NC STATE UNIVERSITY College of Agriculture and Life Sciences

A Case Study: Examining the Relationship Between Soil Health and Food Security in Smallholder Farming Systems in El Salvador

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- One of the main functions of soils is food production
- Increasing research and discussion on relationship between food security and soils
- **Few empirical studies to quantify the relationship** between soil health and food security
- In smallholder farming communities, **a farmers' livelihood is often dependent on productivity of the soils**
- **In El Salvador, soil degradation is a national priority and > 98% of farmers are smallholder farmers.**
- Thus, **El Salvador** provides an excellent location for a case study examining relationship between soil health and food security

El Salvador, on the western coast of Central America, has a volcanic corridor passing through most of the country. Most small producers are farming on the marginal highly sloped land.

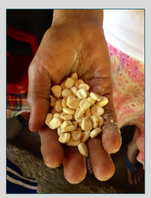
OBJECTIVES

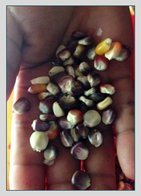
- **Evaluate current soil health indicators**
- **Determine current food security levels**
- **Examine the relationship between soil health and food security**

METHODS

- Soil sampling of 21 randomly selected farms within region
- 3 soil sampling locations representative of the farm
- Each farm was the experimental unit
- Food Security was measured through the FAO Latin American Food Security Index
- Cornell Comprehensive Soil Health Assessment is most advanced and commonly used soil health assessment to date
- Cornell method used successfully in Kenya and

One of the interview participants demonstrating her family's heirloom corn seeds.

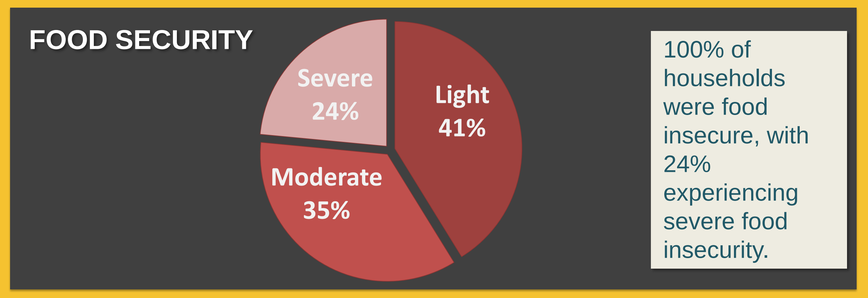




Soil Health Indicators Measured

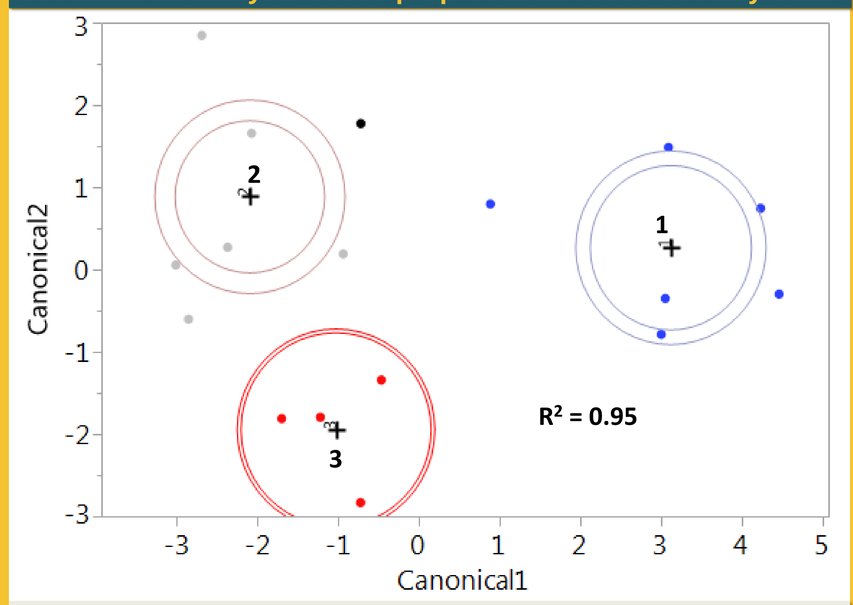
Chemical	Physical	Biological
• pH • Extractable P • Extractable K • CEC • %BS • Ca, Mg, Na, Zn, Cu, Mn, Fe	• Surface/sub-surface hardness • Texture • Infiltration • Aggregate stability • Topsoil depth	• % OM • Worm counts • Soil respiration • Active C

RESULTS and DISCUSSION



100% of households were food insecure, with 24% experiencing severe food insecurity.

Discriminate analysis of soil properties and food security scale

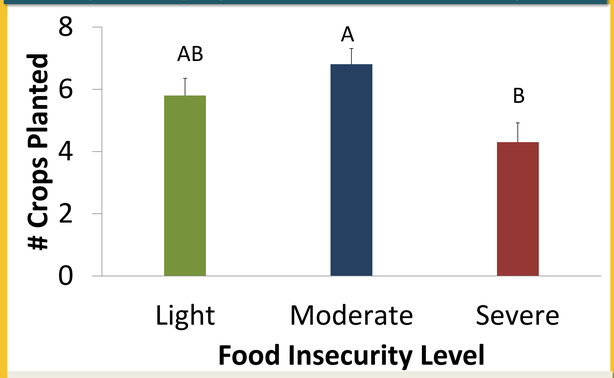


Soil properties were grouped by food security scale with no overlap and a prediction accuracy of 95%

Discriminate Analysis Actual vs. Predicted

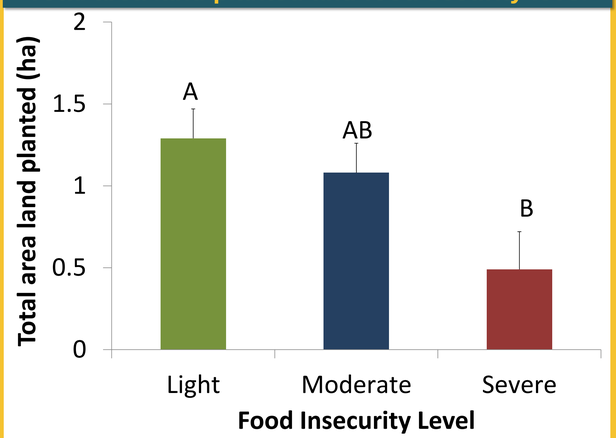
Actual	Predicted		
Food Insecurity Scale	**1**	**2**	**3**
1	6	0	0
2	0	7	0
3	0	0	4

Variety of crops planted and food security level



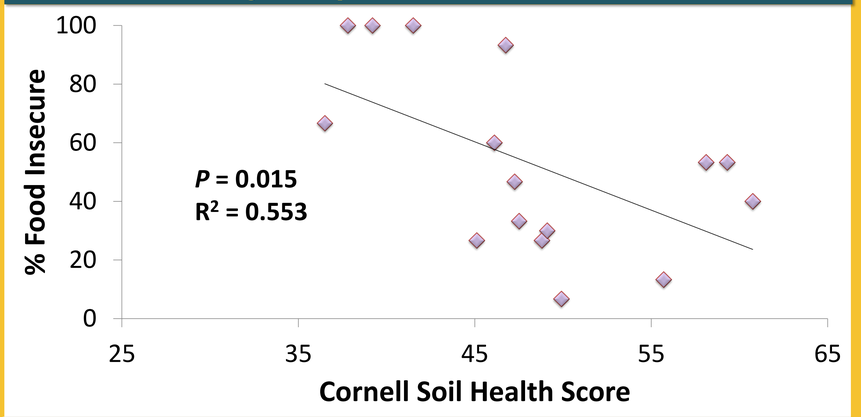
total crops planted differed between food security levels, *P*= 0.023

Total area land planted and food security level



Total area land planted differed between food security levels, *P*= 0.048

Food insecurity compared to Cornell soil health score



Yields for corn & bean were not correlated with synthetic fertilizer inputs

CONCLUSIONS

- **Based on previous research, food insecurity levels were higher than expected**
- **Total land planted and # of crops planted significantly impacts food security**
- **The Cornell soil health index appears to be correlated to food insecurity**
- **Soil properties in different food security levels are different**

In our study area, greater soil health appears to be correlated with higher food security and soil properties are different at various food security levels, implying this research should be expanded to a larger study area

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