

Sunflower Power: Phytoextraction in Action

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Problem

Heavy metal is polluting soil in the Pearl River Delta, South China

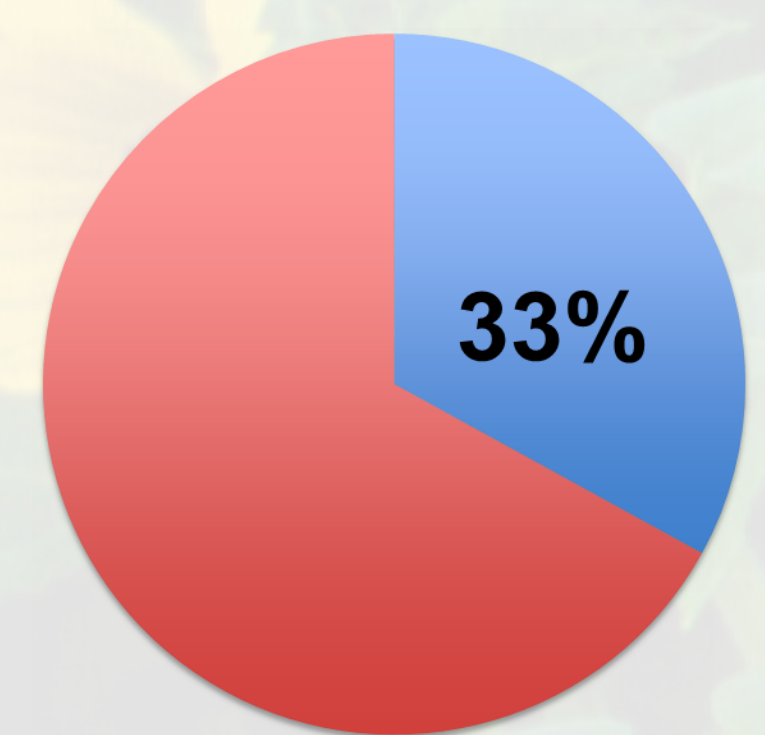
- Food is still grown
- Significant health risks

Causes

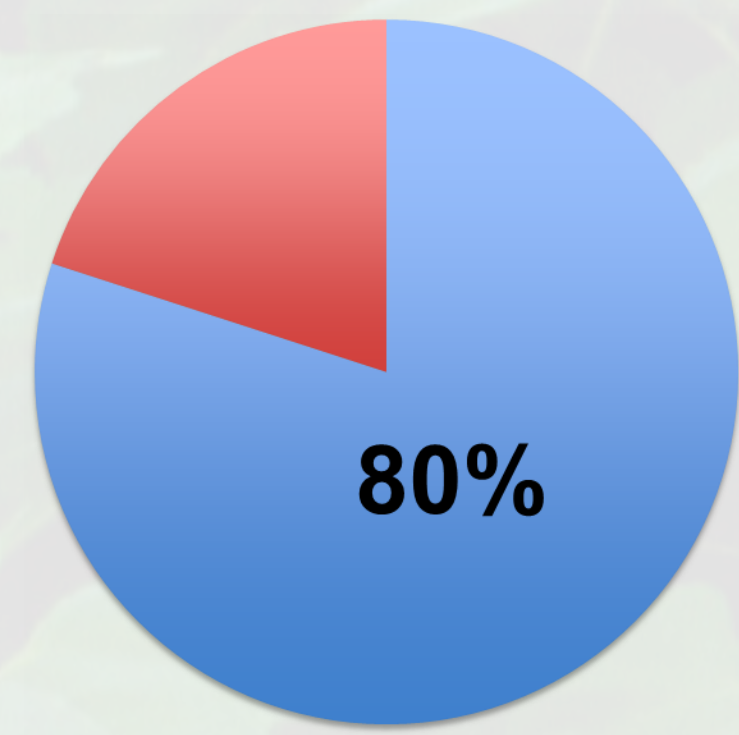
Rapid development of agriculture, industrial, and traffic practices

Background

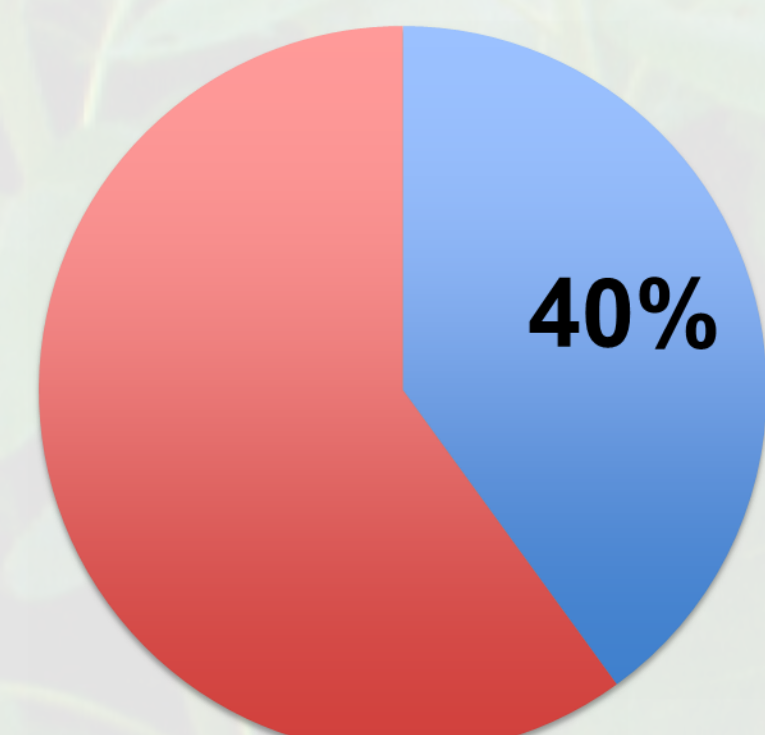
Contaminated Vegetables Consumed in PRD



Vegetables Consumed in Hong Kong, Grown in PRD



Contaminated Farmland/ Vegetable Fields in PRD



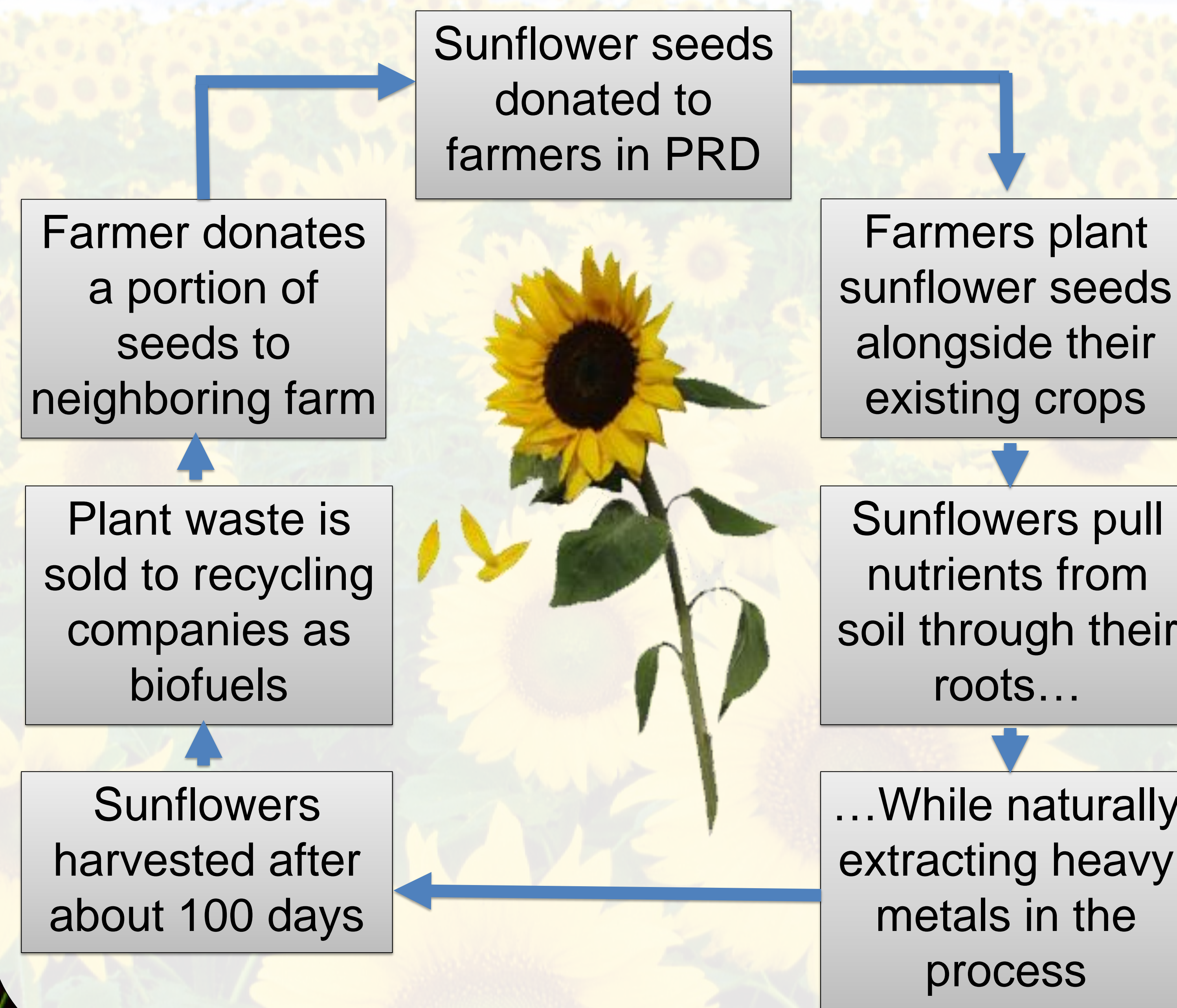
Heavy Metals: Concentrations in PRD

Heavy Metal	Current Concentration (mg/kg)*	Non-Polluted Concentration (mg/kg)*
Cadmium	1.4 to 1.8	< 0.3
Copper	11.0 to 41.0	< 25
Lead	23.0 to 83.0	<40
Zinc	36.0 to 149.0	<40
Mercury	0.29 ± 0.26	< 0.42
Chromium	46.7 ± 27.7	< 25
Arsenic	20.0 ± 20.8	< 20

*Taken from (Hu, 2013), (Chang, 2013), (Bai, 2011)

Solution: Sustainable Phytoremediation

Using sunflowers to remove heavy metal from soil



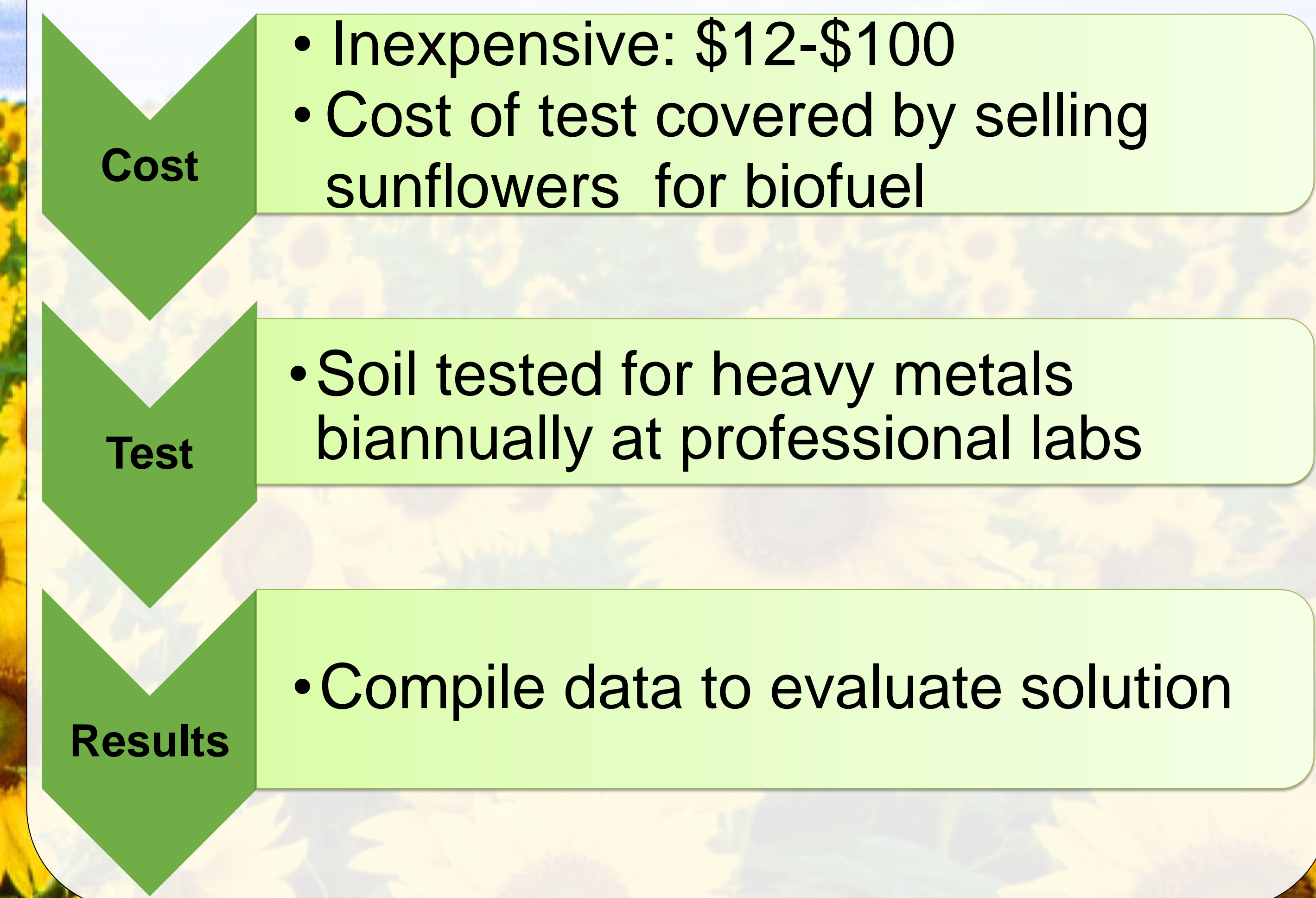
Costs

- Takes 5-10 years
- Labor cost ↑
- Seed transportation
- Sunflower seeds: ≤ \$30 per acre

Benefits

- Yield ↑
- Sunflowers can be recycled as biofuel
- ALL polluting metals are remediated
- Aesthetically pleasing
- Economically feasible
- Productivity ↑

Soil Testing



Conclusions/Recommendations

- Goal: concentrations of the heavy metals decrease by 50% after 10 years
- Expand use of phytoextraction crops, such as the sunflower, to other affected locations
 - 12% of worldwide soil is polluted

Acknowledgments

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