RARE Project

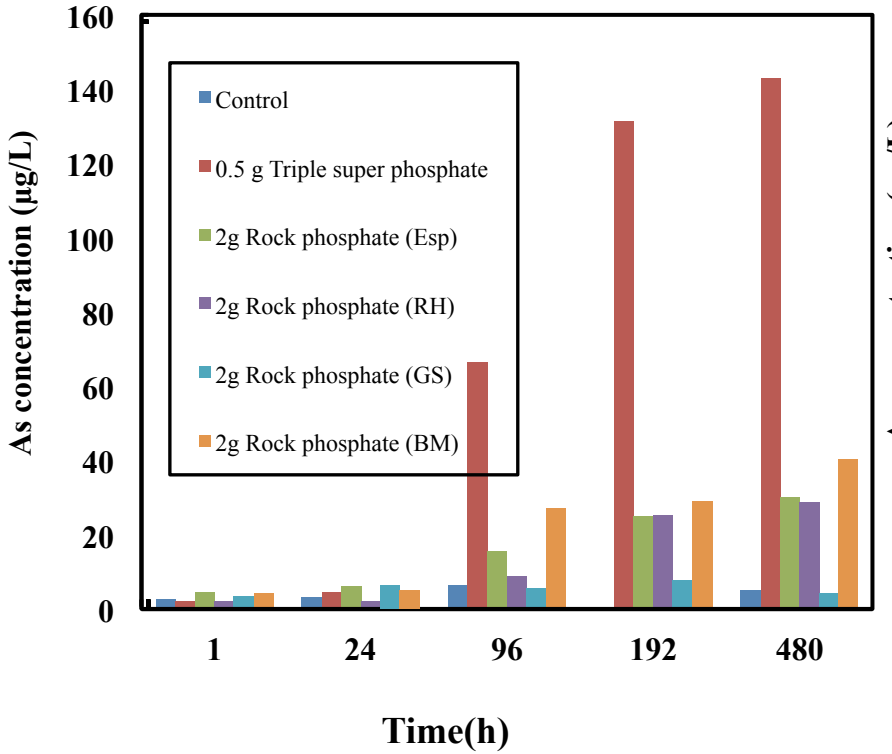
Arsenic Mobilization and Pb Stabilization by Phosphate and Alternative Amendments

Implications on Urban Soil Remediation and Urban Agriculture

Batch Experiment with Pb and As contaminated soil

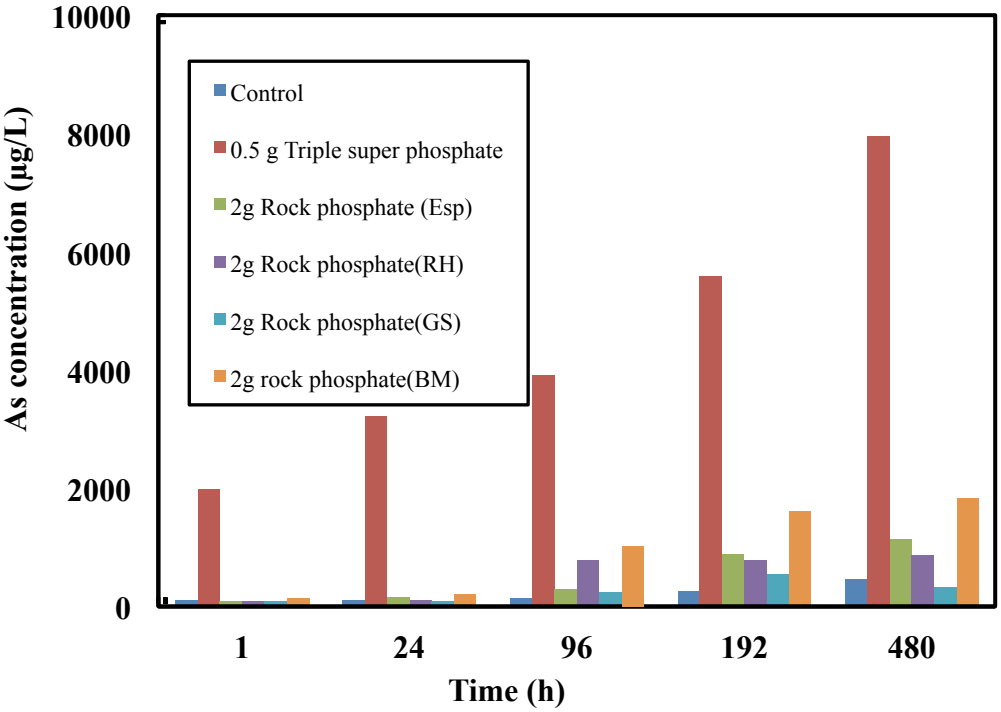
High Pb, Low As

- 50g of soil (Brooklyn, residential)
- 100 mL of DI water
- As ~ 10 ppm



High Pb, High As

50g of orchard soil (upstate NY)
100 mL of DI water
As = 802 ppm



Research Questions

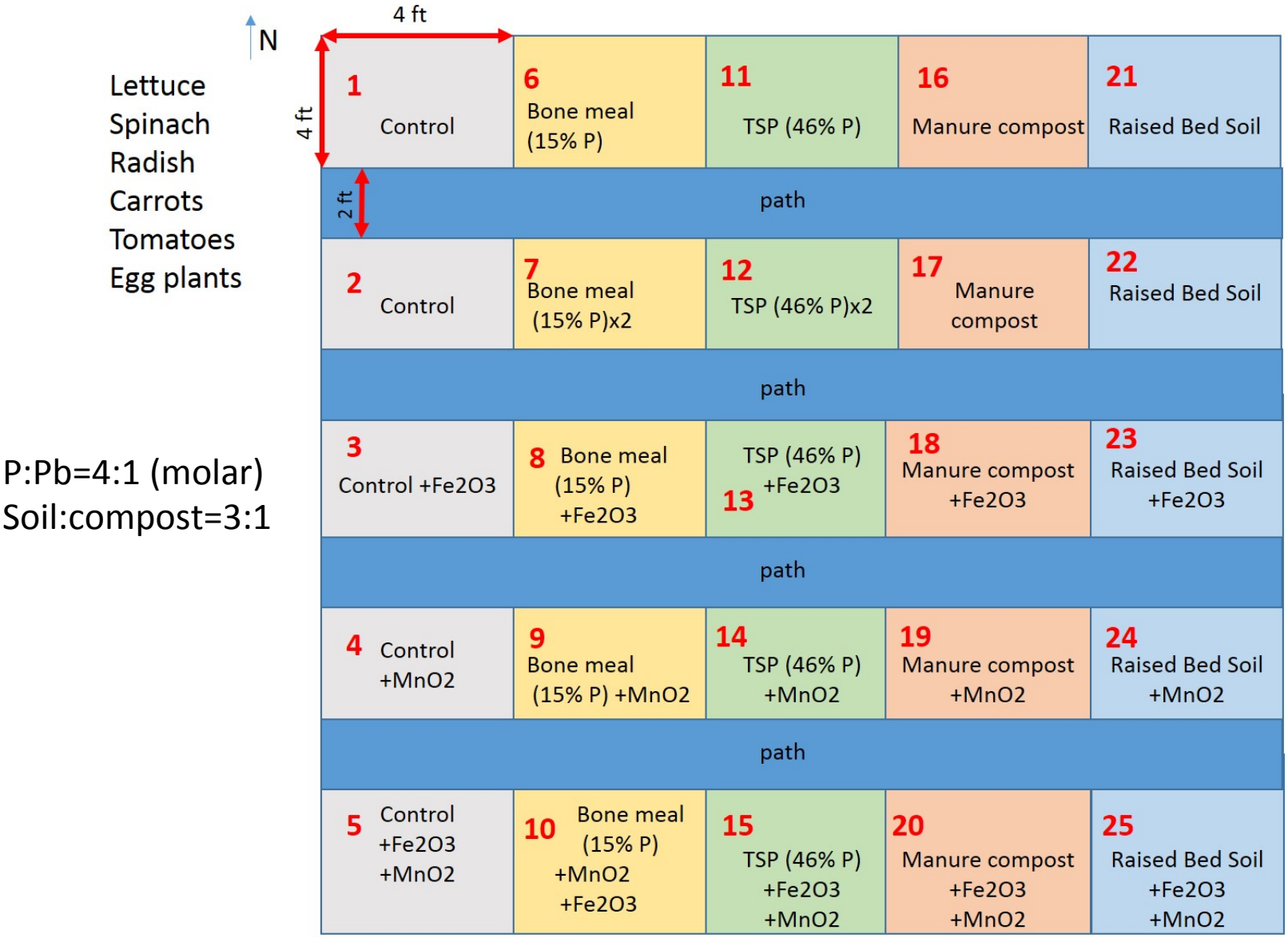
- What is the potential of As mobilization and Pb stabilization due to phosphate amendments?
- Is there any risk for significantly increased As uptake by common produce? Decreased Pb uptake?
- How does it compare to other remediation methods (such as compost application)?
- Can appropriate phosphate levels be identified without posing noticeable As risk, but still achieve good efficiency for lead stabilization?

Two Sites Studied

	A Farm, NJ	Sterling Community Garden, Brooklyn
Soil type	Silty loam	Sandy loam
pH	6.0	7.5
TOC%	6	25
Total P (ppm)	680	4000
Pb	278	2237
Bioaccessible Pb*	77%	77%
As	73	599
Bioaccessible As*	28%	81%

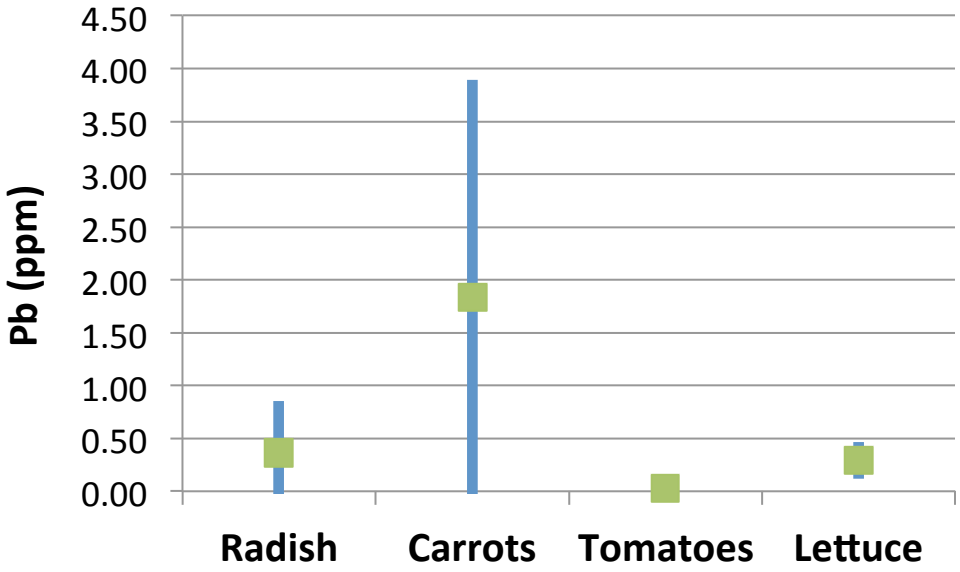
Agricultural Farm Experimental Plots

Farm Plots

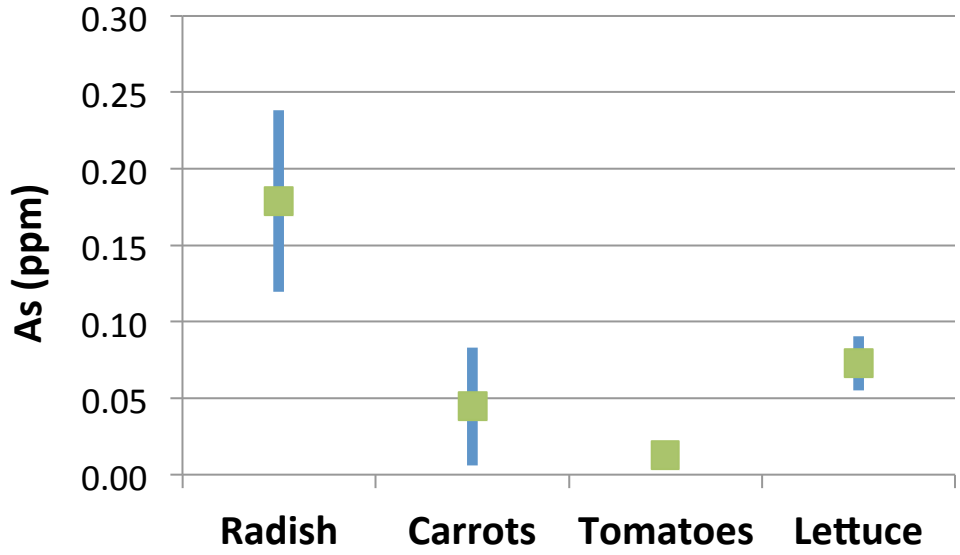


P:Pb=4:1 (molar)
Soil:compost=3:1

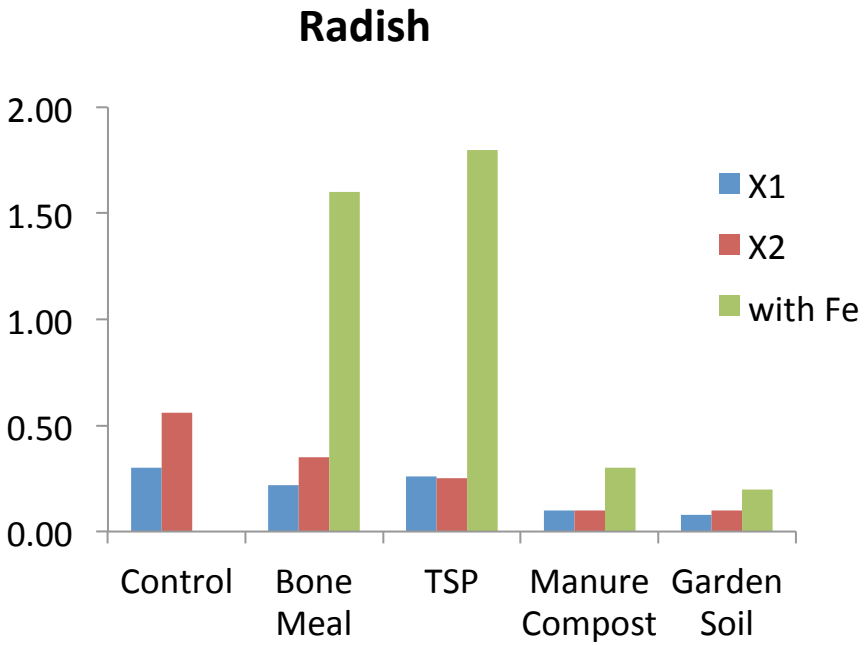
Summary of Pb and As concentrations in four Vegetables collected from Farm Experimental Plots

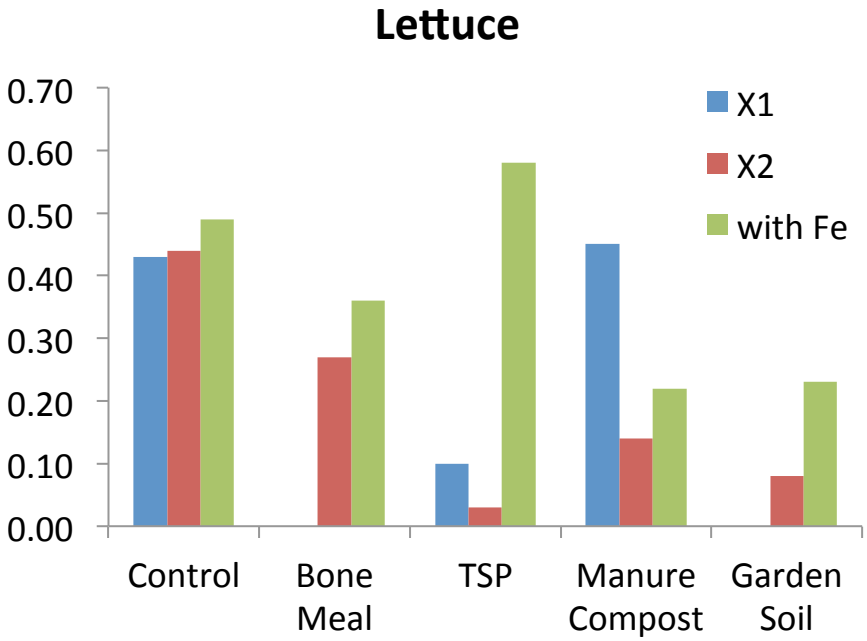


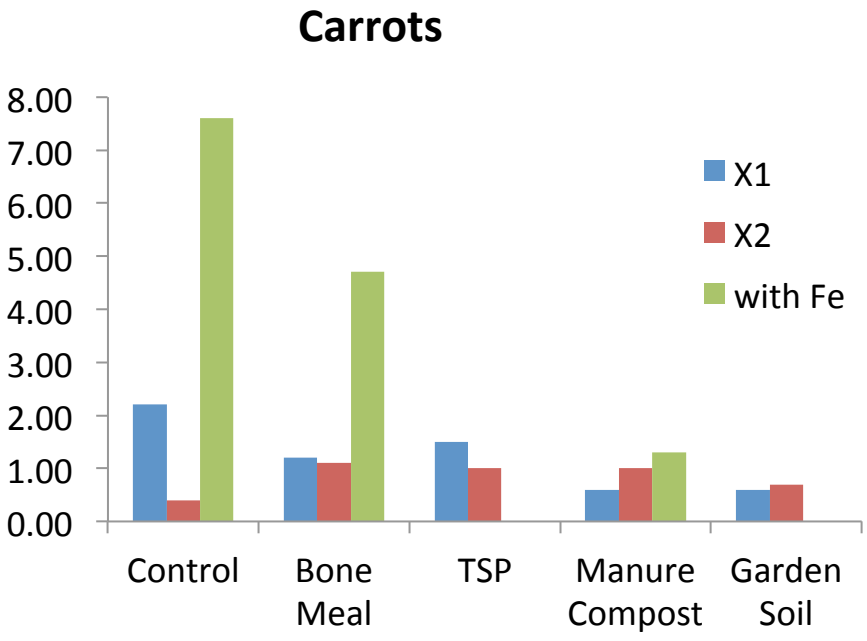
- Based on fresh weight
- Pb one order of magnitude higher
- For Pb, Carrots>Radish>Lettuce>Tomato
- For As, Radish>Lettuce>Carrots>Tomato



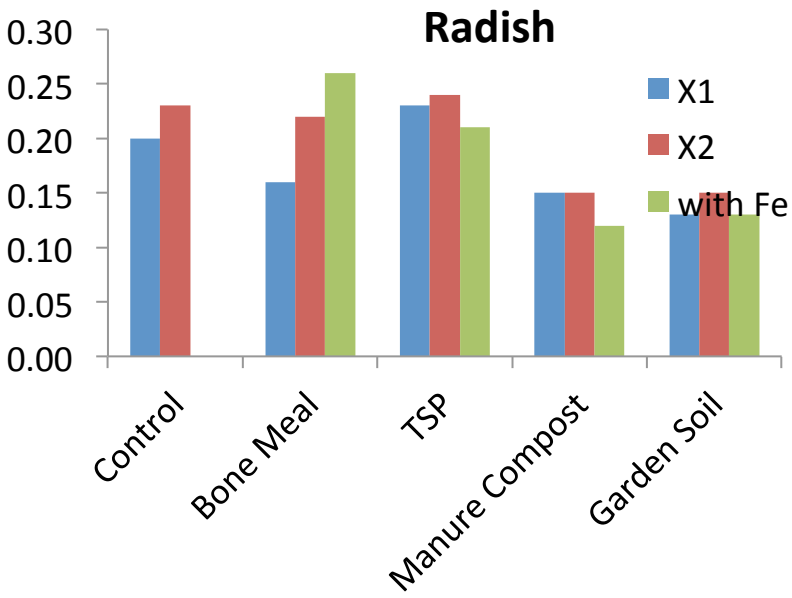
Addition of Phosphates or Compost <u>Does Not</u> Consistently Reduce Pb concentrations in Vegetables

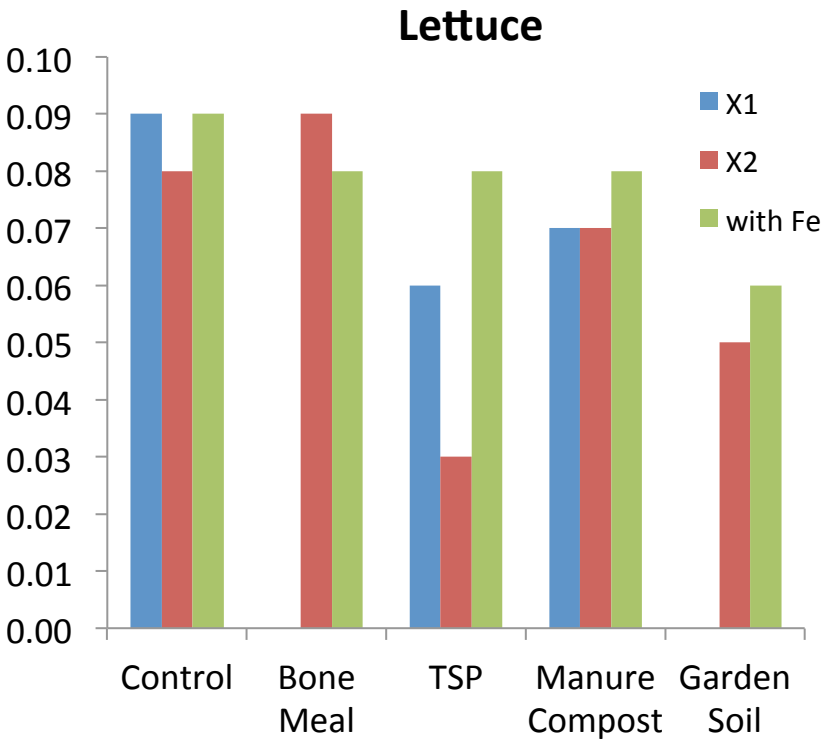


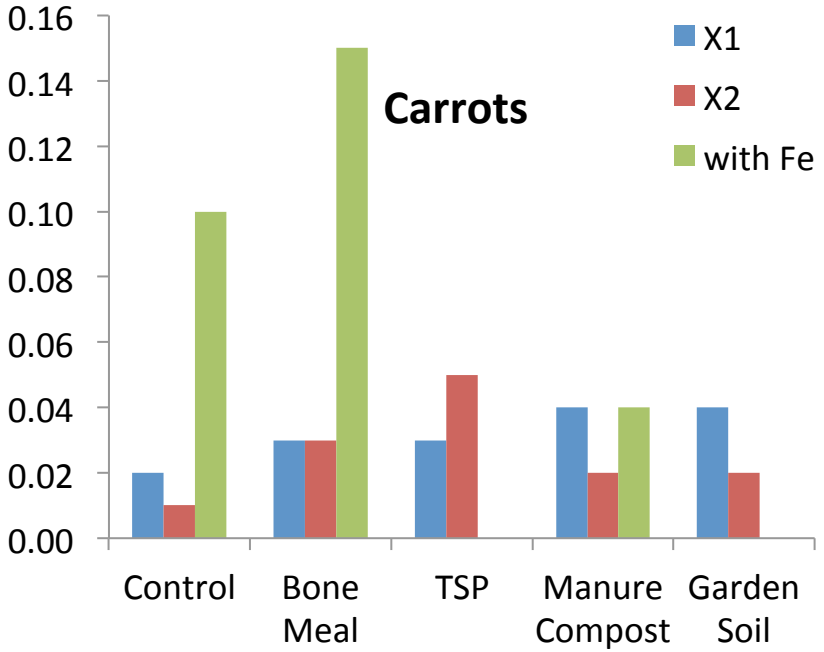




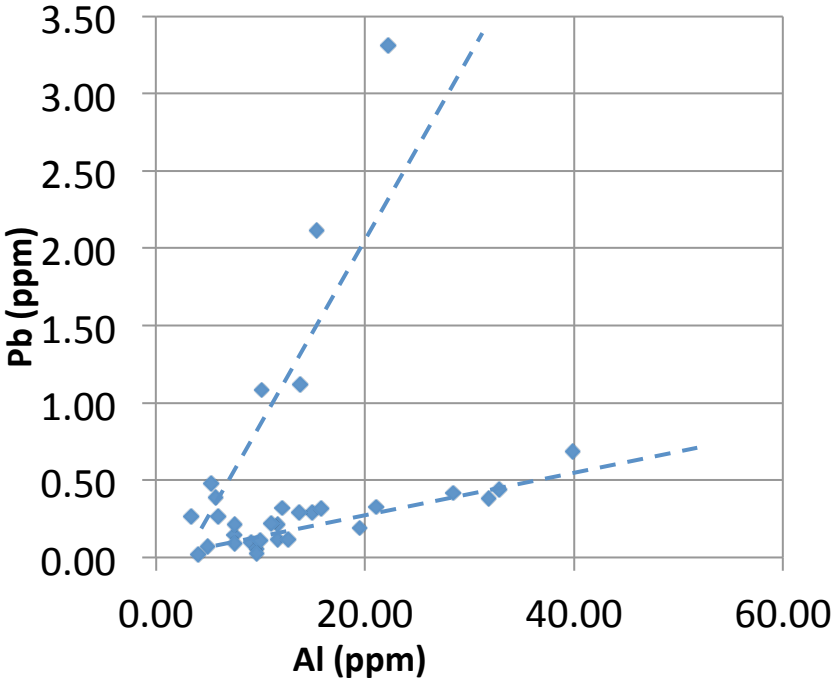
Addition of Phosphates or Compost Does Not Consistently Increase As concentrations in Vegetables

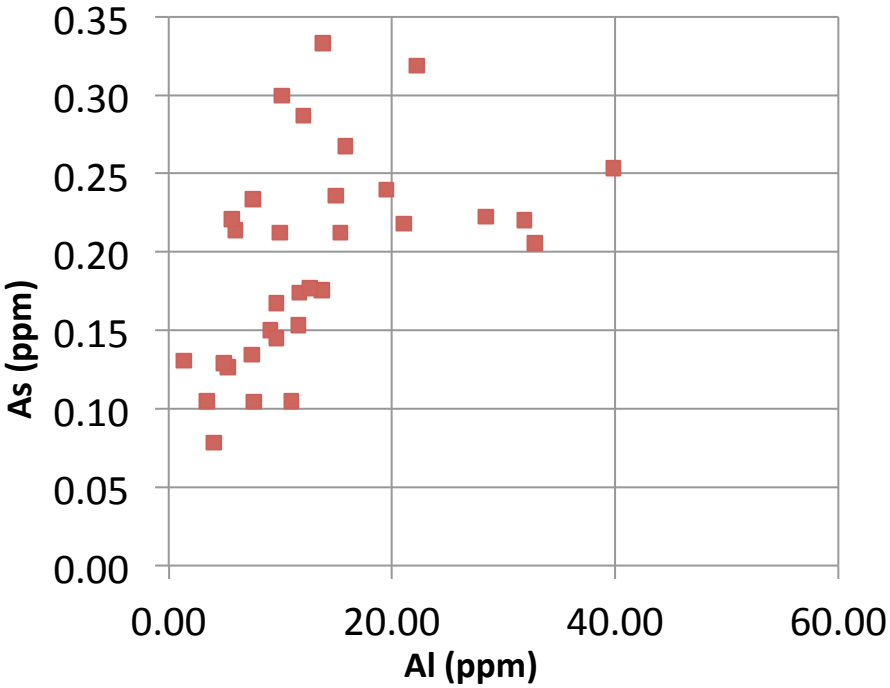






Influence of Dust/Dirt Particles?
Radishes (Farm)





Implications on Mitigation Strategies

- Best Management Practices
- Vegetable selection
- Common sense practices (washing, peeling, etc.)
- Dust control
- Farming/Gardening techniques

Sterling Community Garden Experimental Plots

Sterling Community Garden Experimental Plots

Four plots

- Control
- Bone Meal
- Compost
- Sulfur
- ***A fifth plot*** with clean sediment + compost (Clean Soil Bank project)

Vegetables planted:

- Eggplants
- Cabbages
- Tomatoes
- Onions
- Kale
- Cilantro

Ongoing Lab Work

- Analysis of more vegetable samples from both sites
- Measure bioaccessibility of Pb and As in soil (post harvesting) using RBA protocol, but at pH=2.5
- Measure phyto-availability of Pb and As using Modified Morgan extraction

NOFA – Justine Cook
USDA NRCS NJ – Richard Shaw
US EPA – Mark Maddaloni & Kirk Scheckel
NYC Mayor's Office of Environmental Remediation
Green Thumb
Sterling Community Garden

(Planting at Sterling, 6/26)

- **Anna Paltseva**
- Sara Egendorf
- Zulema Garcia
- Victor Blanco
- Tamar Saimbert
- Bryan Adamcik
- Kyle Goedde
- Roxanne Yolanda
- Jonathan Boyce
- Andrew Bock
- Jumani Rachid
- Michael Ng
- Tatiana Morin