

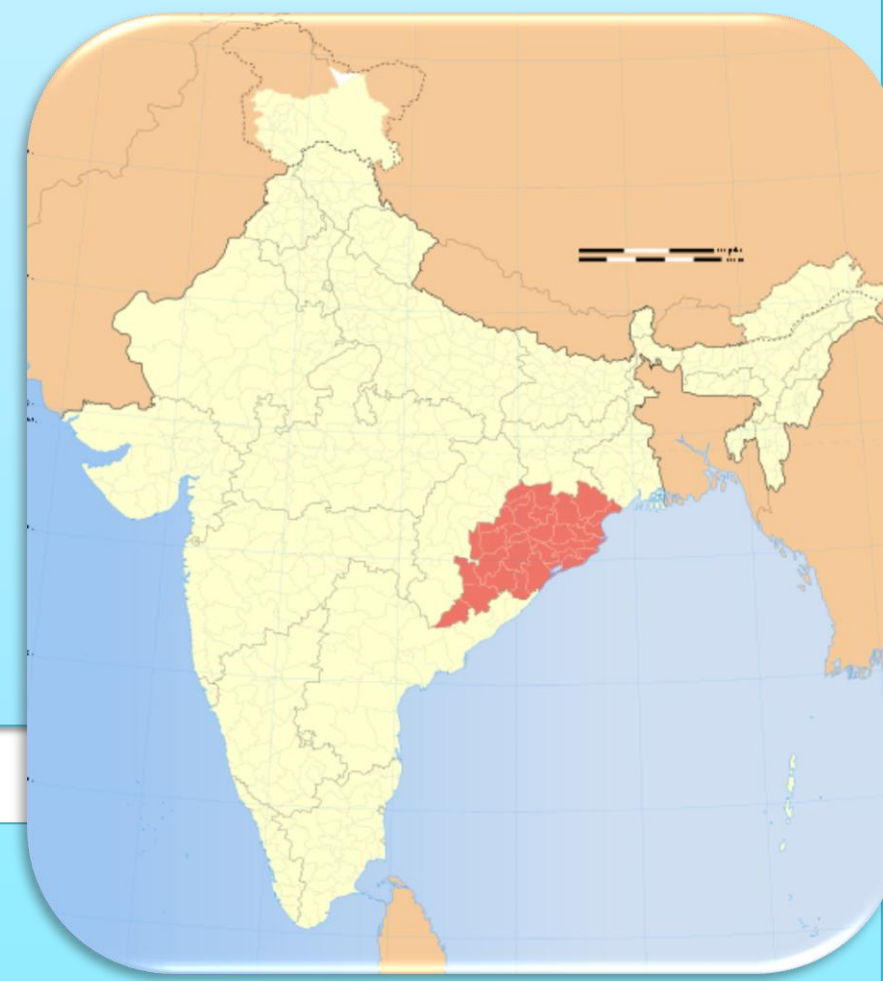
# An Integrative Approach for Introducing Conservation Agriculture Practices to Tribal Societies in India

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## Introduction

- One of the largest states in India, Odisha has a population of 41.9 million, yet remains the 5<sup>th</sup> 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, 5x10 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 ( $\alpha=0.05$ , Infostat 2011)

## FARM HOUSEHOLD MODEL:

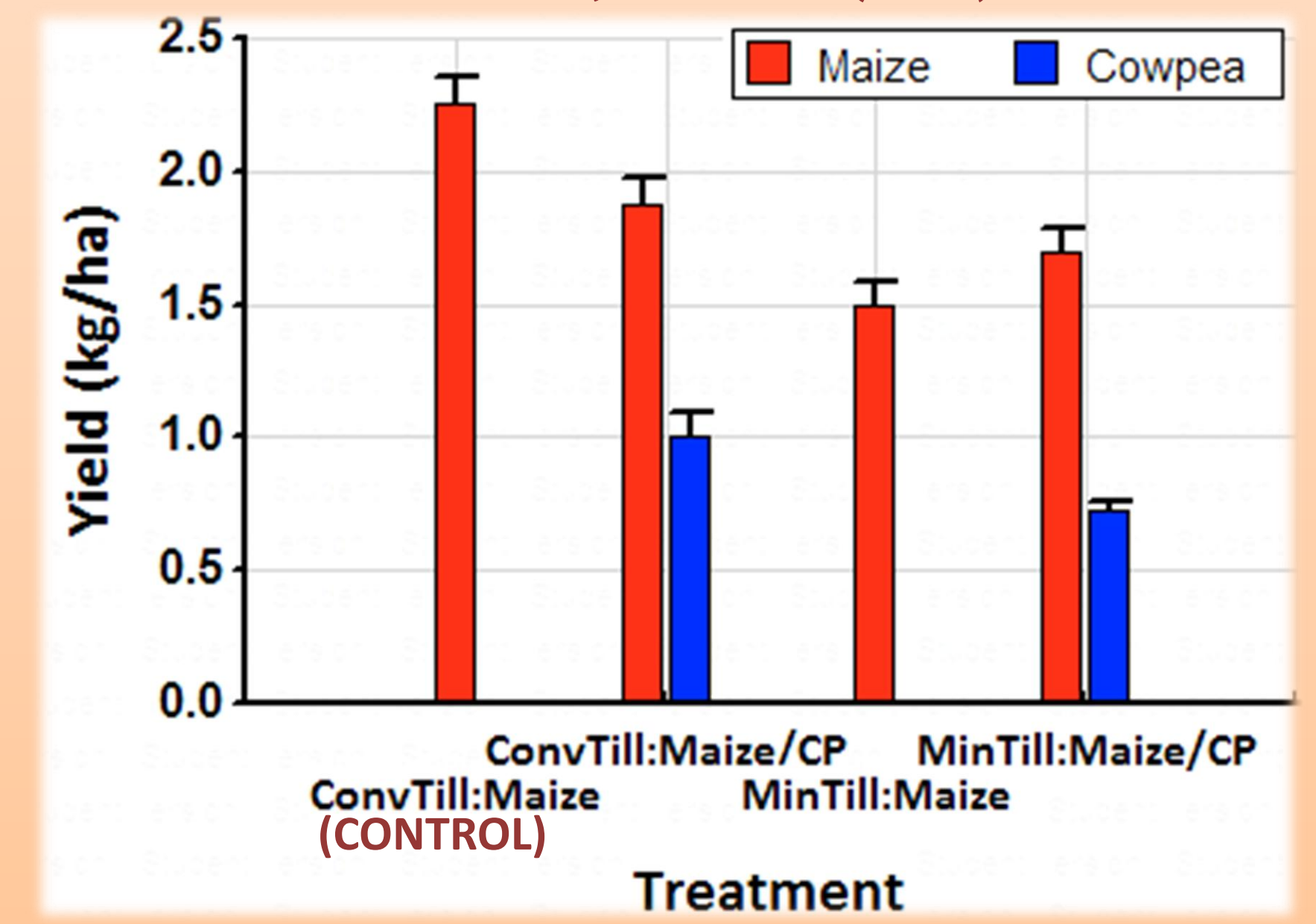
- Socio-economic surveys were conducted in 3 villages through face-to-face interviews to gather data on household & farm size, income, education, farming practices, and crop yields
- The data was validated through relevant literature, farmer focus groups, and consultation with local experts

## 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.

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

## 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.

Treatment	Yield	Labor	Profit	Environmental Benefit
ConvTill:Maize (CONTROL)	High (3 ears)	High (3 people)	Low (1 stack)	None
ConvTill:Maize/CP	High (3 ears)	High (3 people)	High (3 stacks)	Low (1 plant)
MinTill:Maize	Low (1 ear)	Low (1 person)	Low (1 stack)	High (2 plants)
MinTill:Maize/CP	High (3 ears)	High (3 people)	High (3 stacks)	High (3 plants)

- 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](http://evsglobalchange.files.wordpress.com/2010/03/orissa_map.png)