An Integrative Approach for Introducing Conservation Agriculture Practices to Tribal Societies in India

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Introduction

• One of the largest states in India, Odisha has a population of 41.9 million, yet remains the 5th poorest state in the nation
• The tribal societies, which are predominantly comprised of small-holder subsistence farmers, tend to be among the most marginalized, living on nutrient poor agricultural land and with few opportunities for income generation
• Conservation agriculture (CA) has been proposed as a solution to conserve environmental resources while improving agricultural productivity

Objectives

To introduce conservation agriculture approaches to tribal households in Odisha, India through:
• Establishing field experiments to assess the yield impacts of minimum tillage and intercropping
• Creating a representative farm household model to determine household assets and farmer practices
• Developing an approach which integrates agronomic and economic analyses on the effect of conservation agriculture on household income and labor

Materials & Methods

FIELD EXPERIMENT:
• In Summer 2010, 5×10 m field plots were established at the Odisha University of Agriculture & Technology research station in Kendujhar, Odisha State, India
• Two factors were assessed to determine differences in crop yield: minimum tillage & maize-cowpea intercrop
• Plots with conventional plow tillage and a maize mono-crop were used as a control
• 3 replications were used in a completely randomized block design
• An analysis of variance was used to assess the data (α=0.05, Infostat 2011)

FARM HOUSEHOLD MODEL:
• Socio-economic surveys were conducted in 3 villages through face-to-face interviews to gather data on household & farm size, income, education, farming practices, and crop yields
• The data was validated through relevant literature, farmer focus groups, and consultation with local experts

Results and Discussion

FIELD EXPERIMENT:
• Results showed that of the CA treatments, conventional tillage with maize-cowpea intercrop had the highest maize yield (0.00188 Mg/ha), followed by minimum tillage/intercrop (0.00170 Mg/ha)
• The additional yield of high-value cowpea acts as a supplement in lieu of the maize losses when compared with the control

FIGURE 1: Effect of minimum tillage and intercropping on crop yields in Kendujhar, India (2010)

FARM HOUSEHOLD MODEL:
• Results from the representative farm household model (below) show income for Tentuli and Saharpur at just over $1/day, with Gopinathpur at approximately $3/day. This is related to greater access to wage-earning activities in the local mining industry.

<table>
<thead>
<tr>
<th>Village</th>
<th>Ave. annual income (USD)</th>
<th>Ave. Household size</th>
<th>Highest education (mode)</th>
<th>Farm size (ha)</th>
<th>Major staple crops</th>
<th>Maize yield (ton/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tentuli</td>
<td>410</td>
<td>7</td>
<td>None</td>
<td>1.4</td>
<td>Rice, maize</td>
<td>0.25</td>
</tr>
<tr>
<td>Saharpur</td>
<td>433</td>
<td>7</td>
<td>None</td>
<td>1.2</td>
<td>Rice, maize</td>
<td>0.3</td>
</tr>
<tr>
<td>Gopinathpur</td>
<td>1077</td>
<td>7</td>
<td>Primary School</td>
<td>2.1</td>
<td>Rice, maize</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Integrative Approach

Results of the field experiment were incorporated with the representative farm household model to synthesize the agronomic field data with the socio-economic study to demonstrate the potential effects of the CA treatments on farm income, labor, & environment.

• This approach creates a simple yet integrated model for introducing the costs and benefits of CA practices to rural farmers
• The model is ideal for use in conjunction with AHP farmer preference surveys for developing on-farm implementation of conservation agriculture practices

Conclusions

• A maize-cowpea intercrop farming system with conventional tillage provided the highest yields of both maize and cowpea
• However, intercropping with minimum tillage would provide greater environmental benefit over the long term
• By assessing the agronomic and economic effects of introduced technologies, sustainable farming and adaptive management systems can be developed

References

Odisha map: http://evsglobalchange.files.wordpress.com/2010/03/orissa map.png

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