Economic Viability of Irrigated Maize Production.

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Kenya School of Monetary Studies, NAIROBI
INTRODUCTION

- Introduction
- Methodology
- Results
- Political Economy Issues
- Lessons From Irrigation
- Policy Recommendations
Status of irrigation in Kenya

- Irrigation potential of 3 million acres & only 13% of this has been developed. The growth rate is 0.5%

- Categories
  - public, private and smallholder

- Challenges
  - Wrong perception
  - Lack of a national policy legal and institutional framework
  - Inadequate public-private sector participation in the sector
  - Inadequate irrigation infrastructure and water storage
  - Weak WUAs
  - Inadequate support services
Rationale

- The government of Kenya is supporting irrigation development and its expansion into the ASAL areas.

- The past history of irrigation schemes were associated with project failure in the 80’s- 90’s and inadequate information.

  These led to:
  - low engagement and
  - Investment in irrigation
A study was carried out to answer the following questions.

- Is irrigated maize production profitable?
- Are farmers willing to accept and pay for irrigated maize production?
- What are the lessons from irrigated maize productions for other similar projects?

We postulated that irrigation development for food production can only be sustainable if economic value of water exceeded the operations and management costs.
Methodology

- The areas covered were Lower Kuja, Bunyala, Nandi, Lower Nzoia, Perkerra, Mwea, Bura, Hola and Galana Ranch.

- Data sources
  - 2014 TAPRA II data
  - Cost of production data
  - HH interviews, FGDs, Key informant interviews
  - Published materials were the main source of secondary data

- Data Analysis
  - Description. The analysis was based on GM, O&MI, FPI and RI
  - A production and profit function
  - Willingness to pay modeled for selection and outcome.
## Budgeting results

<table>
<thead>
<tr>
<th></th>
<th>Irrigated</th>
<th>Non irrigated</th>
<th>Simulated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maize yield</strong> (bags/acre)</td>
<td>11</td>
<td>7.6</td>
<td>11</td>
</tr>
<tr>
<td><strong>Sale price per 90kg bag</strong></td>
<td>2,200</td>
<td>2,382</td>
<td>2,382</td>
</tr>
<tr>
<td><strong>Sold to</strong></td>
<td>Traders</td>
<td>Traders</td>
<td>Traders</td>
</tr>
<tr>
<td><strong>Total revenue</strong></td>
<td>24,200</td>
<td>18,103</td>
<td>26,202</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>3,086</td>
<td>3,086</td>
<td></td>
</tr>
<tr>
<td><strong>Total production costs (TC)</strong></td>
<td>15,705</td>
<td>13,100</td>
<td>15,705</td>
</tr>
<tr>
<td><strong>Profit=TR-TC (per acre)</strong></td>
<td>8,495</td>
<td>5,003</td>
<td>8,927</td>
</tr>
<tr>
<td><strong>Breakeven yield (90kg bags)</strong></td>
<td>7.14</td>
<td>5.5</td>
<td>6.59</td>
</tr>
<tr>
<td><strong>Margin per bag (Ksh) w/o WC</strong></td>
<td>772.3</td>
<td>658.3</td>
<td>954.3</td>
</tr>
<tr>
<td><strong>Margin per bag as % of cost w/o</strong></td>
<td>54%</td>
<td>38%</td>
<td>67%</td>
</tr>
<tr>
<td><strong>O&amp;MI</strong></td>
<td>1.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FPI</strong></td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RI</strong></td>
<td>-0.78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Comparative margins

### Irrigated and Non-Irrigated Maize

<table>
<thead>
<tr>
<th></th>
<th>Working capital (WC) 10%</th>
<th>Total production costs (TC) with wc</th>
<th>Cost per bag w/o WC</th>
<th>Cost per bag with WC</th>
<th>Profit=TR-TC (per acre)</th>
<th>Margin per bag (Ksh) w/o WC</th>
</tr>
</thead>
<tbody>
<tr>
<td>irrigated</td>
<td>1571</td>
<td>17,276</td>
<td>1,428</td>
<td>1,571</td>
<td>8,495</td>
<td>772.3</td>
</tr>
<tr>
<td>non-irrigated</td>
<td>1310</td>
<td>14,410</td>
<td>1,724</td>
<td>1,896</td>
<td>5,003</td>
<td>658.3</td>
</tr>
</tbody>
</table>

The table above illustrates the comparative margins of irrigated and non-irrigated maize. The columns represent different cost components and profit calculations for each category.
About 73.4% were willing to pay for irrigation services with an odds ratio of 1.772 in favour of paying for irrigation.

The mean willingness to pay for irrigation water and services was KES 2,952/acre/season were paying KES 3,082.
Willingness to pay

- Scheme level factors which affect production and these are
  - Availability of sufficient water (+)
  - Enforcement of rules and regulations within the schemes (+)
  - Efficient fertilizer use (+)
  - Quality of produce (-)

- Plot level factors affecting maize labour
  - Water (+)
  - Seed (+)
  - Land (+)
  - Fertilizer (+)
## Allocative Efficiency Test

<table>
<thead>
<tr>
<th>Factor</th>
<th>GM MVP</th>
<th>Price</th>
<th>Ratio</th>
<th>Decision</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>16,852.13</td>
<td>4911</td>
<td>3.43</td>
<td>Under</td>
<td>Use more</td>
</tr>
<tr>
<td>Labor</td>
<td>25.56</td>
<td>312.61</td>
<td>0.08</td>
<td>Optimal</td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>5,977.48</td>
<td>3000</td>
<td>1.99</td>
<td>Under</td>
<td>intensification</td>
</tr>
<tr>
<td>Seed</td>
<td>3,365.74</td>
<td>3750</td>
<td>0.9</td>
<td>Optimal</td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>1,078.08</td>
<td>2400</td>
<td>0.45</td>
<td>Excess</td>
<td>Reduce rates</td>
</tr>
</tbody>
</table>
Allocative Efficiency

Input Use

- Price
- Water, Land
- Seed, Labour
- Fertilizer

MVP
MFC
Factor use level
Allocative Efficiency

- We establish that irrigated maize production
  - Produces 45% more maize than non irrigated maize
  - It has a 71% production gap.
  - Every production season here is a loss of 9 bags per acre.
  - Implying that the potential output is 20 bags/acre/season.

- The EVW per season per acre was ranged from KES 9,252 at the current production technology to KES 21,432 at the most efficient allocation.

- Irrigate maize production has the potential to increase maize output by 163% over non irrigated maize.
## Allocative Efficiency

<table>
<thead>
<tr>
<th></th>
<th>Current Technology</th>
<th>Efficient Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Season</td>
<td>Annual</td>
</tr>
<tr>
<td>Efficiency</td>
<td>29%</td>
<td>100%</td>
</tr>
<tr>
<td>Output</td>
<td>5.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Losses</td>
<td>4.5</td>
<td>13.5</td>
</tr>
<tr>
<td>EVW</td>
<td>9,252</td>
<td>27,706</td>
</tr>
<tr>
<td>Potential Output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Political economy – Issues

- Conflicting government roles
  - Changing project costs
  - Institutions and bureaucracy

- Producer policies on water use
  - Value Chain development/absorption of surplus output
  - Changing land and water use rights

- Competition for resources
  - Prioritization of the enterprise and interest groups guiding the process
Lessons from Irrigated maize Prodn

**Strengths**
- High returns, high profit, High O&MI, FPI.
- Farmers high willing to pay for irrigation

**Weaknesses**
- The land sizes are small
- Low yields
- Inefficient factor use

**Opportunities**
- Through R&D,
- Training
- Availability of irrigable land

**Threats**
- Climate change
- High irrigation premium rates
- Long payback period / RI

**SWOT**
Policy recommendations

- Irrigated maize production sustainable

**Policy Options**

- Formulating policies that favour
  - Empower the WUAs.
  - R&D to improve field level productivity
  - Training farmers for better skills in irrigation management.
  - Clear definition of the roles of the National and County governments
  - Participatory prioritization of resource use for irrigation development in Kenya
Thank you