Soil Sampling, Risk Mapping & Exposure Prevention

Second Session of a Three Part Series on Soil Quality/Health

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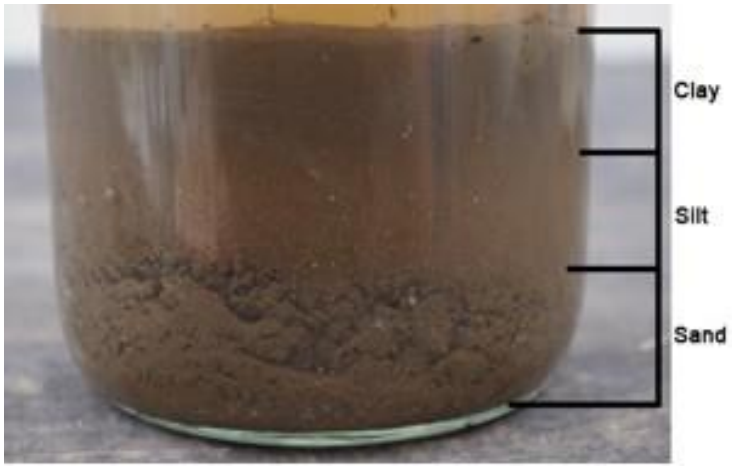
Goal:

Understand Soil Quality to Assess Site-Risk & Manage Soils to Grow Food, Farm, Family Safely

Objective:

Provide Soil Testing & Best Practice Guidance to ↑ Informed Decision Making that ↓ Risk of Soil Contaminant Exposure

Why should you care about your soil?



Soil Quality

→ How Your Crops Grow!!!

Some Soils Are Easy To Improve:

Plants Grow Best With Proper Soil

Nutrients/Structure/Composition/pH

Dont Guess!

Test!!

Some Soils are Harder to Improve: If Contaminated…

Soil Quality Affects Human/Plant Health

→ Crop Quality/Risk Management

Home Tests vs. Lab Test Results

DIY Home Tests →~Approximate Results

Lab Tests → Reliable & Precise

Where are Soil Contaminants a Concern?

- **Agricultural Lands** - Historical Contaminants can Inhibit Plant Growth/Affect Human Health
- **Residential Properties** - Contaminants could be > Allowable for Human or Plant Health
- **Urban Ag/Community Garden Sites** -

  Based on Site History/Possibly Several Risks

Common Soil Contaminant Sources

Source:	Contaminant
Paint (before 1978):	lead
High traffic areas:	lead, zinc, PAHs
Treated lumber:	arsenic, chromium, copper
Burning wastes:	PAHs, dioxins
Manures:	copper, zinc
Coal ash:	molybdenum, sulfur
Sewage sludge:	cadmium, copper, zinc, lead, PBTs
Petroleum spills:	PAHs, benzene, toluene, xylene
Commercial / industrial	PAHs, petroleum products, solvents, lead,
site use:	other heavy metals
Pesticides:	lead, arsenic, mercury (historical use),
	chlordane and other chlorinated pesticides

Where to start?

Understand/Interpret:

- Site History
- Soil Sample Testing
- Remediation **(STOP!)**

versus Best Management Practices **(GO!)**

Observe Plant Growth/Soil Organisms/Debris

→ Dig test, Soil Structure Tests.

Site History→ What to Look For:

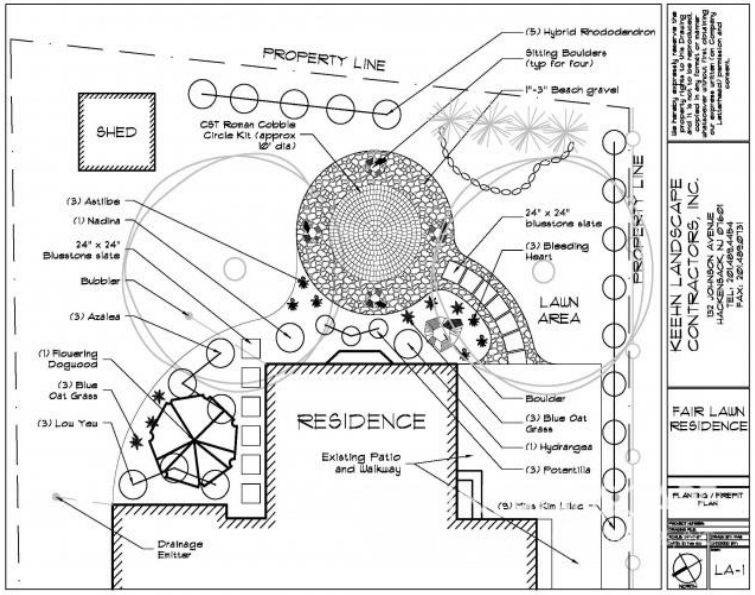
- **Public Access Maps (Sanborn)**
- **Walk around, ask neighbors/property owners, identify other homes in neighborhood that show similar potential hazards.**
  - **Parking lots, auto repair, junkyards, machine shops, dry cleaners, gas stations, concrete plants, illegal dumping sites!!**

Mapping YOUR Soil Sample Sites

Make Maps with Notes for Different Sample-Site Locations

Ex: Front/Back/Side Yard Sample Maps

Map your Garden Based on Planting Areas (Exs: veggies, native perennials, fruit trees, etc…)



Every site is different, Soils vary too…

Ask Yourself….:

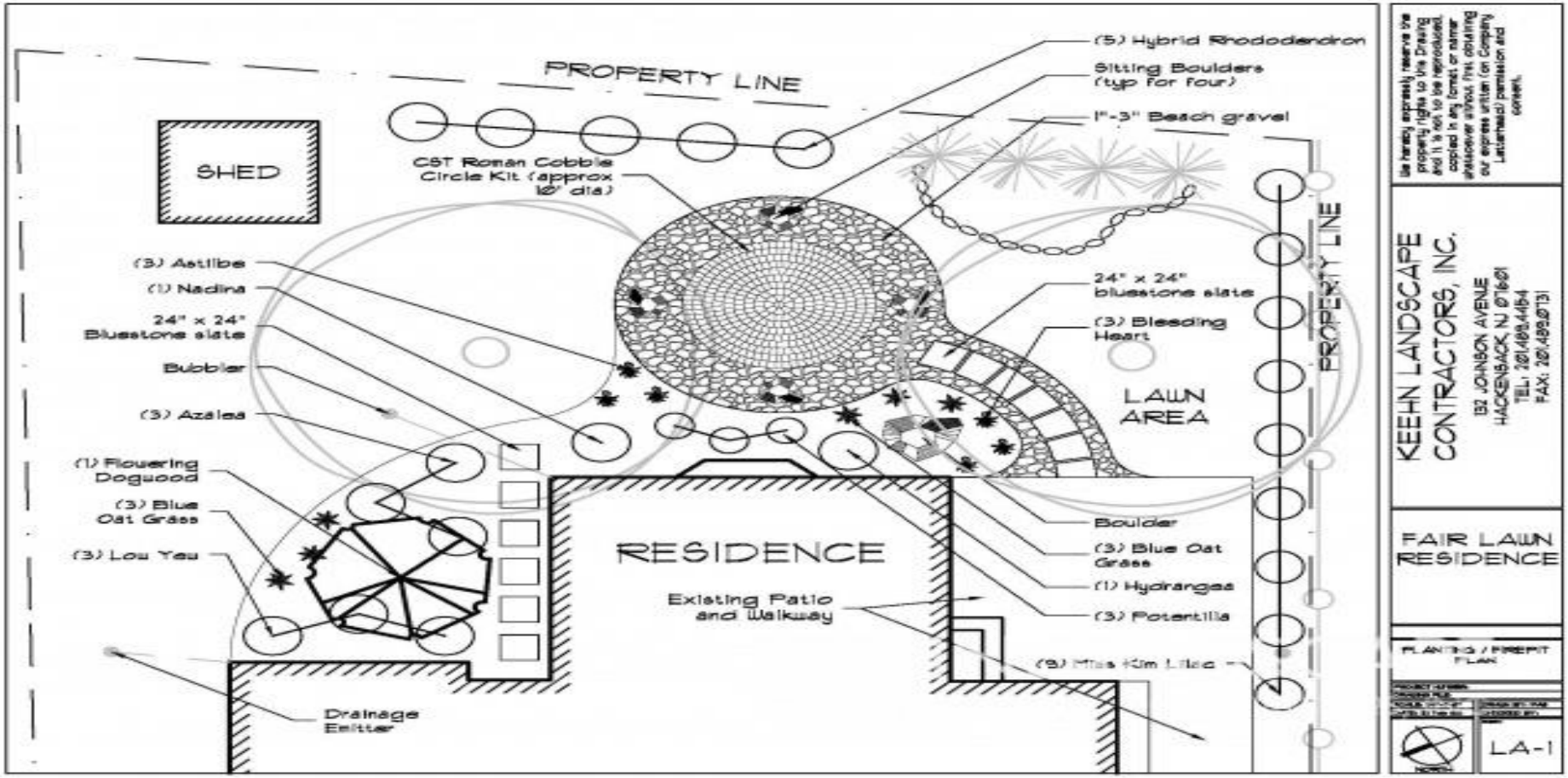
Are there plants currently growing?

- Is the soil easy to dig into?
- Are you finding any micro organisms in the soil? (worms, insects, larvae)
- Do you come across any debris or trash?
- Consider a Bean Test: plant in testing site soil, and compare growth with potting soil.

Mapping Your Food Growing Site 2-3x

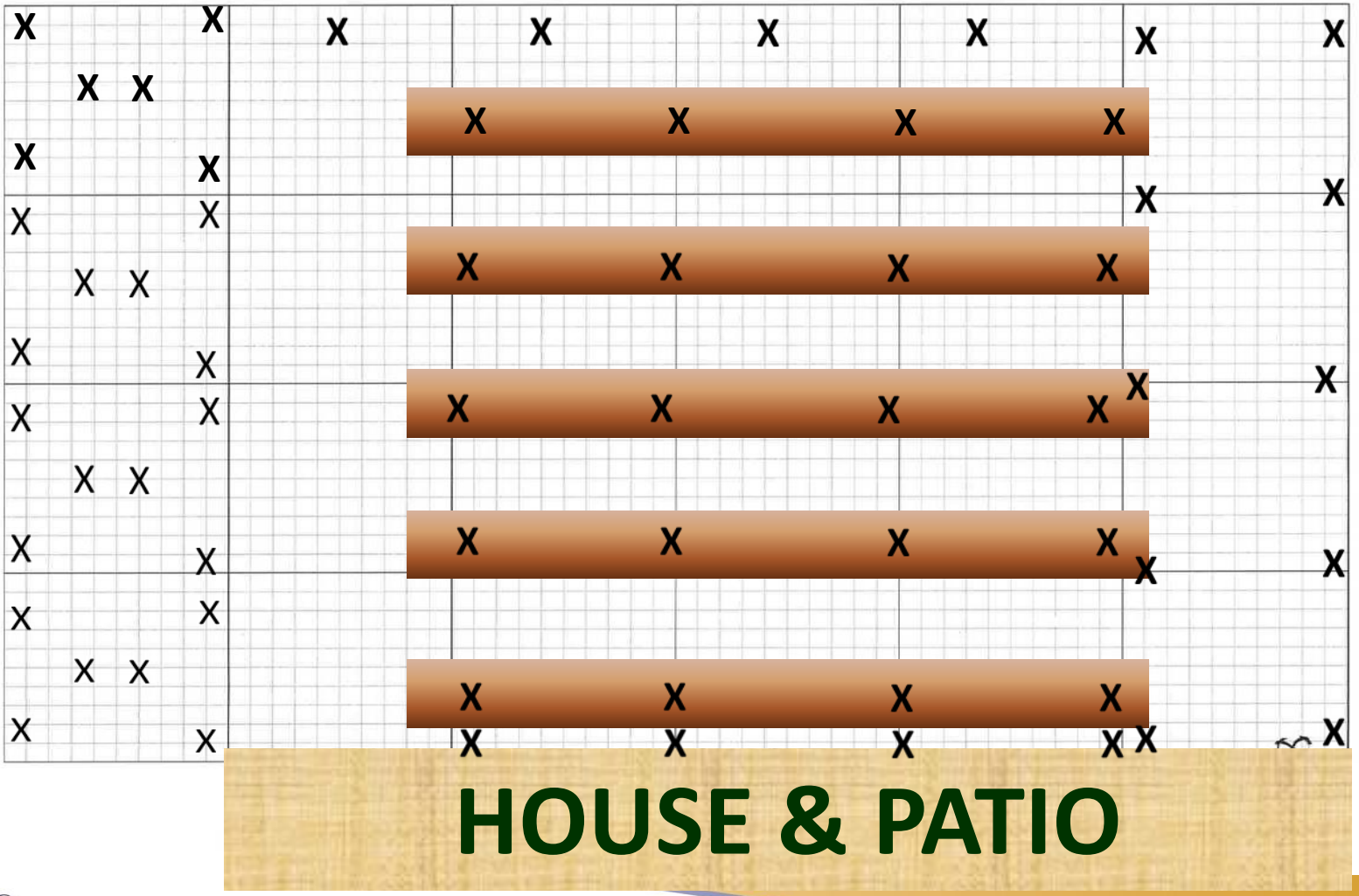
- Areas that show differences in plant growth should be sampled separately
  - Peeling paint, evidence of contamination
- # Samples per Area (top 4-6 inches of soil)
  - Keep accurate notations per site-area
  - Each distinct area should be sampled

Map Your Growing Site



GAS STATION or DRY CLEANERS

Example of Soils Sampling Map



Soil Testing

See UCCE Contra Costa/Alameda Master Gardeners

Growing Your Own Food Web Page(s)

for Analytical Laboratories for Soil Testing

EPA Suggests Urban Garden Soils should Be Tested for: -pH -% organic matter

-Nutrients -Heavy Metals/Petro-/Dioxins (based on site history including lead)

Why are soil contaminants a concern in urban areas?

Contaminants Can:

- -Inhibit Plant Growth
- -Affect Human Health!
- -Persist in Soils Long Term
- -Persist without Us Knowing

Sources of Heavy Metal/Lead Exposure

- **Lead paint hazards**

  → lead **dust** in homes; from exterior prep work

  & friction of windows

- **Bare soil** in yards with lead contamination from house paint or previous use of leaded gasoline

- **Take-home** lead dust from construction work or other occupations

How do we get lead into our body while growing food?

- **Hands contaminated with leaded soil**

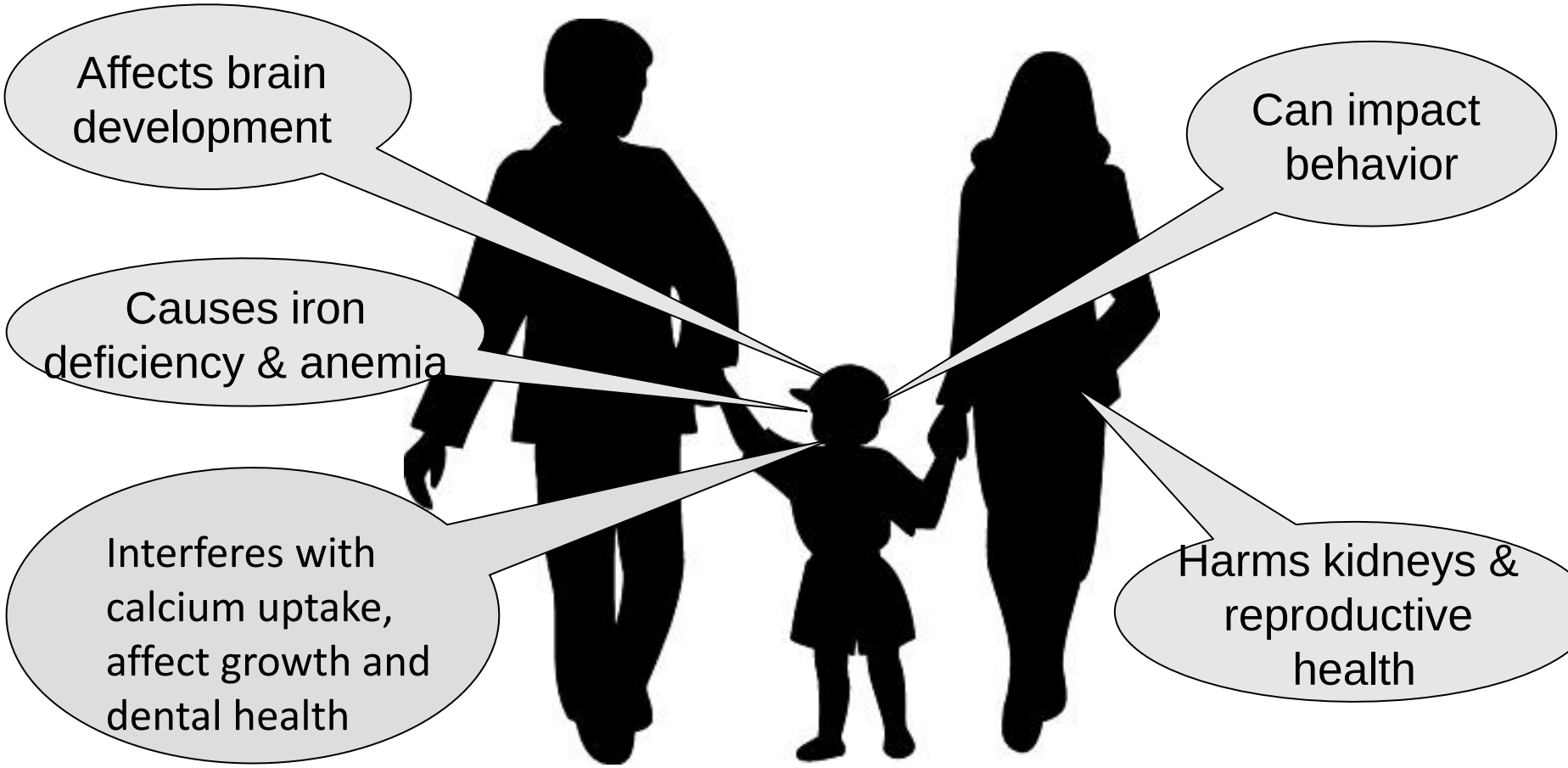
  Contaminated hands touch mouth, food, drink container, cigarette

- **Hands contaminated with leaded paint**

  Hands touch damaged lead paint and its dust. Then hands touch mouth, food, drink container, cigarette, etc.

- **Eating lead-containing soil or paint dust on unwashed produce, or eating produce that has lead uptake**

How Lead Toxicity Affects Health



Children at most risk- their brains & bodies are still developing (& fetus, because lead easily crosses placenta).

Human Exposure Pathways:

→Soils/Dust Ingestion

→Skin/Eye Contact (& Bare Feet)

→Inhalation

Who is impacted?

-Humans/Children/Seniors -Pets

~ Based on Contaminant Concentrations

Plant/Crop-Contaminant Exposure Pathways

Through Plants Roots → **Plant Root Uptake**

(In Plants=Lab Tests) **(Plant-Internal/Now what?)**

On Plants' Parts/Leaves → **Topical**

(ALL Plant/Leaf Surfaces) **(Plant-External/Wash)**

If contamination found, how manage soils?

→Use Best Management Practices ~ Site

Soil-Contaminants

No Single PPM Standard for Acceptable [ ]

→US EPA/Cal EPA provide Benchmarks
(Values Developed for Industrial Site Clean Ups)

If contamination found, how manage soils?

→Use Best Management Practices/Remediate ~ Site

Best Practices: Recognize Potential Contamination → Know Risks

- **Test Soils: Dont Guess! Research! Investigate! Do Soil Tests!!**

- **Buy Organic Materials Review Institute (OMRI)**
- **Test soils to confirm lead is < 80 ppm/HMetals**

- **Wear Gloves & Practice Good Hygiene/Boots**
- **Don’t Let Kids Garden/Play in > 80 ppm Soils**

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Best Practices:

Raise Beds	→	Import Clean Soils/Make & Use Compost
Amend With OM	→	To Bind Soil Contaminants With Phoshorous/Dilute Low [%] Contaminants
Mulch	→	To Prevent Airborne Soil Dust & Prevent Upsplash
Sub-Surface Irrigate	→	To Prevent Up-Splash/Spreading Particles

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Best Practices:

Adjust pH	→	-Neutral pH → Optimal Growth/Nutrition
Promote Good Drainage	→	-Soil Contaminants Concentrate @ Slopes-Bottoms/Allow H20 Infiltration
Post-Harvest	→	-Soak in Vinegar/Wash Produce & Peel Root Crops
Manage Inputs	→	-Avoid Waste-Derived Fertilizers

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