

# Using Compost to Improve Soil Fertility and Crop Production

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Managing Pigs for a Productive and Healthy  
Environment

Pohnpei

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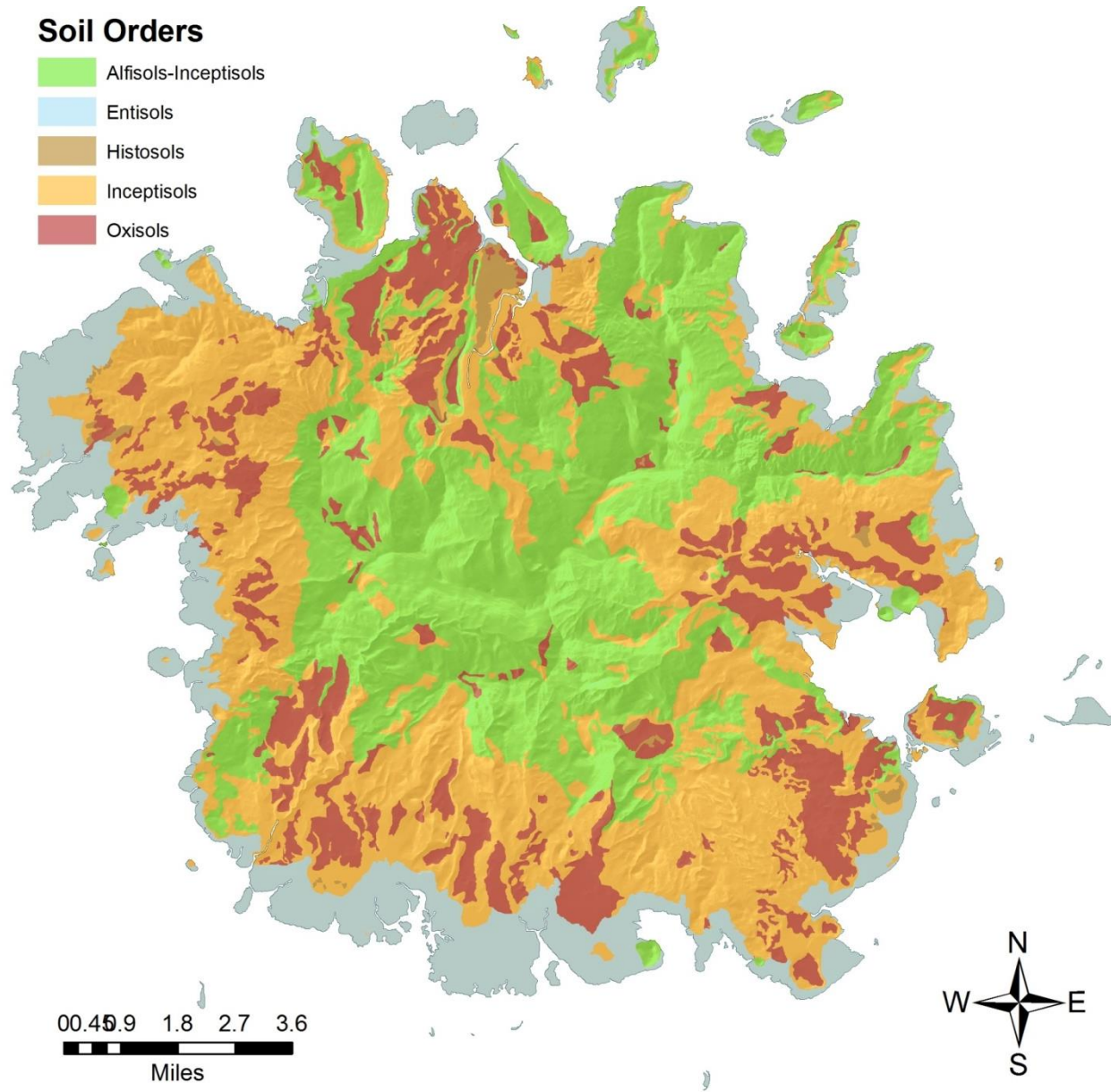
# Outline

- Pohnpei soil fertility
- Making compost
- Compost quality
- Compost application
- Compost effects on plant growth
- Compost effects on soil properties

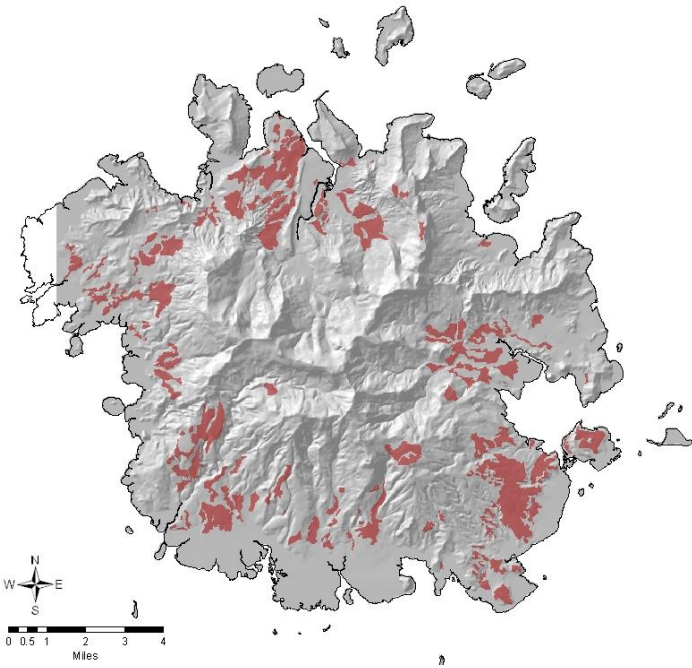




# Soils of Pohnpei



# Umpump Soil

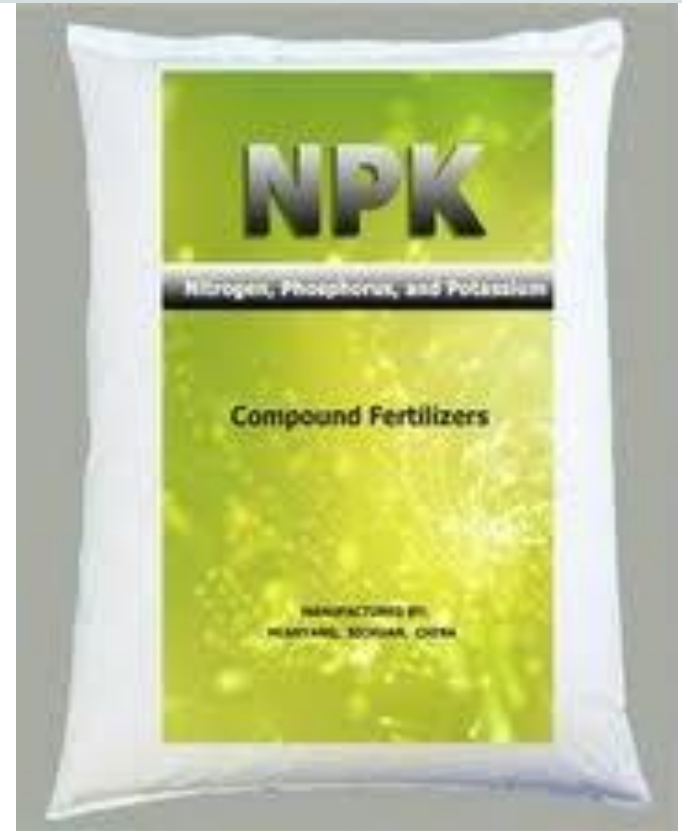


Depth	pH	Org C	Ca	Mg	K	Al <sub>sat</sub>
cm		%	ppm			%
0-10	5.2	6.35	600	440	78	29
10-20	5.0	2.16	120	72	39	35

- The Umpump soil is infertile and requires nutrient inputs

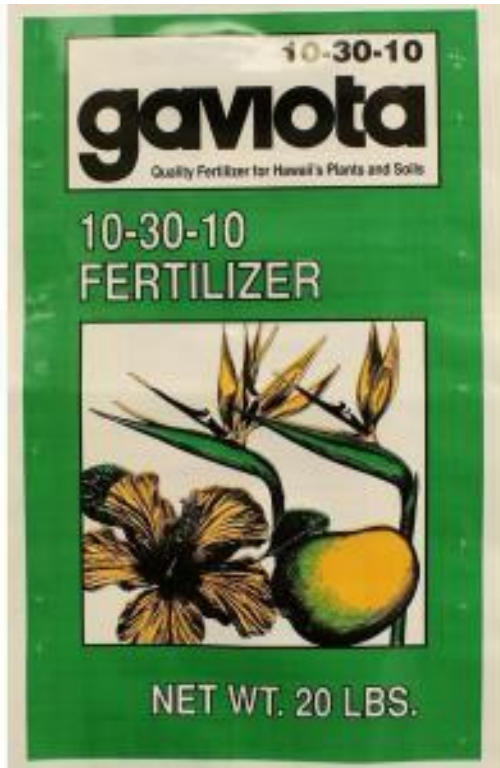


# Conventional Fertilizers



- Imported lime and chemical fertilizers are effective, but **EXPENSIVE**
- Prolonged use of chemical fertilizers leads to declines in soil quality

# Conventional Fertilizers



- Conventional fertilizers are effective, but not complete
  - They are rapid release and must be applied often
- 
- Coral sand: 14,800 lb/acre or 34 lb/100 ft<sup>2</sup>
  - 16-16-16: 4,640 lb/acre or 11 lb/100 ft<sup>2</sup>  
equivalent to \$12 of fertilizer



# Compost





# What is Compost?

## Definition

*Compost* is the product resulting from the controlled *biological* decomposition of organic material

- **Humus** is the end product
- Properties of **Humus**:
  - Dark in color
  - Chemically complex
  - Stable
  - High surface area
  - Balanced nutrient composition





# Why is Compost Important?

- Efficient way to *recycle* organic waste materials
  - Green waste
  - Animal manure
  - Certain kitchen scraps
  - Paper products
- Produces a valuable soil amendment that can replace imported chemical soil amendments
- Composting process disinfects (kills pathogens), detoxifies (transforms toxic organic substances), and sterilizes (kills weed seeds)



**RECYCLE**

# Benefits of Compost to Soil

## Soil Physical Properties

1. Reduce soil density
2. Increase porosity
3. Increase water infiltration
4. Increase water retention

## Soil Chemical Properties

1. Reduce negative effects of acidity
2. Increase nutrient supply
3. Increase nutrient retention



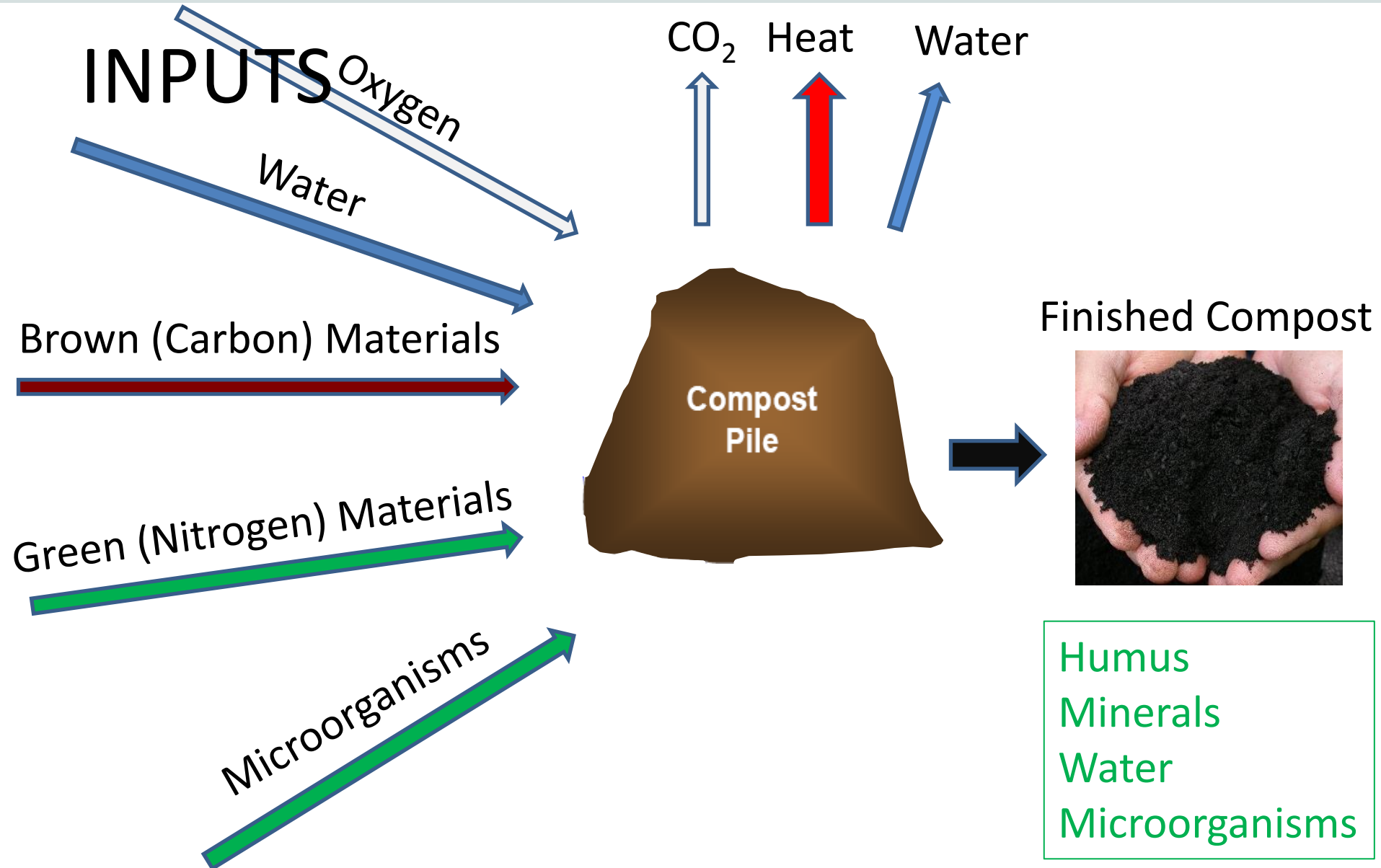
COMPOST

## Soil Biological Properties

1. Increase soil microorganism population and diversity
2. Reduce soil pest problems
3. Increase soil health and resilience



# Composting Process



1/3 brown  
carbon



1/3 manure  
nitrogen



1/3 green  
nitrogen



Brown vegetation  
Wood chips  
Saw dust  
Coconut husk

Pig manure  
Chicken manure  
Cow manure  
Fish waste

Grass cutting  
Green leaves (*hibiscus*,  
*acacia*, *telentund*)



# Local Materials





# Optimum Conditions for Composting



- Pile size: 3'X3'X3'
- Correct mixture of carbon and nitrogen
- Particle size: <1"
  - Some large particles to improve aeration
- Moisture: 45 – 60%
- Oxygen: >5%
- Temperature: 130 - 150°F



# Biology of Composting

- Pile size: requires a minimum critical mass
- Carbon and nitrogen containing materials need to be in balance to provide correct amount of nutrients for microorganisms
- Small particles break down more quickly
- Microorganisms need water to grow, but too much water drowns them
- Microorganisms need Oxygen to live
- High temperatures needed to kill pathogens and sterilize weed seeds.

# Aeration

- Inserting a perforated tube (bamboo) increases airflow into the pile
- Turning the pile provides aeration and speeds up composting process





# Protect Against Rain

- In wet environments like Palau, too much rain delays the composting process.
- Piles must be protected against rainfall



# Compost Quality

Source	C	N	C:N	P	Ca	Mg	K
	%	%		%	%	%	%
Taiwan Tech Mission	18.9	1.9	9.9	1.0	9.2	0.4	0.9
Koror Municipal	21.9	1.4	15.6	0.3	19.5	0.6	0.3
Bureau of Ag	14.6	1.4	10.4	1.1	8.9	0.5	0.9
PCC Dry litter	16.2	1.2	13.5	0.6	1.2	0.4	0.8
Am. Samoa Dry litter	40.4	2.4	16.8	0.7	2.5	0.6	2.0





# Pohnpei Field Experiment



Paul Lake

Saimon Mix

Local NRCS

Local Farmer



Mark Kotska  
COM CRE



# Pohnpei Field Experiment





# Research Questions

1. What ingredients produce high quality compost most efficiently?
  - Manipulate ingredients
2. What is the agronomic value of the locally made compost?
  - Conduct a compost rate experiment





# Pohnpei Field Experiment



## Treatments:

T0(0 compost); T1(20.5 lb compost/plot); T2(41 lb); T3(82 lb);  
T4(164); T5(328 lb); T6 (1.7 lb)

Soil: Oxisol

Compost: 1/3G, 1/3B, 1/3M



# Pohnpei Field Experiment



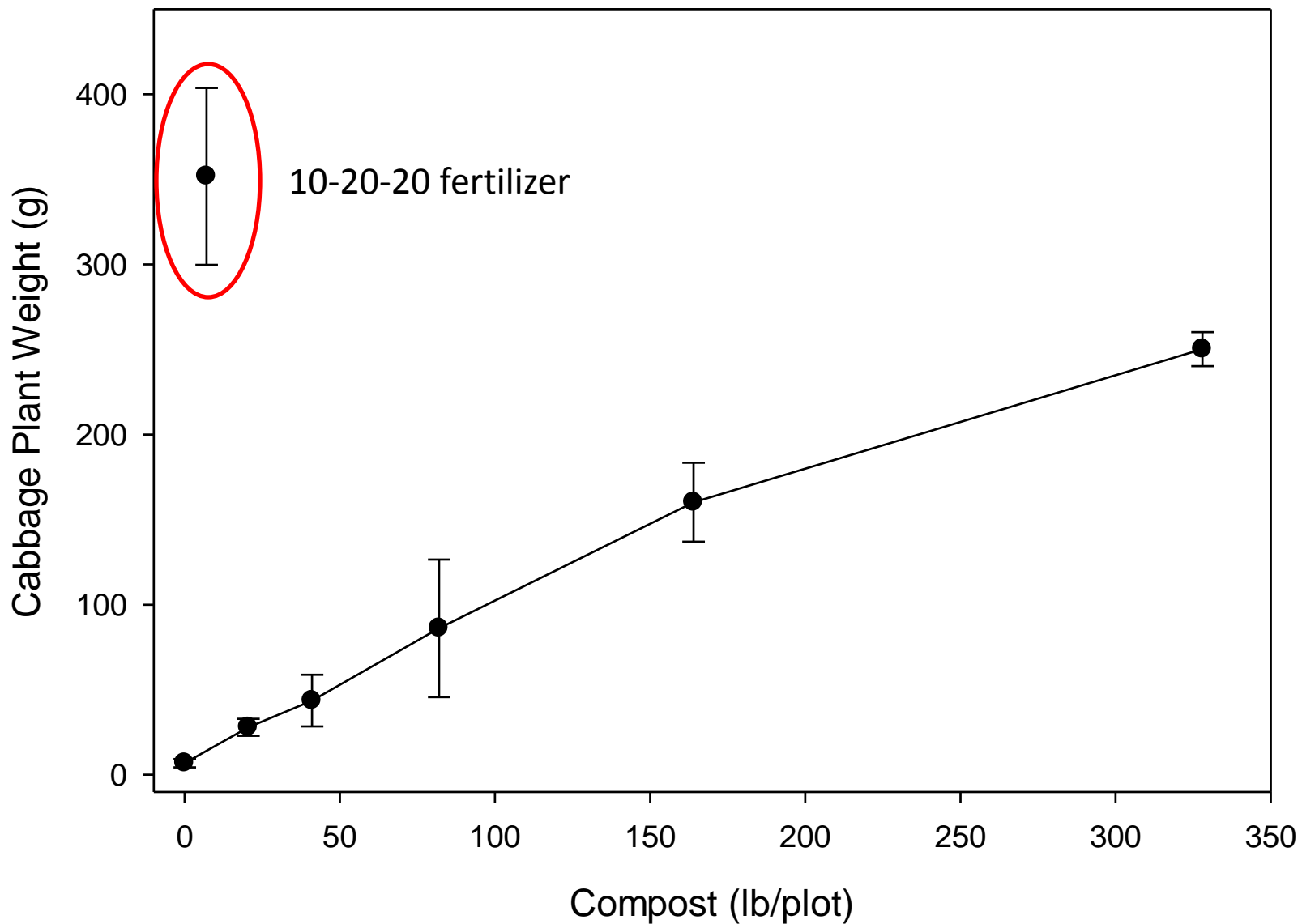


# Pohnpei Field Experiment





# Cabbage Plant Response to Compost

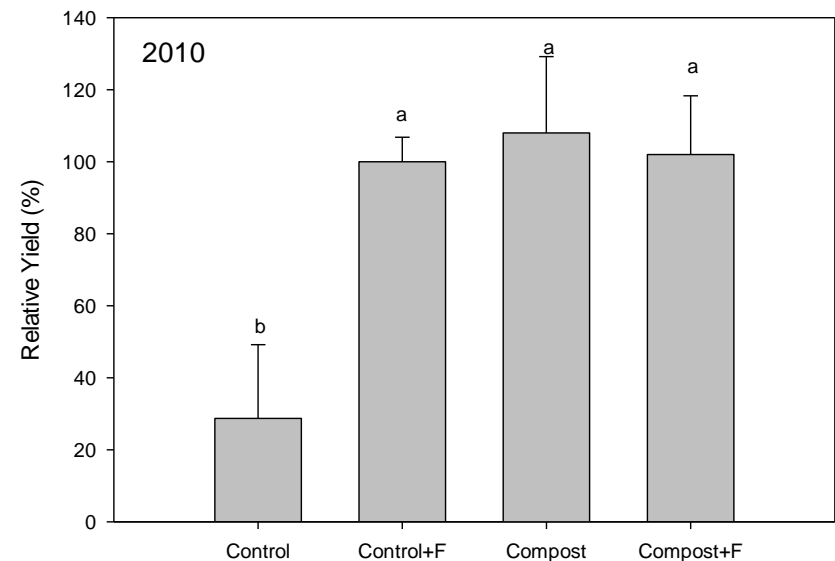


# Pohnpei Field Experiment

Treatment	pH	NO <sub>3</sub>	NH <sub>4</sub>
		ppm	ppm
T0 (0 compost)	5.3	0.4	1.3
T1 (6.25 T compost)	5.2	0.5	0.8
T2(12.5 T compost)	5.7	0.9	0.9
T3(25 T compost)	5.4	1.5	1.1
T4 (50 T compost)	5.9	5.4	1.5
T5(100 T compost)	6.5	10.7	2.8
T6(Conventional)	6.4	1.5	7.5



# Compost and Sweet Corn Yield





# Summary

1. It is possible to make high quality compost with locally available materials
2. Compost has multiple benefits to soil
3. Compost application can replace dependence on imported fertilizers
4. Making compost is labor intensive







Kalahngan!