

# Measuring Agricultural Idiosyncratic Income Shocks

NSF-AERC-IGC Technical Session

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# What is the *full* measure of the farmer-specific income shock?

- Aim: get an exogenous measure of a farmer's income shock
- Is important question because income shocks used for many other research questions
  - ▶ risk sharing, risk aversion, technology adaption
- Standard in the literature: reduced form rainfall shocks using land holdings
- But: farmers have many different assets: should be estimating full profit function

## Defining a profit function

Consider the following profit function for farmer  $k$  at time  $t$  (adapted from Rosenzweig and Binswanger (1993))

$$\Pi_{kt} = \sum_i \beta_i \alpha_{ikt} + \frac{1}{2} \sum_i \sum_j \delta_{ij} \alpha_{ikt} \alpha_{ijt} + \sum_i \gamma_i \alpha_{ikt} \text{weather}_t + \epsilon_{kt} + \nu_k$$

Assets  $\alpha_j$ : real value of

- Consumer Durables
- Farm equipment
- Livestock
- Farm Machinery
- Non irrigated land
- Irrigated land

## Defining the shock

Reduced form:

$$\Pi_{kt} = \sum_{i=\text{land assets only}} \gamma_i \alpha_{ikt} \text{weather}_t + \epsilon_{kt} + \mathbf{v}_k$$

Profit function:

$$\Pi_{kt} = \sum_i \beta_i \alpha_{ikt} + \frac{1}{2} \sum_i \sum_j \delta_{ij} \alpha_{ikt} \alpha_{ijt} + \sum_i \gamma_i \alpha_{ikt} \text{weather}_t + \epsilon_{kt} + \mathbf{v}_k$$

- Measure of the profit-based idiosyncratic income shock:

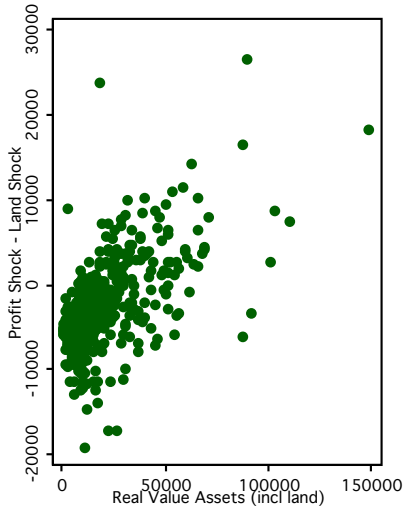
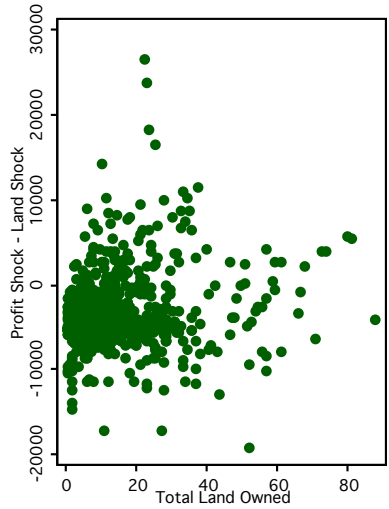
$$\sum_i \hat{\gamma}_i \alpha_{ikt} \text{weather}_t + \epsilon_{kt} \quad \forall i$$

- Measure of landholdings-based idiosyncratic income shock:

$$\sum_i \hat{\gamma}_i \alpha_{ikt} \text{weather}_t + \epsilon_{kt} \quad \text{for } i = \{\text{irrigated land, nonirrigated land}\}$$

- Which measure gives the full idiosyncratic income shock?

# Difference between Methods of calculating Idiosyncratic Shock



Source: Indian ICRISAT villages

# Conclusion

- Idiosyncratic shock is an important input for many economic applications
- Currently - standard to look at shock to just land, instead of all assets
- Next stages: refining the profit function
  - ▶ Endogeneity of asset stocks
- What impact does this have on end results? Risk sharing application