A multiple Interventions Approach to Increasing Technology Adoption: Evidence from Mexico

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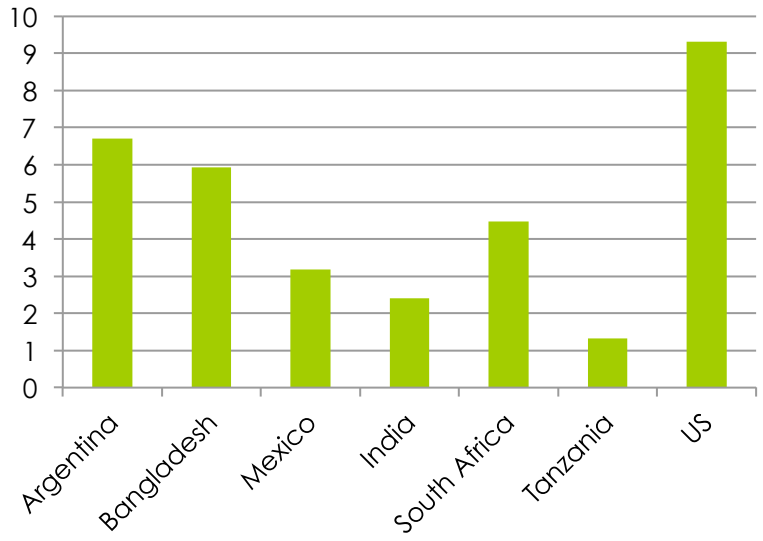
Average Maize Productivity 2008-2012



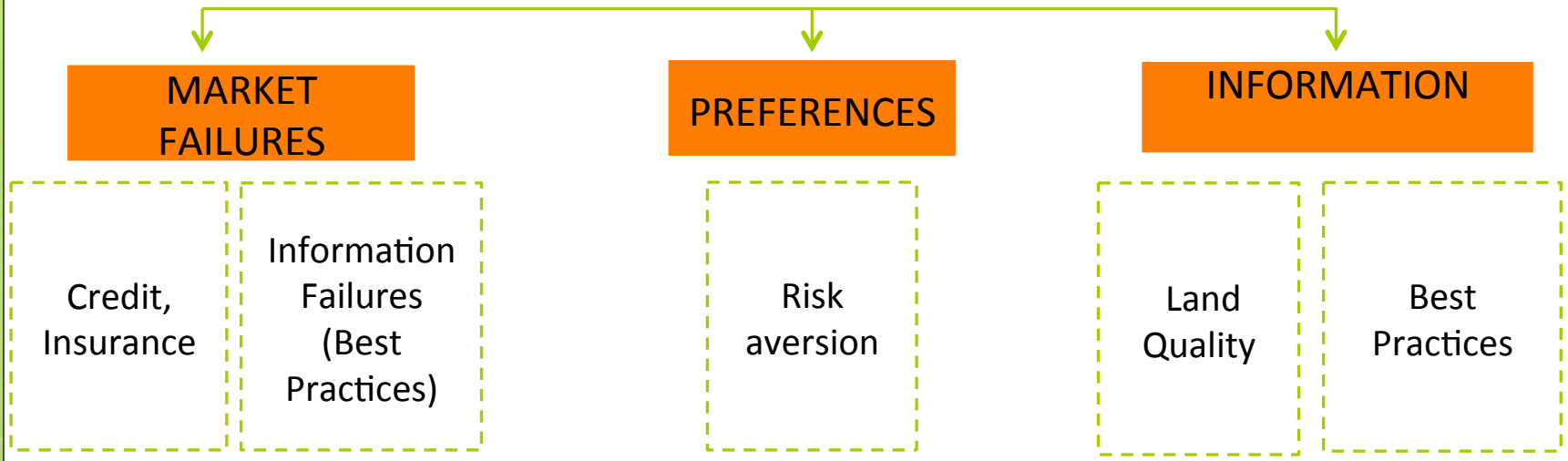
Source: FAO statistics

Although yields have been improving in Mexico since the 80`s, they are as low as those in much poorer countries , particularly among small land holders.

MITA Scope of work

- [Histogram of Yields]
- There is some debate about whether observed variation reflects:
  - Essential heterogeneity (e.g. Suri (2006) Barrett, Marenya and Barrett (2009))
  - Constraints to optimal Behavior (e.g. Credit, Insurance, Information, Non-standard preferences)
- We hope to get a better understanding both of the nature of the essential heterogeneity (measurement) as well as attendant constraints (interventions).

Hypothesized Constraints



Intervention

- Long-term project relaxing constraints simultaneously (vs piece-meal) and detailed information on plot quality and inputs.
- Proposed interventions:
  - Improved information
    - Land (Soil testing and recommendations)
    - Best Practices (Frequent AEW visits)
  - Relaxing Credit constraints
    - Working with State, Private Dealers for input credit
  - Improving market (AEW) incentives:
    - "Efficacy": Using Highly skilled AEWs (graduates from Mexico's best agriculture universities)
    - "Effectiveness": Intervention around hiring and compensation regular AEW pool.
  - Insurance
    - Index Insurance

Intervention

- Long-term project relaxing constraints simultaneously (vs piece-meal).
- Detailed measurement of land quality and inputs.
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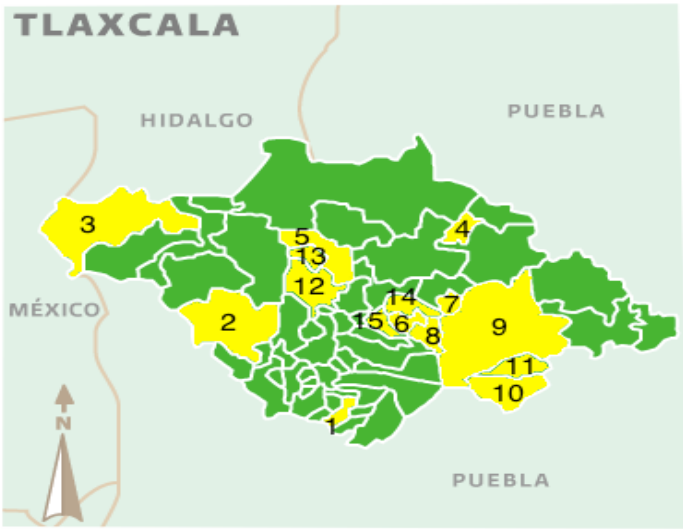
Sample

- **Demographics**
  - 419 farmers. 273 in treatment (3 treatment groups) and 146 control in Tlaxcala. 1192 plots (70% with maize in 2012)

2012 Average	Tlaxcala Sample	National Average
Age	55 years	51 years
Education	5.5 years	5.2 years
Average plot size	3.82 HA	6.48 HA
Ag. Inc	USD 2300	USD 2354
Female	18.14%	13.65%
TNs/HA	2.36	3.18



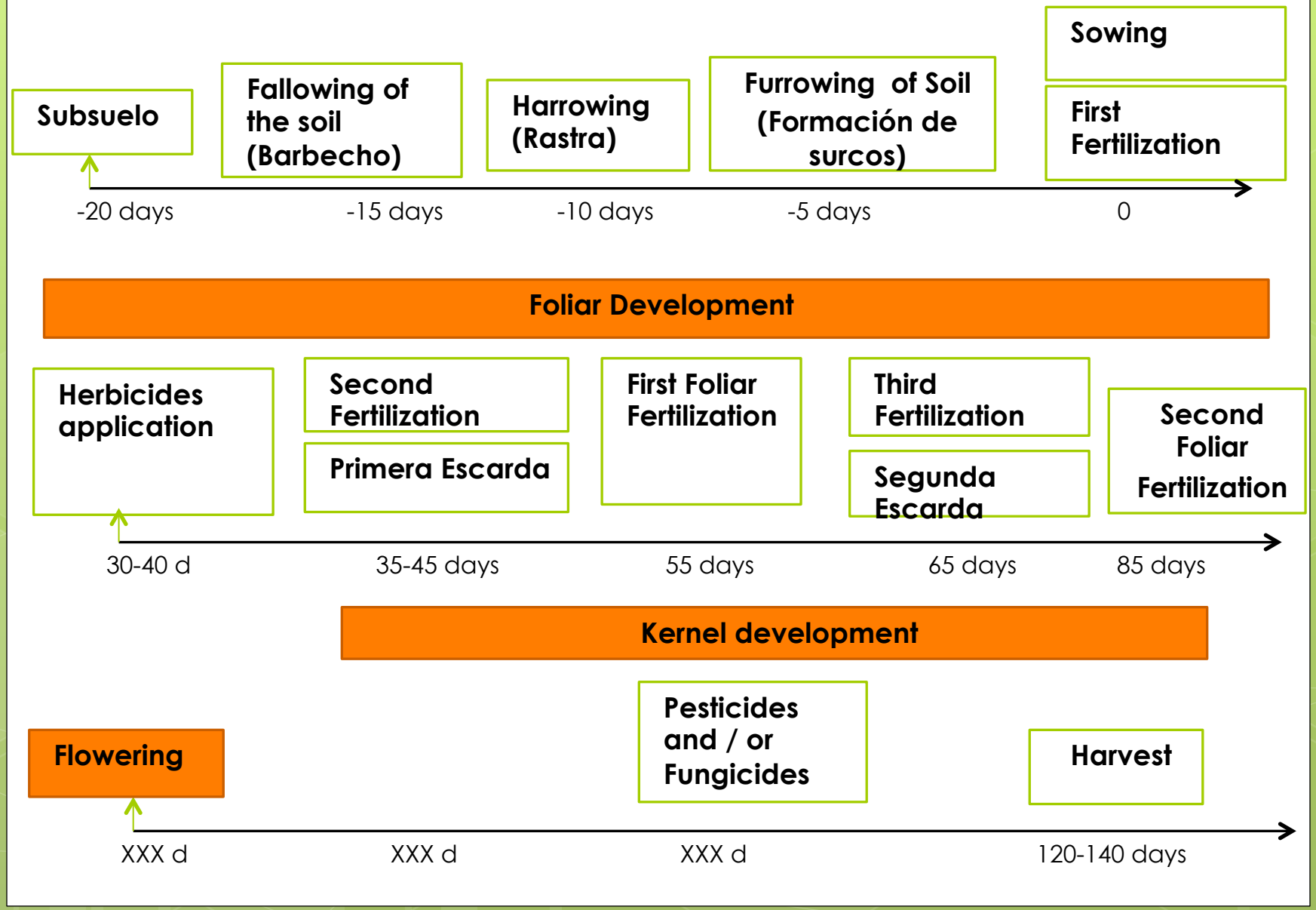
MITA 2013 Sample Frame

Agricultural Practices (2012)	MITA Sample
Hybrid seeds	29.89%
Chemical fertilizer: at sowing	24.17%
Chemical fertilizer: after sowing	64.17%
Foliar Fertilizer	29%
Soil Tests	3.81%
Technical Assistance	4%
Credit	11.93%
Crop insurance at least once	28.16%
Had lost productivity due to climate issues in the past 5 years	94.5%

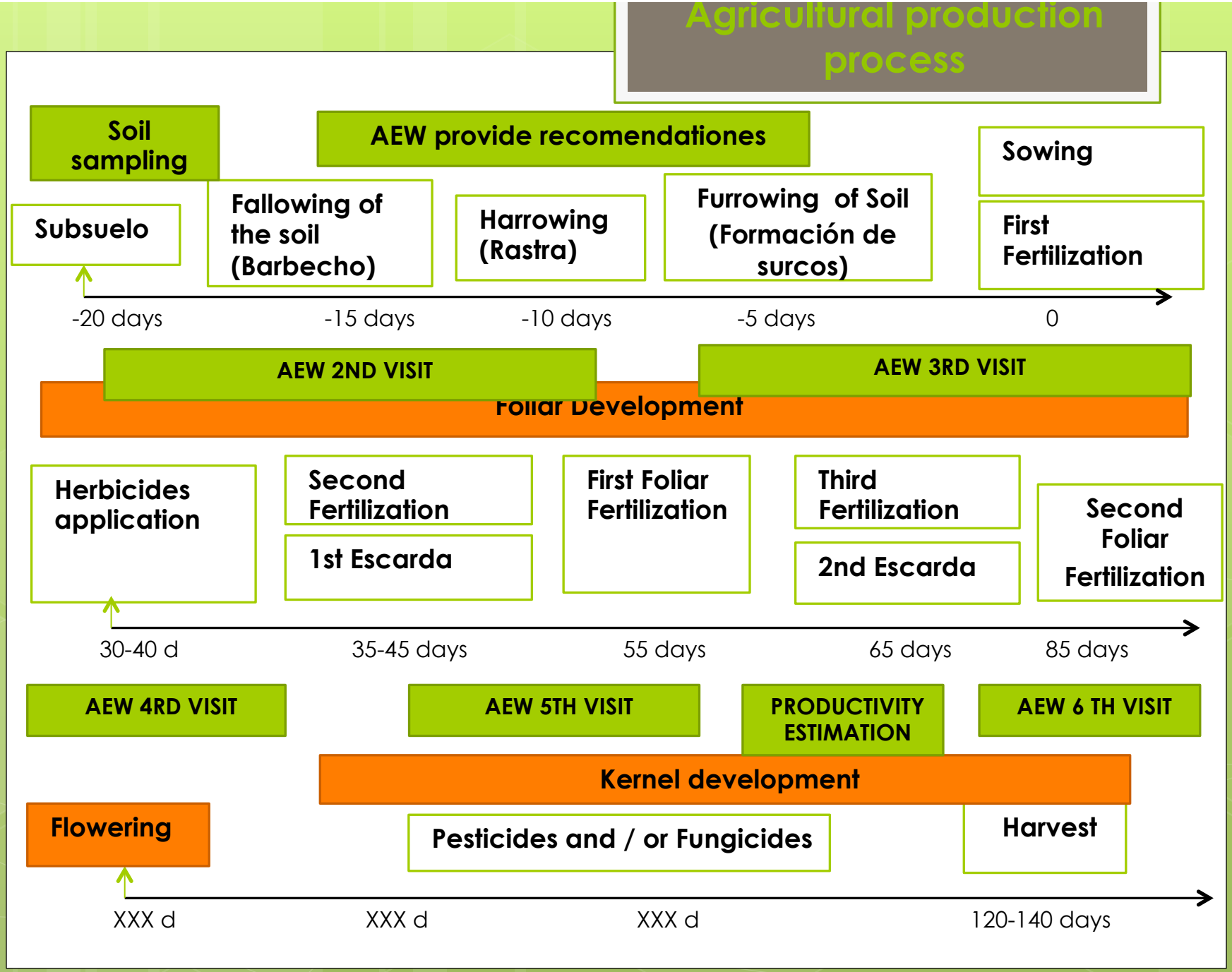
Add fertilizers usage

Machinery for soil preparation and sowing

Agricultural production process

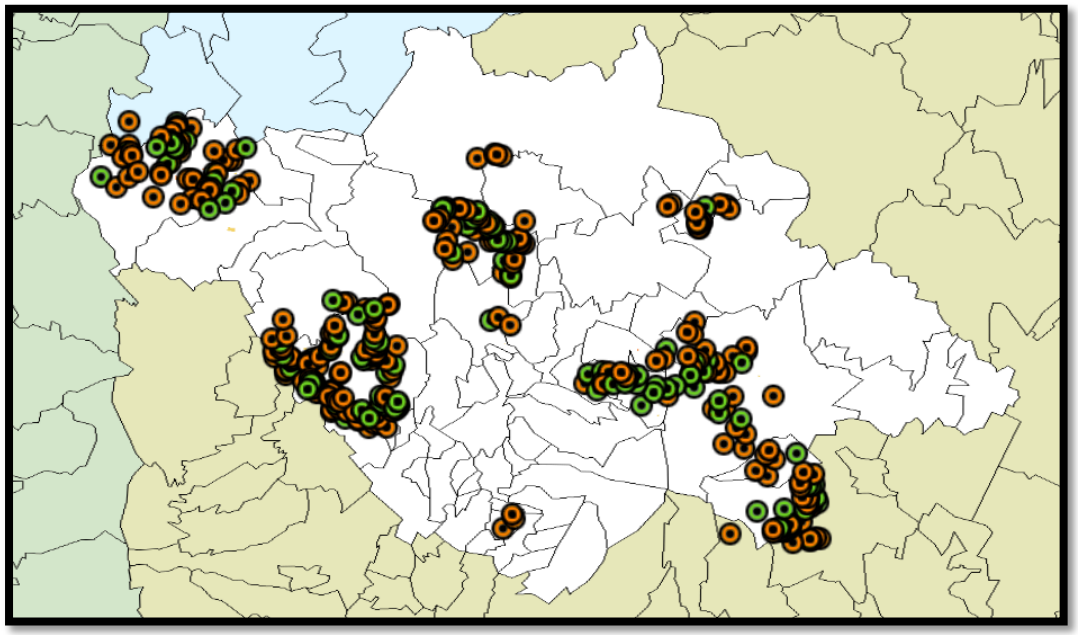


Agricultural production process



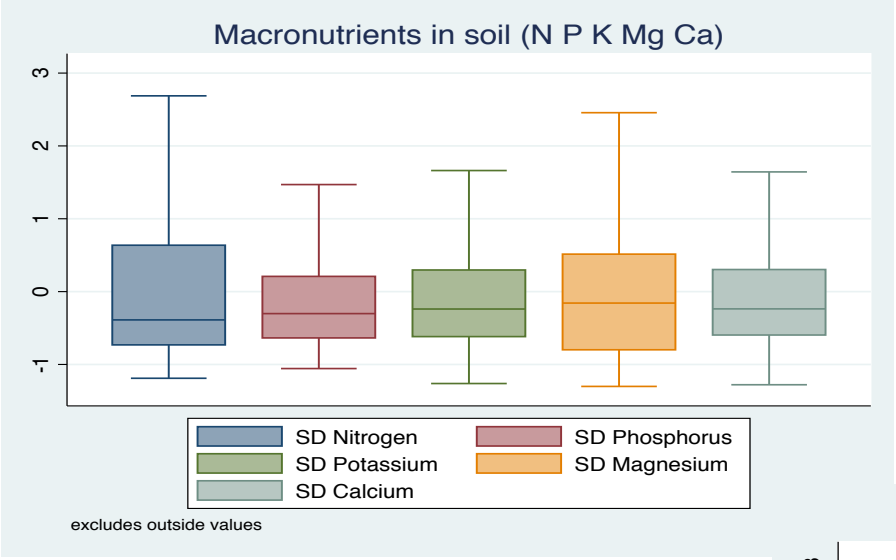
Soil Analysis intervention

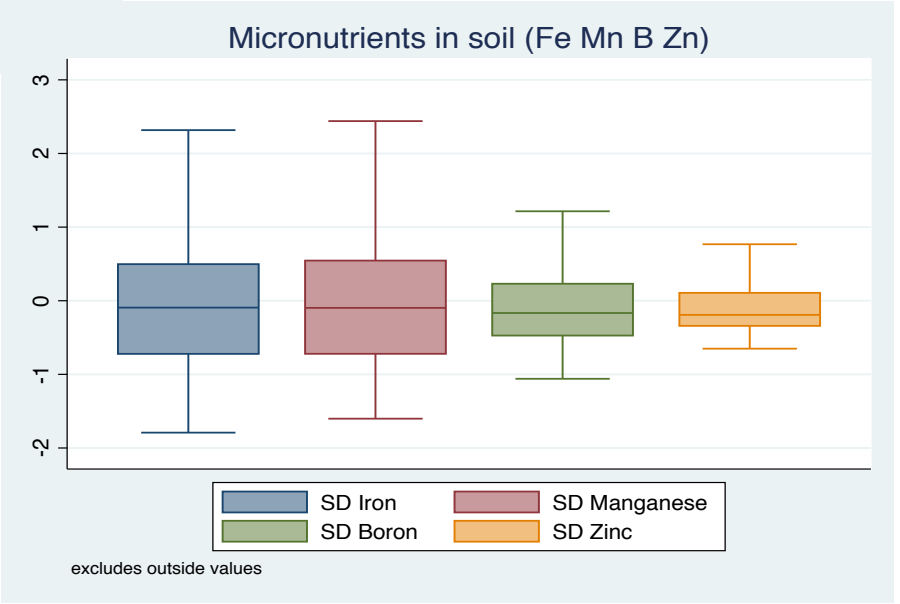
Program	Randomized	Eligible		Take up	
	n	n	%	n	%
SA+AEW+CostlyFoliar	91	57	63%	33	58%
Price level 1	31	16	52%	5	31%
Price level 2	34	25	74%	15	60%
Price level 3	26	16	62%	13	81%
SA+AEW+FreeFoliar	91	65	71%	57	88%
Total	182	122	67%	90	74%



Soil Analysis Results

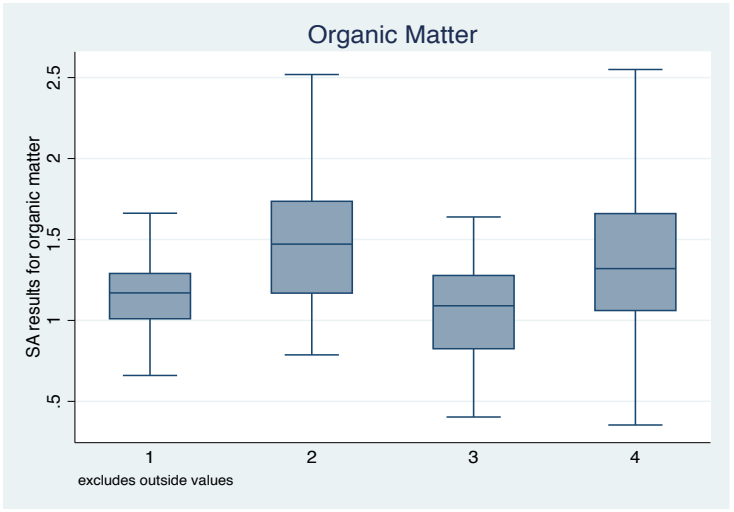
Variation

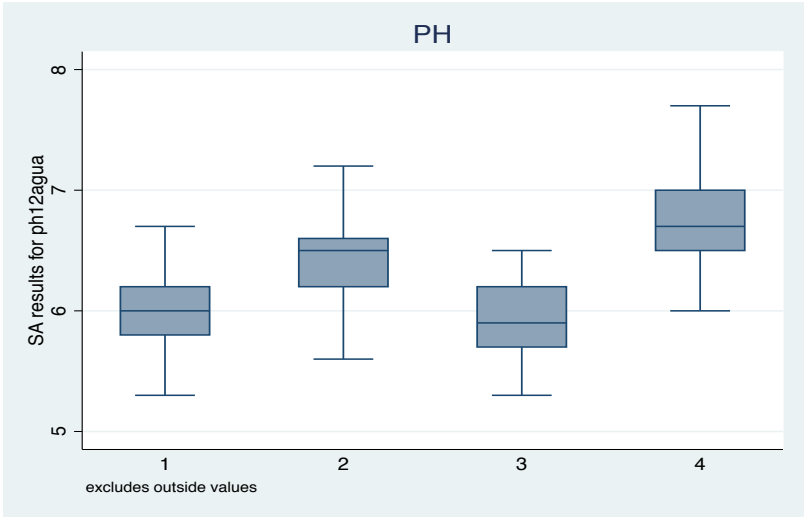


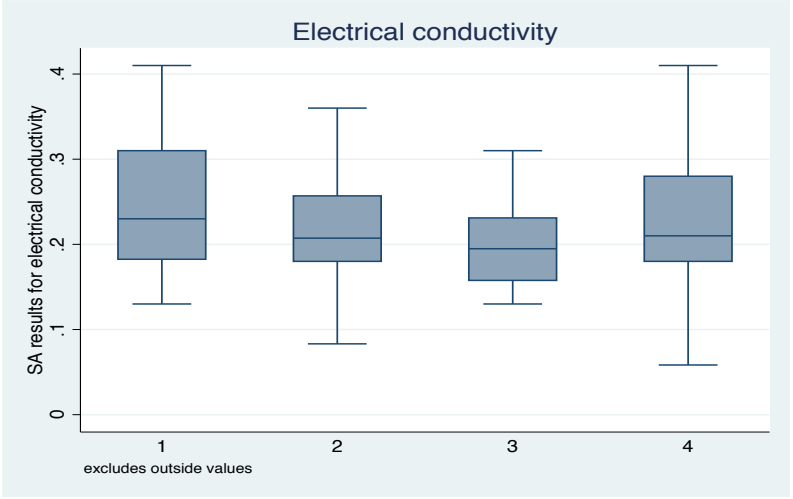


Soil Analysis Results

Variation within agricultural zones

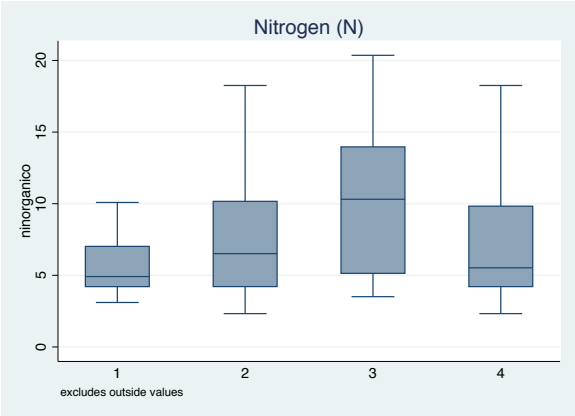


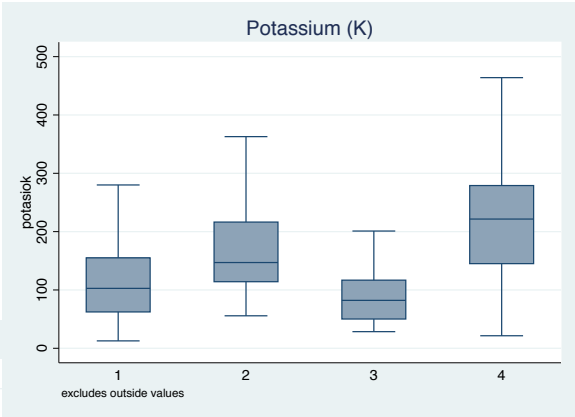


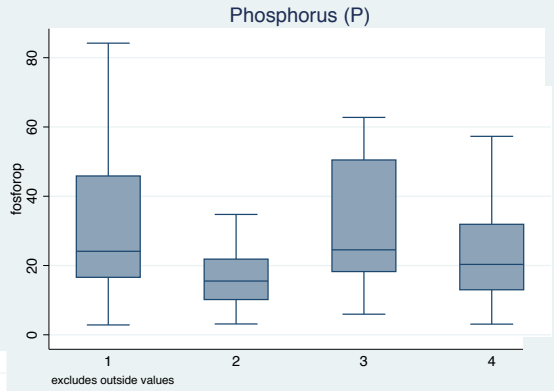


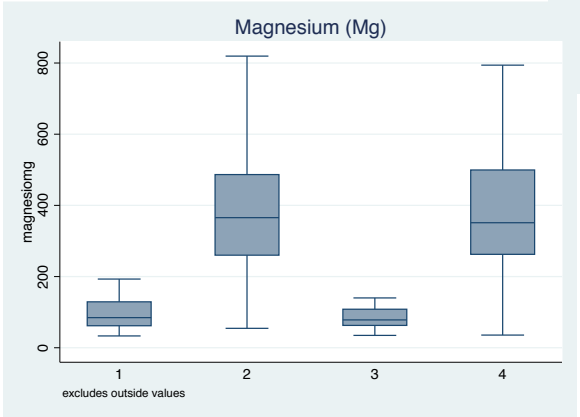
Soil Analysis Results

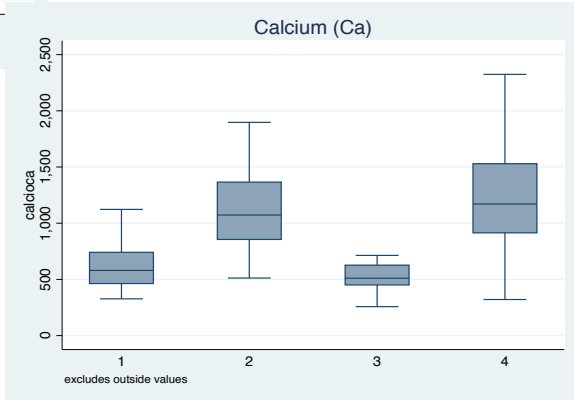
Variation within agricultural zones (Macronutrients) (n: 311)





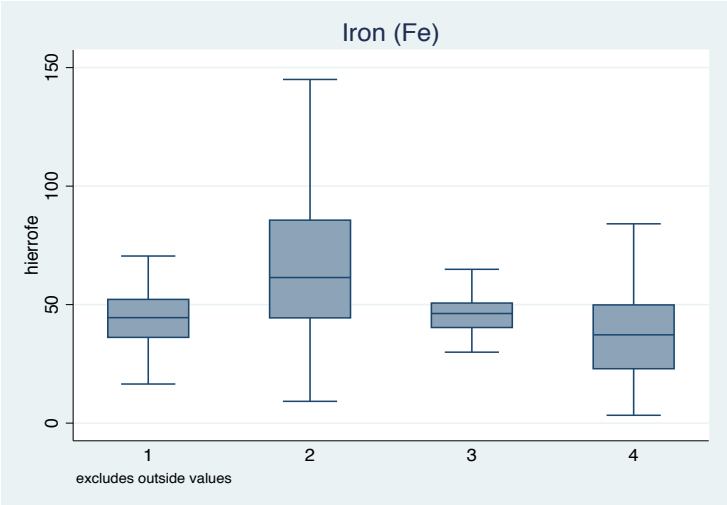


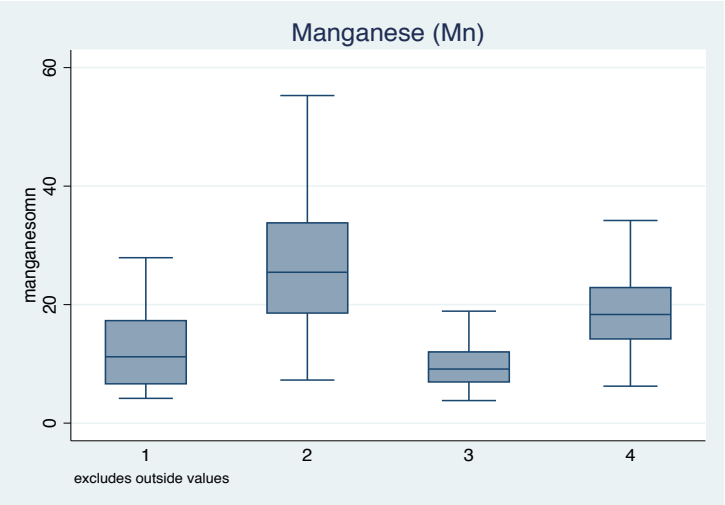


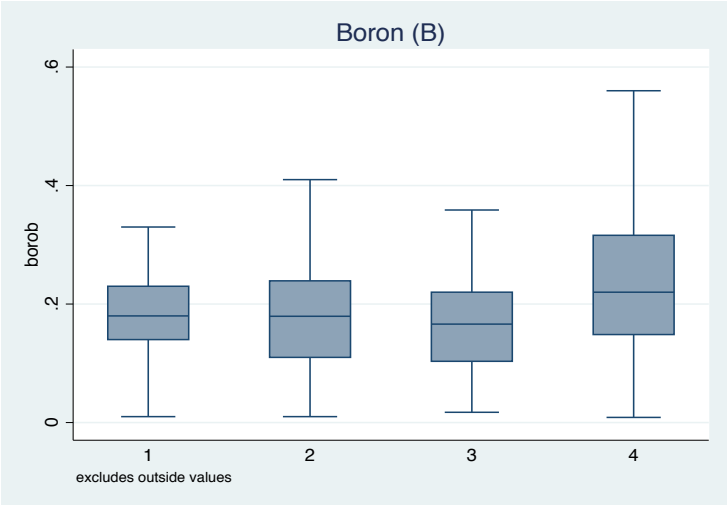


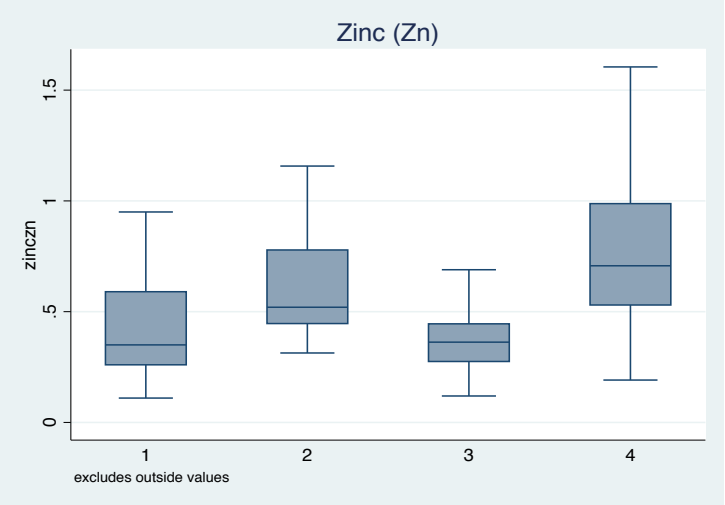
Soil Analysis Results

Variation within agricultural zones (Micronutrients)



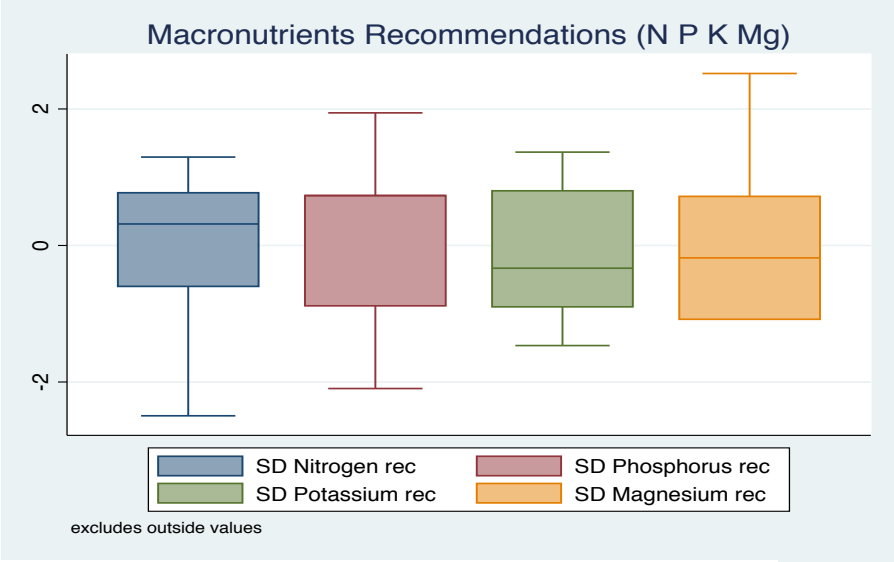


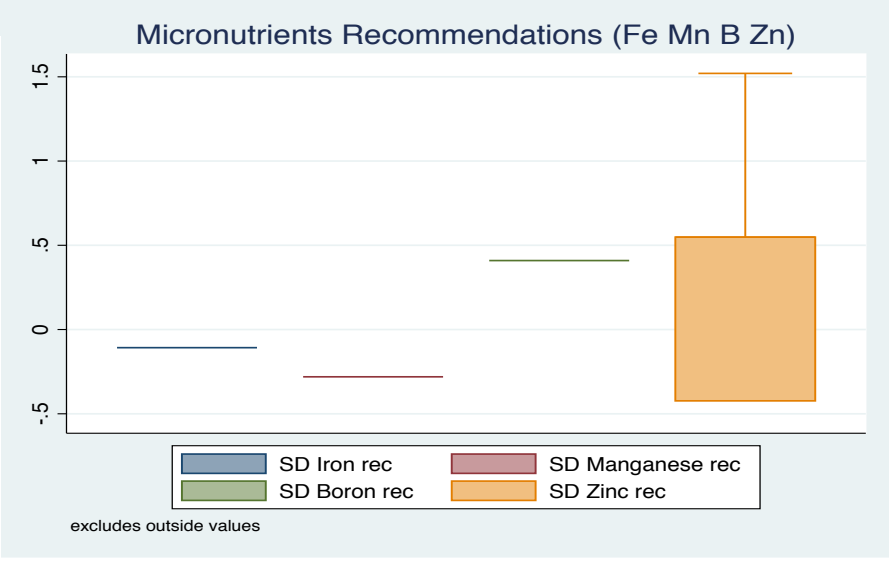




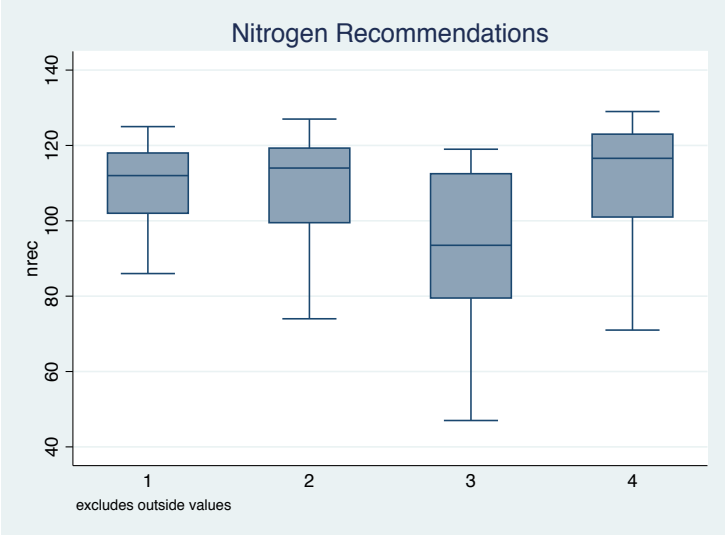
Aggregated Recommendations

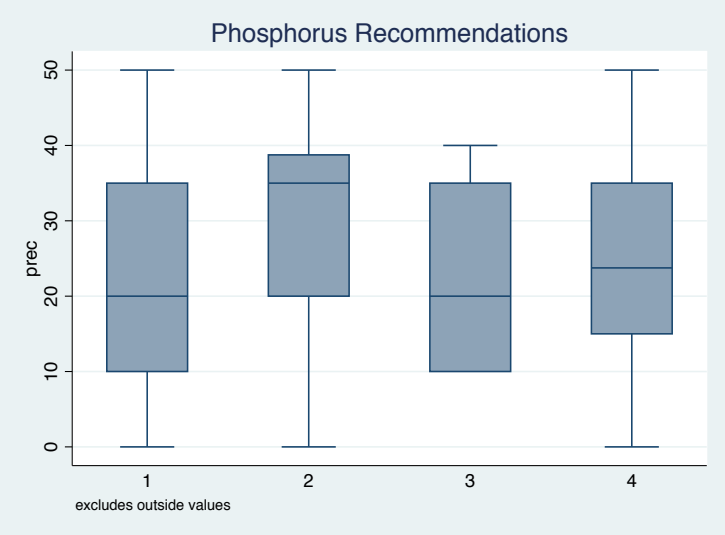
Variation within agricultural zones (Macronutrients) (n: 311)

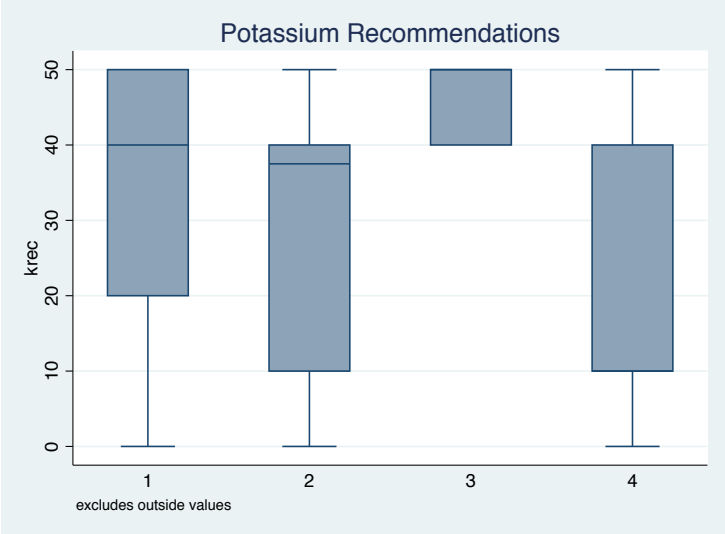


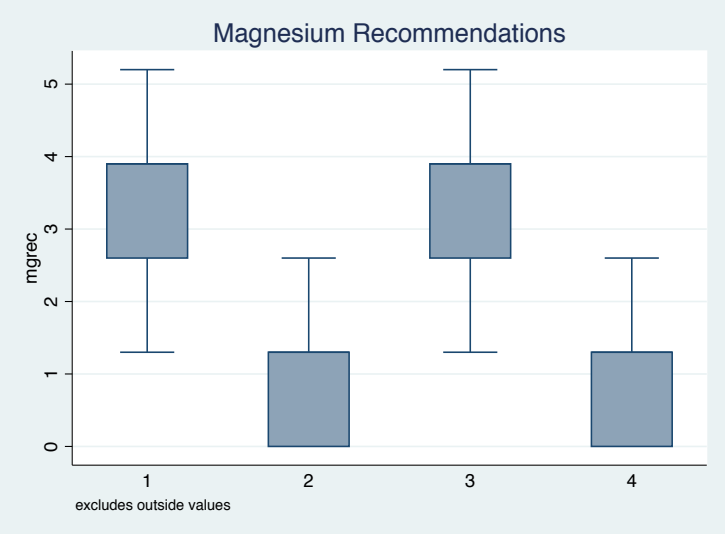


Recommendation for Macronutrients



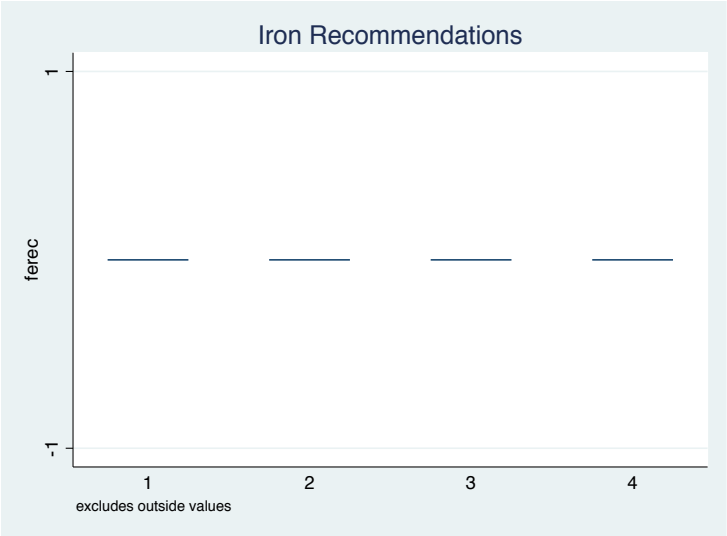


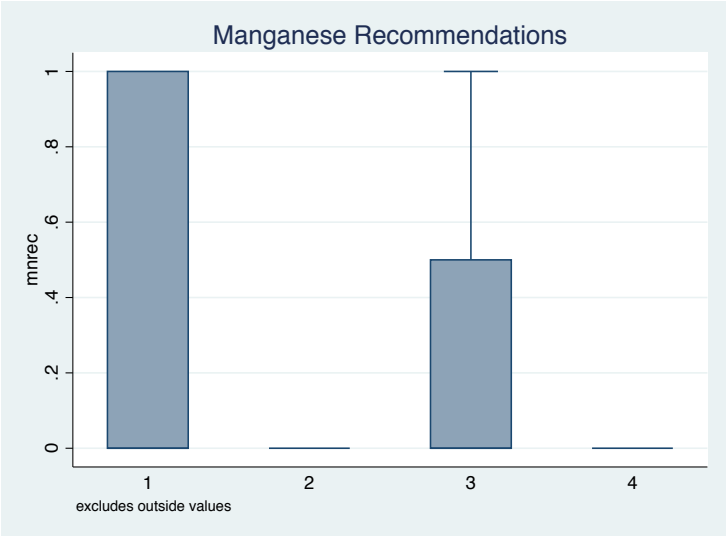


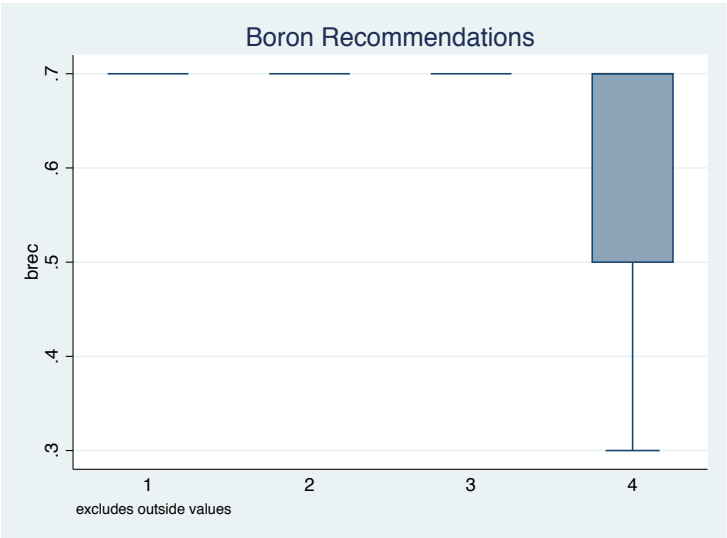


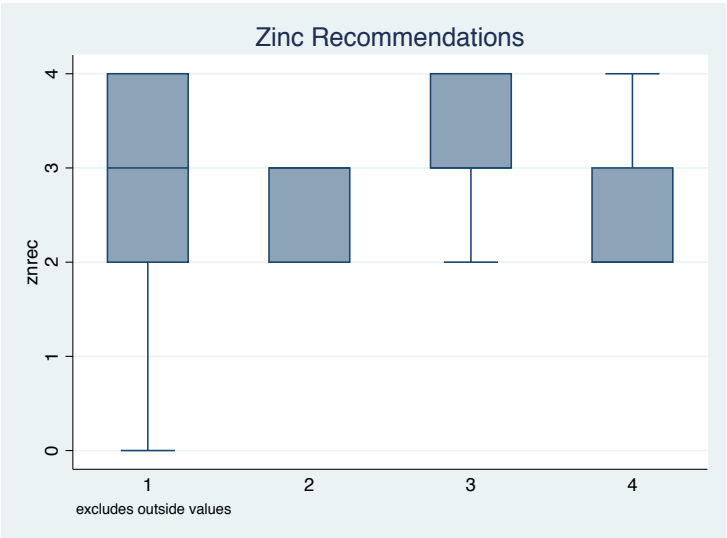
Micronutrients

- Variation within agricultural zones (recommendations for micronutrients)









AEW ADVICE

- Soil Analysis combined with frequent visits by AEWs (this year: survey team high quality AEWs)
- AEWs explain in detail soil analysis and the recommendations for input use.
- This year, attempted to convince fertilizer sellers to tailor fertilizer packages more specifically. Limited experiment with Foliar fertilizer tailored to address deficiencies in 80% of plots.
- AEWs also visit farmers regularly (verify whether items on a "check-list" have been undertaken)
- Experimenting with tablets for AEWs (allows GPS monitoring as well as quicker data collection). Prospectively useful for proposed supply side interventions.

Wrap-Up

- First few months of a multiple intervention project growing maize in Mexico
- So far, documented substantial heterogeneity in soil quality even within relatively homogenous agroclimactic zones
- Corresponding heterogeneity in optimal fertilizer recommendations
- More interventions in subsequent years.
- Finally, use the data to revisit (old) question of estimating agricultural production functions (Masenya and Barrett (2009)).
- Hard: Leontief type functions with endogenous regressors. Use better data and intervention to avoid stronger parametric assumptions