What Kinds of Rural Irrigation Infrastructure Have Played Role on Dealing with Drought?

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Motivation

- Drought became increasingly frequent in China.
- The Chinese government will invest 4 trillion Yuan on irrigation infrastructure for enhance resistance to the drought in next ten years.

Research Questions

- How did the drought occur and its influence on crop production during the past few years?
- What about the current situation of irrigation infrastructure?
- Which kinds of irrigation infrastructure have played significant roles?

Methods and Data

- Econometric model analysis.
- Data come from a face to face field survey conducted in 2010, covered 1,118 farmers, 107 villages and 18 counties in 6 provinces in China.

Drought Influence in 2006-2010

- Half of farmers have been affected by drought in past 5 years.
- The most severest drought cause 40% yield reduction.

Utilization Status of Irrigation Infrastructure

- Nearly half of farmers suffered drought in 2006-2010, and the drought caused 40% yield reduction on them.
- 26% villages have not been covered by irrigation infrastructure yet, which need more investment in future.
- Large-scale and middle-scale reservoirs, pond and tube well play significant role in dealing with drought, comparing with the type of “rely on rain”.

Econometric Analysis

- Econometric model (OLS):

\[ y_{ij} = \alpha + \beta W_{ij} + \gamma V_{ij} + \delta H_{ij} + \lambda D_{ij} + \epsilon_{ij} \]

where \( y_{ij} \) is yield reduction rate of farmer \( i \) in village \( j; W_{ij} \) is a vector of irrigation infrastructure dummy variables (set “rely on rain” as control group); \( V_{ij}, H_{ij} \) and \( D_{ij} \) are (village, household and regional) control variables.

- Estimation results of key variables:

<table>
<thead>
<tr>
<th>Utilization Status of Irrigation Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rely on rain &amp; Large-scale Reservoir</td>
</tr>
<tr>
<td>Rely on river and lake &amp; Middle-scale Reservoir</td>
</tr>
<tr>
<td>Irrigation district &amp; Small-scale Reservoir</td>
</tr>
<tr>
<td>Tube well</td>
</tr>
<tr>
<td>Pond</td>
</tr>
</tbody>
</table>

Descriptive Analysis

<table>
<thead>
<tr>
<th>Utilization Status of Irrigation Infrastructure</th>
<th>No reduction</th>
<th>1%-33% reduction</th>
<th>34%-66% reduction</th>
<th>67%-100% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larger scale reservoirs</td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Middle scale reservoirs</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Small scale reservoirs</td>
<td>12</td>
<td>17</td>
<td>14</td>
<td>38</td>
</tr>
<tr>
<td>Pond</td>
<td>25</td>
<td>18</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Tube well</td>
<td>3</td>
<td>22</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>Irrigation District</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Rely on river and lake</td>
<td>19</td>
<td>15</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Rely on rain</td>
<td>12</td>
<td>6</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

Conclusions and Political Implication

- Nearly half of farmers suffered drought in 2006-2010, and the drought caused 40% yield reduction on them.
- 26% villages have not been covered by irrigation infrastructure yet, which need more investment in future.
- Large-scale and middle-scale reservoirs, pond and tube well play significant role in dealing with drought, comparing with the type of “rely on rain”.
- Expanding investment on irrigation infrastructure is a wise choice under the increasing threat of drought. It should not only focus on larger scale facilities, e.g. reservoirs, but also consider small one, such as pond and tube well.

Note: “*”, “**” and “***” respectively means P<0.1, P<0.05 and P<0.01.