coefficient (OLS)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer demand</td>
<td>-14.175</td>
<td>0.043</td>
</tr>
<tr>
<td>function constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y Output quantity</td>
<td>0.356</td>
<td>0.052</td>
</tr>
<tr>
<td>W\textsubscript{1} Seeds price</td>
<td>1.908</td>
<td>0.001</td>
</tr>
<tr>
<td>W\textsubscript{2} Fertilizer price</td>
<td>-0.456</td>
<td>0.133</td>
</tr>
<tr>
<td>Z\textsubscript{1} Land</td>
<td>0.049</td>
<td>0.562</td>
</tr>
<tr>
<td>Z\textsubscript{2} Irrigation cost</td>
<td>0.222</td>
<td>0.613</td>
</tr>
<tr>
<td>Z\textsubscript{3} Family size</td>
<td>0.047</td>
<td>0.635</td>
</tr>
<tr>
<td>Z\textsubscript{4} Land preparation</td>
<td>-0.095</td>
<td>0.521</td>
</tr>
<tr>
<td>D\textsubscript{c} Community dummy</td>
<td>-0.258</td>
<td>0.063</td>
</tr>
</tbody>
</table>

Note: This is just an example and it is not the regression we analyzed in class.

- N = 40
- R\textsuperscript{2} = 0.455
- F-value = 0.008
Fertilizer Regression Results

- The proposed model is significant at the 95% confidence level.
- Output quantity $\uparrow$, price of seed $\uparrow$, fertilizer price $\downarrow$, and the community dummy $\downarrow$ are significant.
- 45.5% of the variation in fertilizer demand is explained by the model.
Report

- Individual
- 1-3 pages
- Regression results for fertilizer demand
  - Report regression parameters
  - Briefly explain meaning of estimated parameters coefficient
- How we could affect fertilizer demand?
  - Policy to affect farmers’ behavior