



Breadfruit: From Orchard to Table and Around the Globe

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Breadfruit Institute
Est. 2003

National Tropical Botanical Garden



www.ntbg.org





Breadfruit Germplasm Repository



- 326 Accessioned trees
 - 34 Pacific Island
 - Seychelles
 - Indonesia
 - Philippines
 - Honduras

Dr. Diane Ragone
Director, Breadfruit Institute
National Tropical Botanical Garden

Breadfruit Germplasm Repository



43 accessions
from 18
Islands

281
accessions
from 31
Islands



Breadfruit Institute
Est. 2003







1978 – 1981 First plantings at KG

1989 – 1991 Bulk of Collection planted

1995 First tree fertilization
2003 Breadfruit Institute established

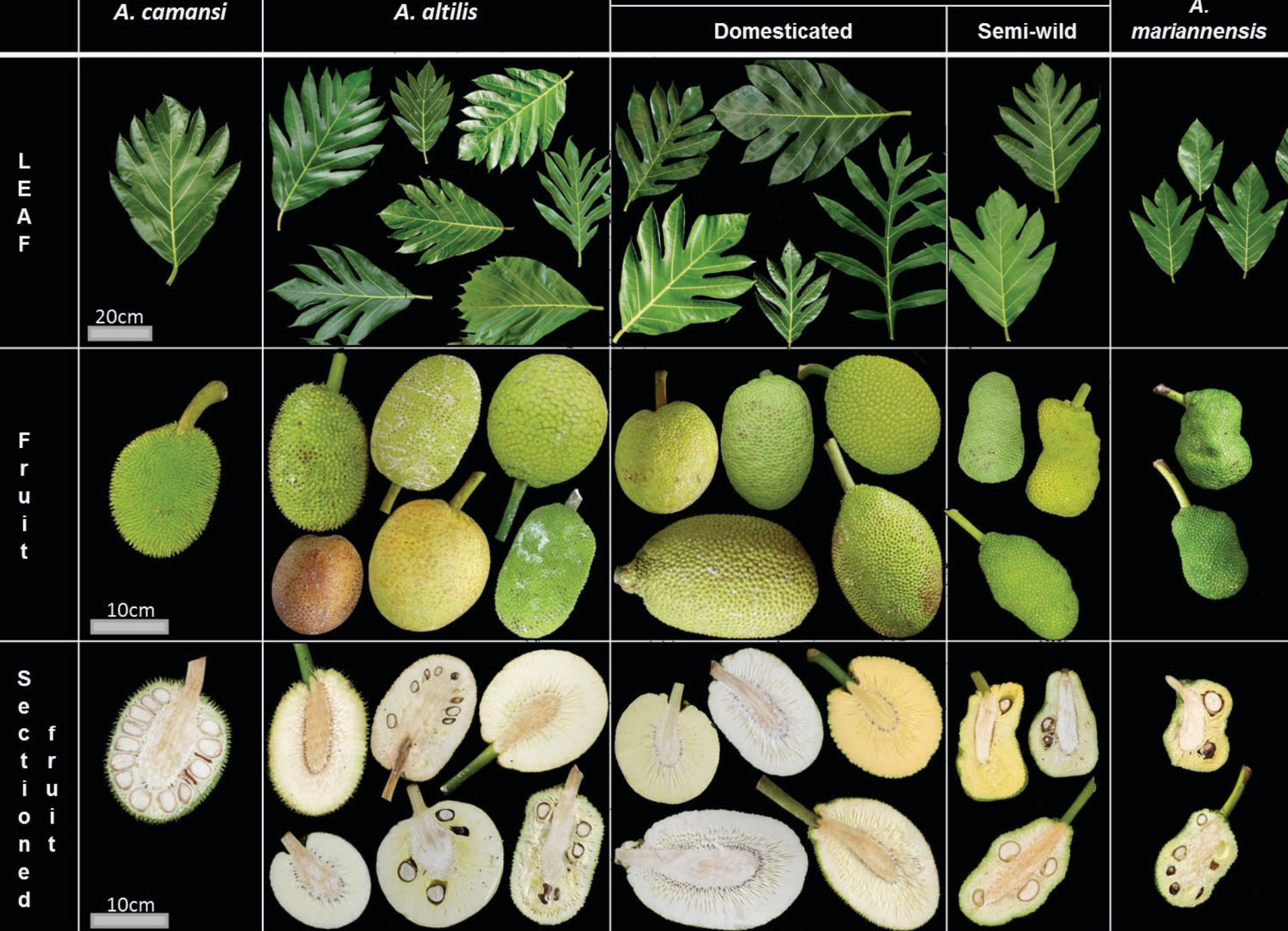
**Kahanu Garden ~120 acres in cultivation:
never more than 5 full time gardeners**





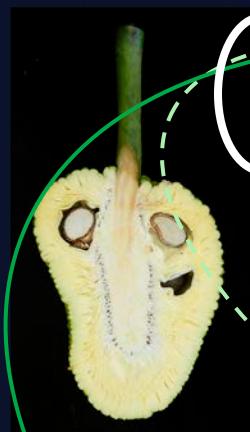
28 | Accessioned trees from 3 | Pacific Islands (on ~5.7 acres)

- Legend
- LABEL, |
 - EQIP 2
 - EQIP Prac
 - LABEL, |
 - EQIP 2011-13, 340, 484, 590, 328



A. mariannensis

HAWAII



UNITED STATES OF AMERICA
INDONESIA



A. a. x A. m.

KIRIBATI

A. mariannensis

PAPUA NEW GUINEA

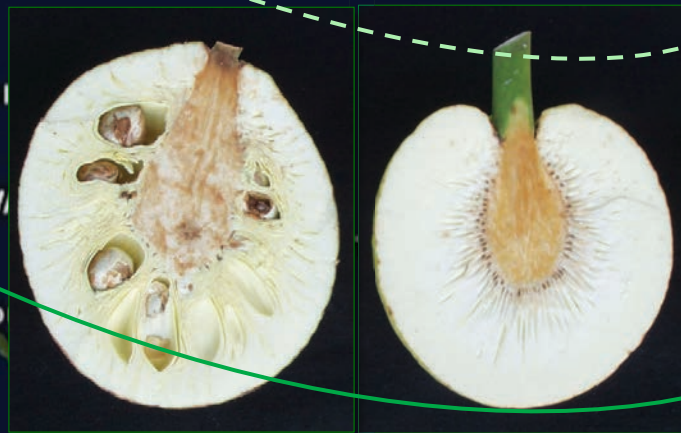
A. camansi



SOLOMON ISLANDS

VANUATU

NEW CALEDONIA



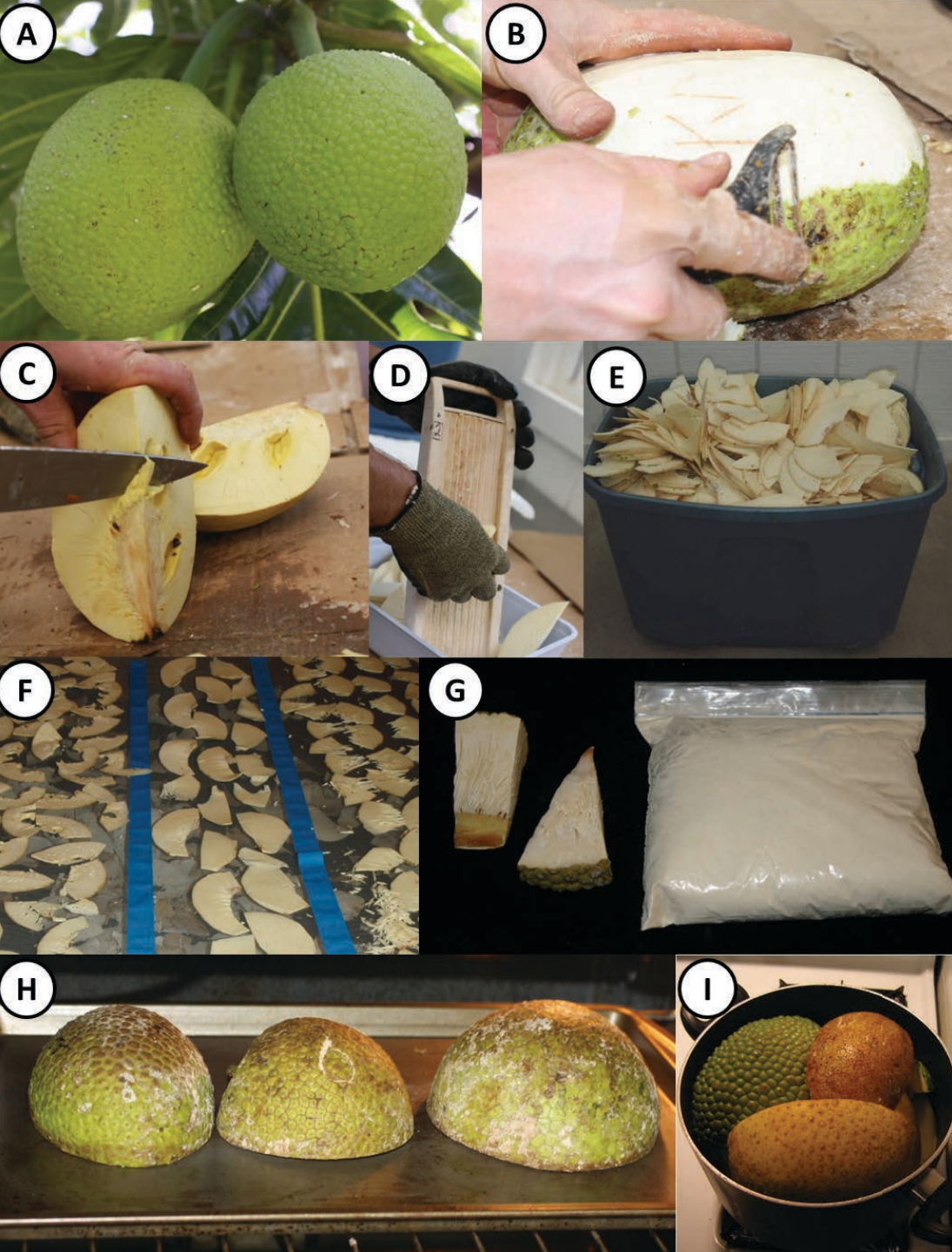
FRENCH POLYNESIA

TONGA

A. atilis

Pacific Ocean

PHILIPPINES



Nutritional Characterization

- **94 cultivars/species**
- **3 fruit per tree**
- **2 years of collections**
 - Frozen
 - Flour
 - Baked
 - Boiled
- **Measures**
 - Edible Yield
 - Moisture
 - Protein
 - Ash / minerals
 - Starch
 - Carotenoids / Vitamin A



Published for The Society for Economic Botany
 by The New York Botanical Garden
 The New York Botanical Garden
 Springer

Protein Content - Fresh

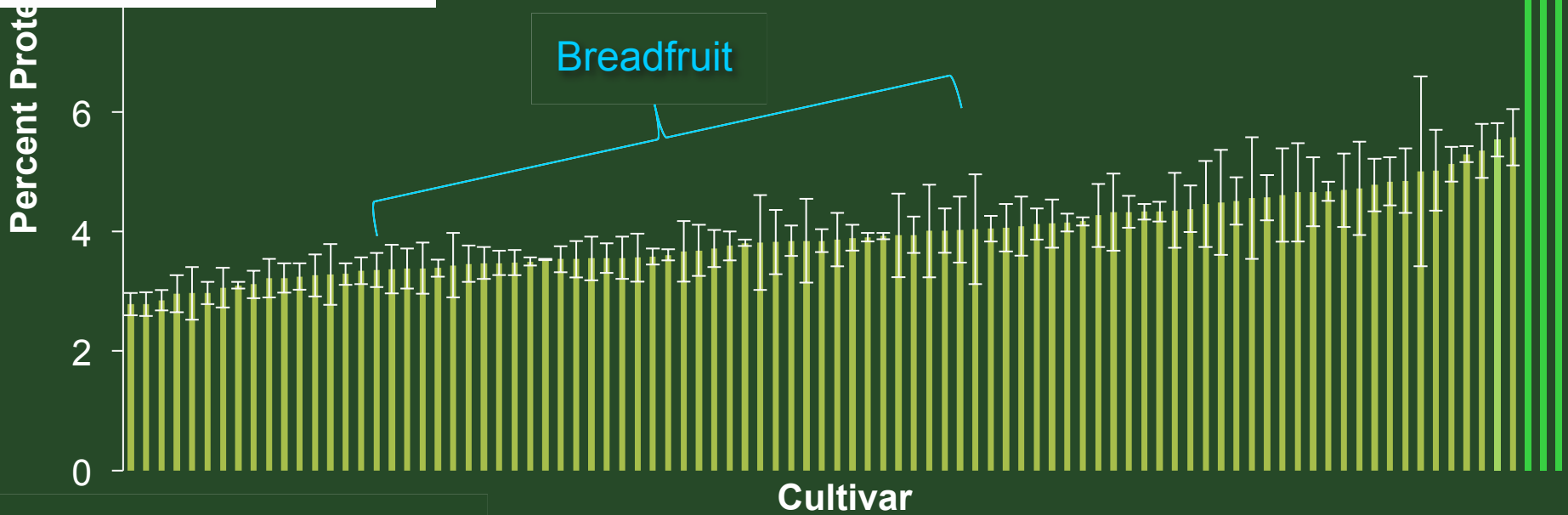
Breadfruit

Range = 2.8 - 6.2%
 Mean = 3.9%

Breadnut

Mean = 13.1 %

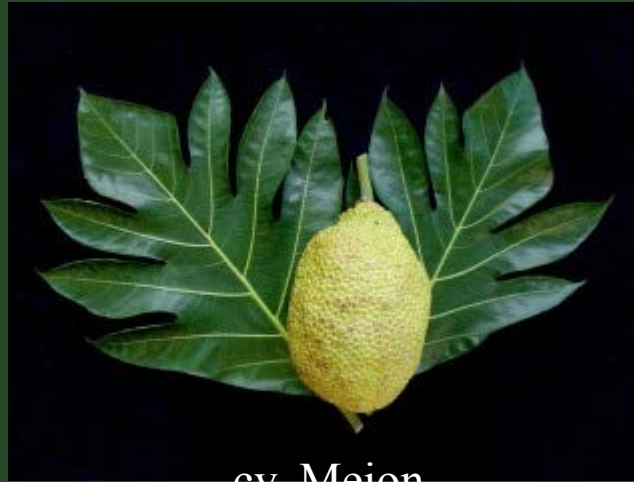
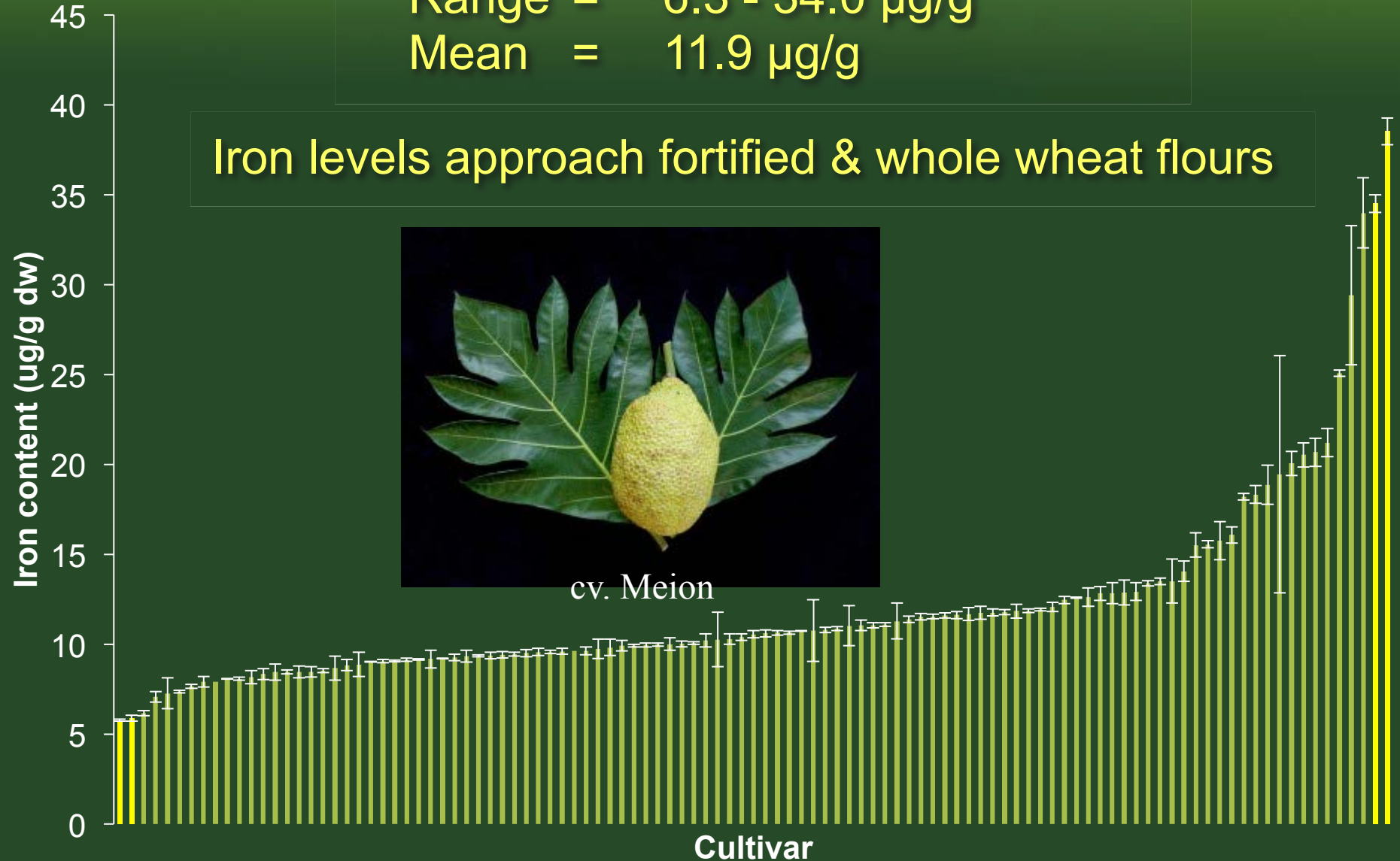
Breadnut



Iron

Range = 6.3 - 34.0 $\mu\text{g/g}$
Mean = 11.9 $\mu\text{g/g}$

Iron levels approach fortified & whole wheat flours



cv. Meion

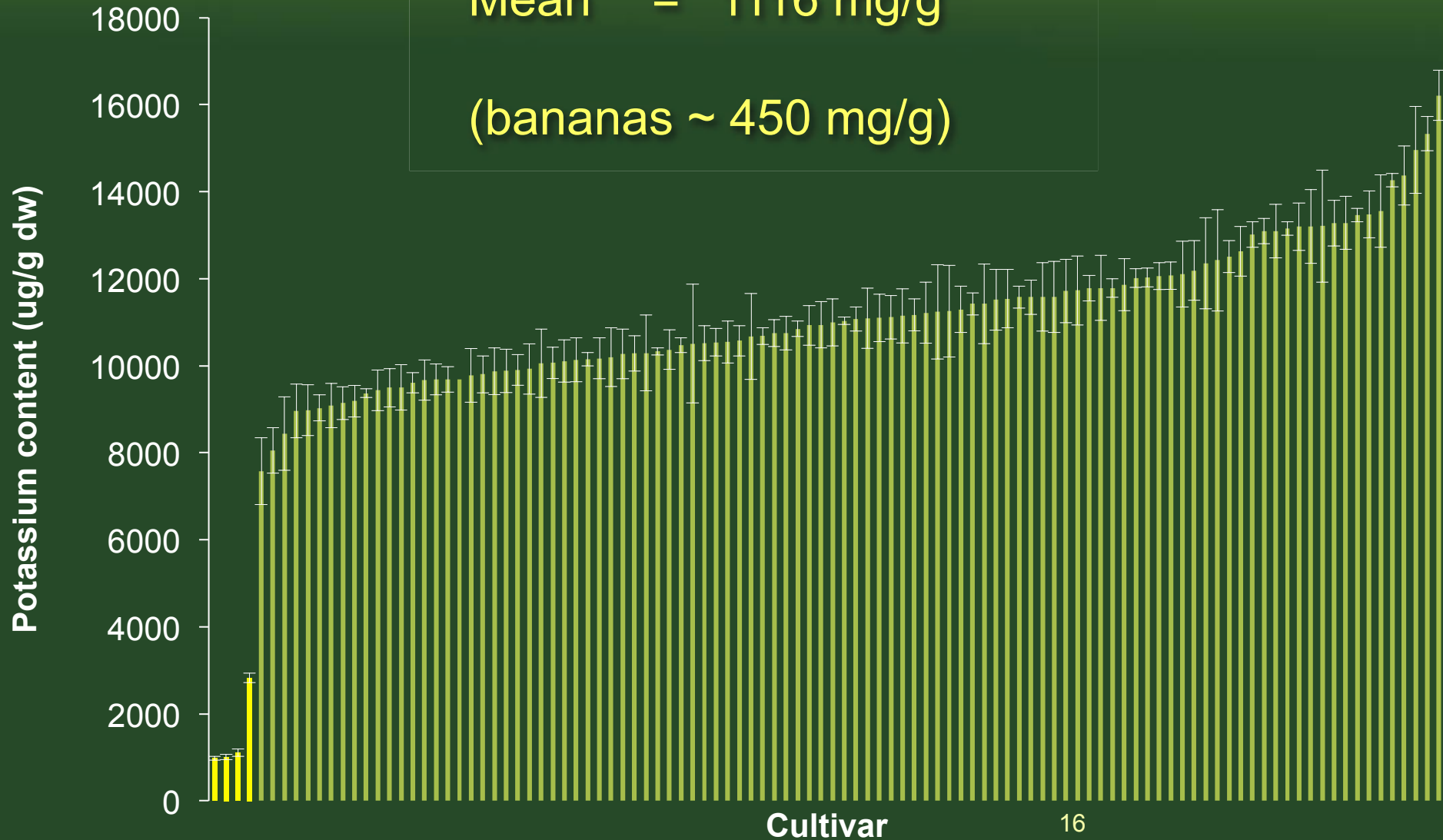
Cultivar

Potassium

Range = 758 - 1621 mg/g

Mean = 1116 mg/g

(bananas ~ 450 mg/g)

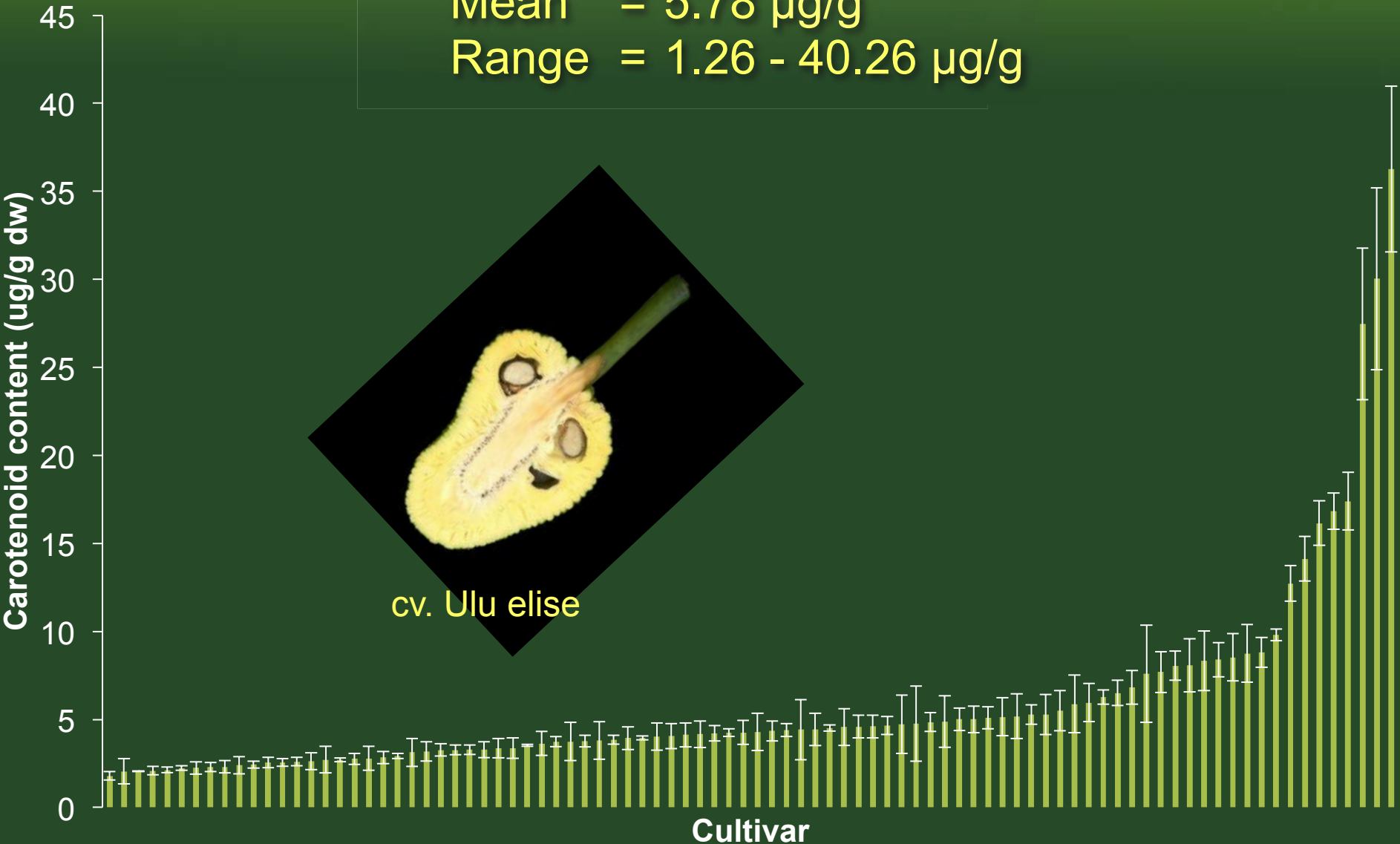




Relative Potassium Levels

Total Carotenoids

Mean = 5.78 $\mu\text{g/g}$
Range = 1.26 - 40.26 $\mu\text{g/g}$



cv. Ulu elise

Value-added Products





ti Champion
Veritab la
Snack #1
PowerCakes
OVER Essential Vitamins & Minerals

BREADFRUIT CAKES
Nutrition Facts
Serving Size: 44 grams
Calories: 129

INGREDIENTS
Sugar, wheat flour, Breadfruit Flour, Yeast, salt, dark molasses, baking powder, vanilla, lemon zest

VITAMINS & MINERALS
Iron, Zinc, Magnesium, Manganese, Phosphorus, Iodine, Copper, Vitamin C (ascorbic acid), Biotin, D3 (cholecalciferol), Folic Acid, Nicotinamide, Pyridoxine, Riboflavin, Thiamine, Vitamin B1 (thiamine), Vitamin B12, Vitamin D3, Vitamin E (d-alpha-tocopherol acetate).

Produced in Jamaica...plans to export into the US market.
Specifically for Afro-Caribbean neighborhoods and population
centers



MARKET

Nel's Old Time
AUTHENTIC JAMAICAN

FRESH

**ROASTED
BREADFRUIT**

Slices

**REBANADAS DEL FRUTO
DEL PAN ASADO**

ISO 14001
Certified

Frozen for Freshness/ Congelado para conservar su frescura

Net Wt. / Peso Neto 400g (14.1oz)

JAMAICA

Flour

- Bread (loaf & flat breads)
- Baby food
- Crackers/biscuits
- Snack foods (extruded)
- Cakes
- Pancakes
- Cereal
- Animal Feed



**The flour is
Gluten Free!**

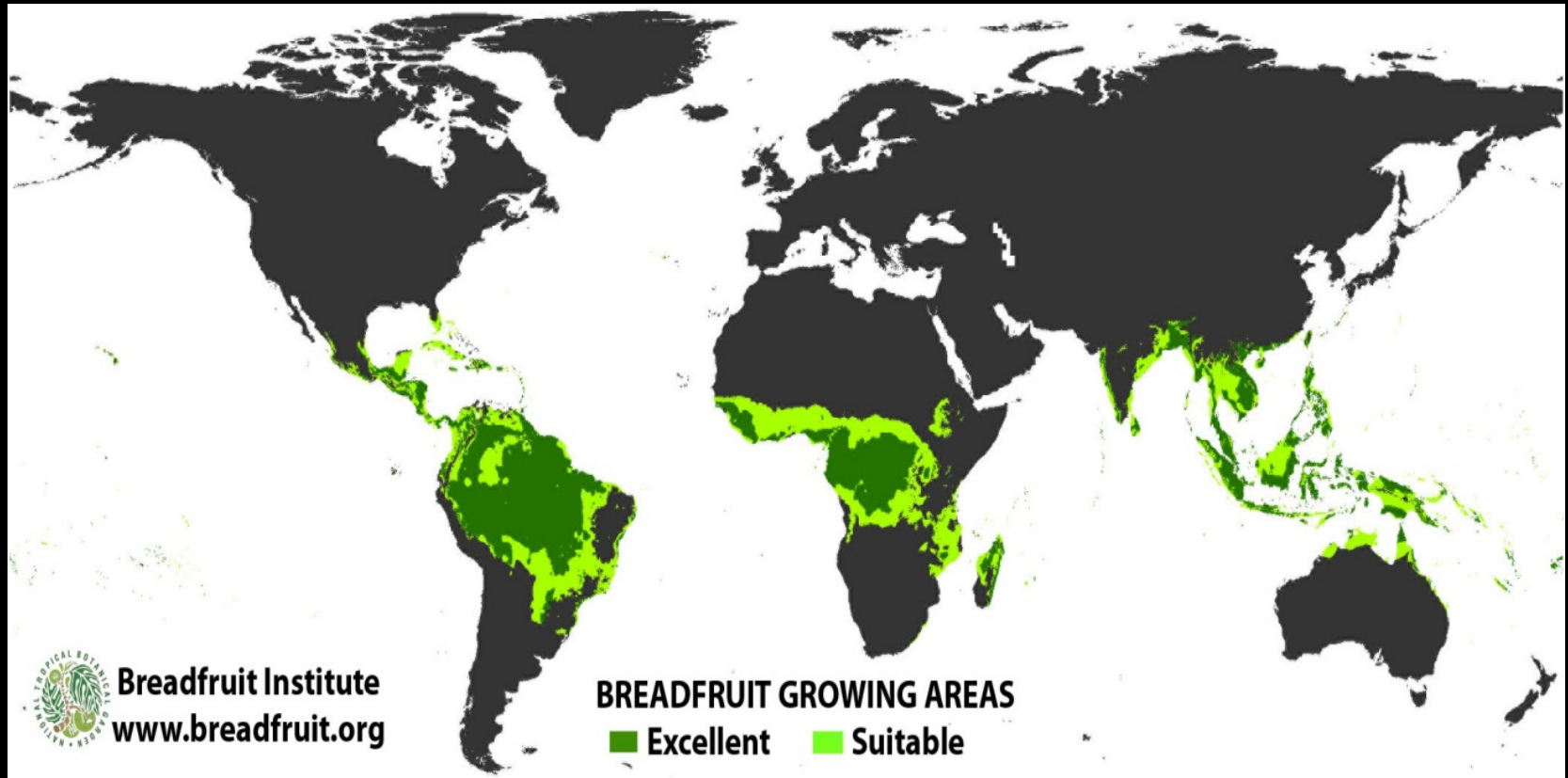


Fish & Livestock



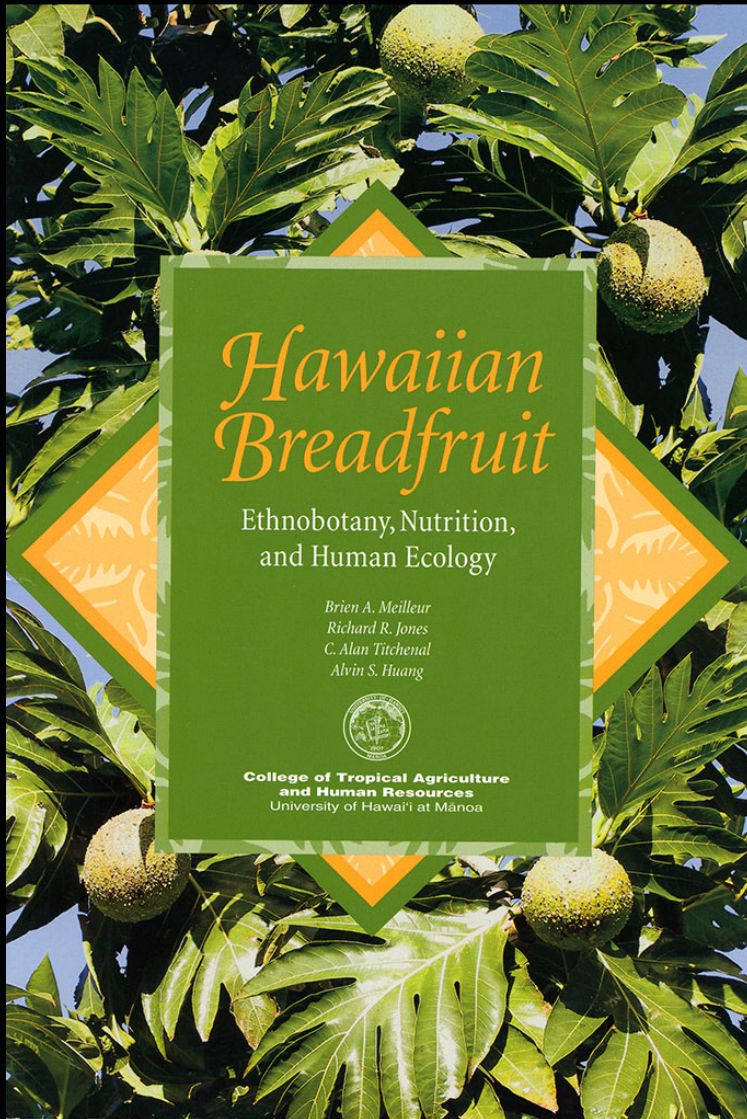
- Traditional and currently fed to dogs, pigs, goats, poultry, sheep.
- Hogs finished faster when diet was supplemented
- Also used to entice fish into fishtraps, and as chum.
- Peels, core over-ripe, unused fruit
- Natural Farming-type IMO machines?

Will breadfruit grow (well) on my land?



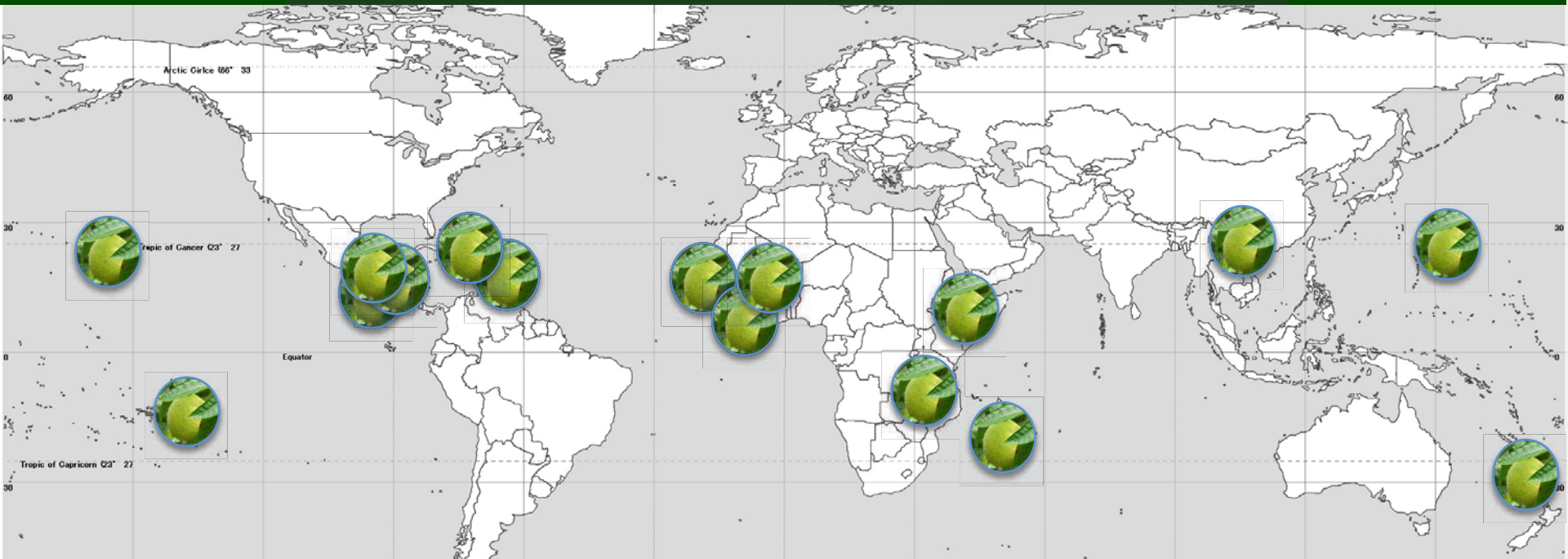
- Will they grow at High Elevations (~2000')?
- Will they grow where it is dry / windy / hot
- Need more Agronomic Data

Historical Account

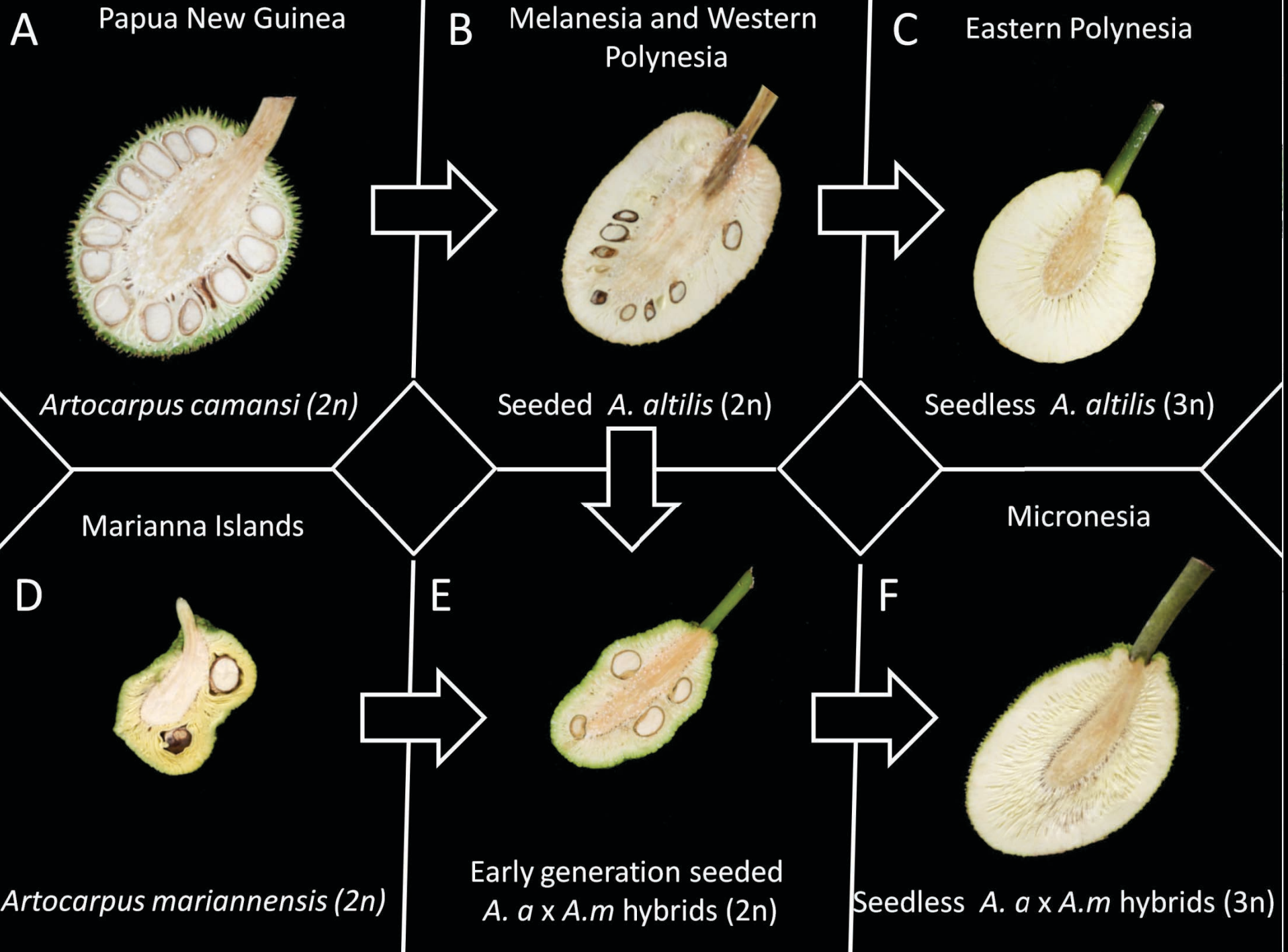


- May or June through summer into August.
- Cultivated from 30-1500 ft.
- Kona - groves located at 2000-2600 ft., most concentrated at 600-650 ft.
- Temperature: 60-82°F
- 12 tons fruit/acre (40 ft. spacing).

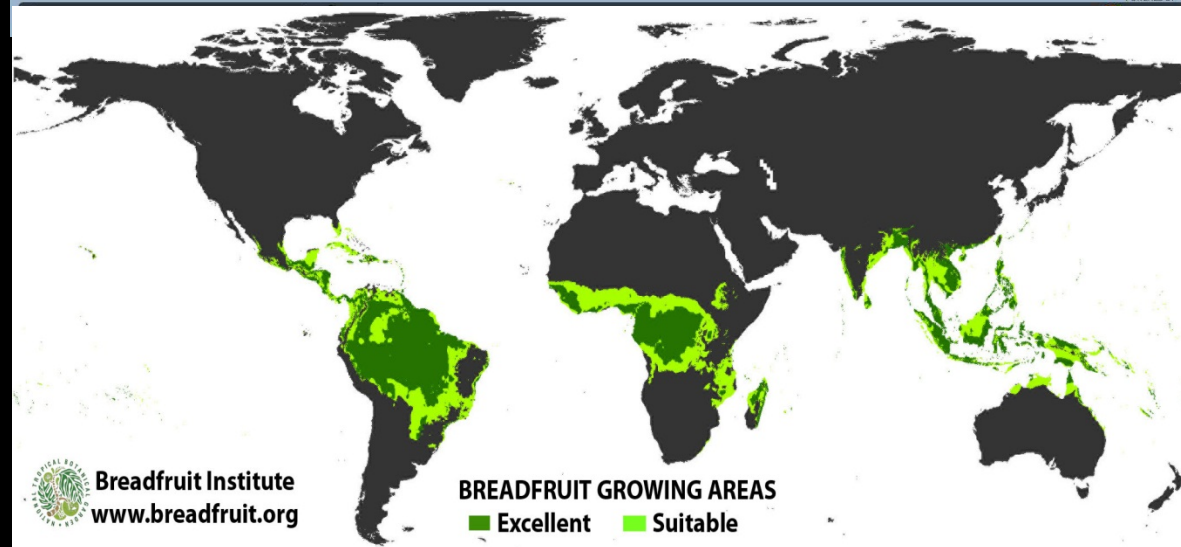
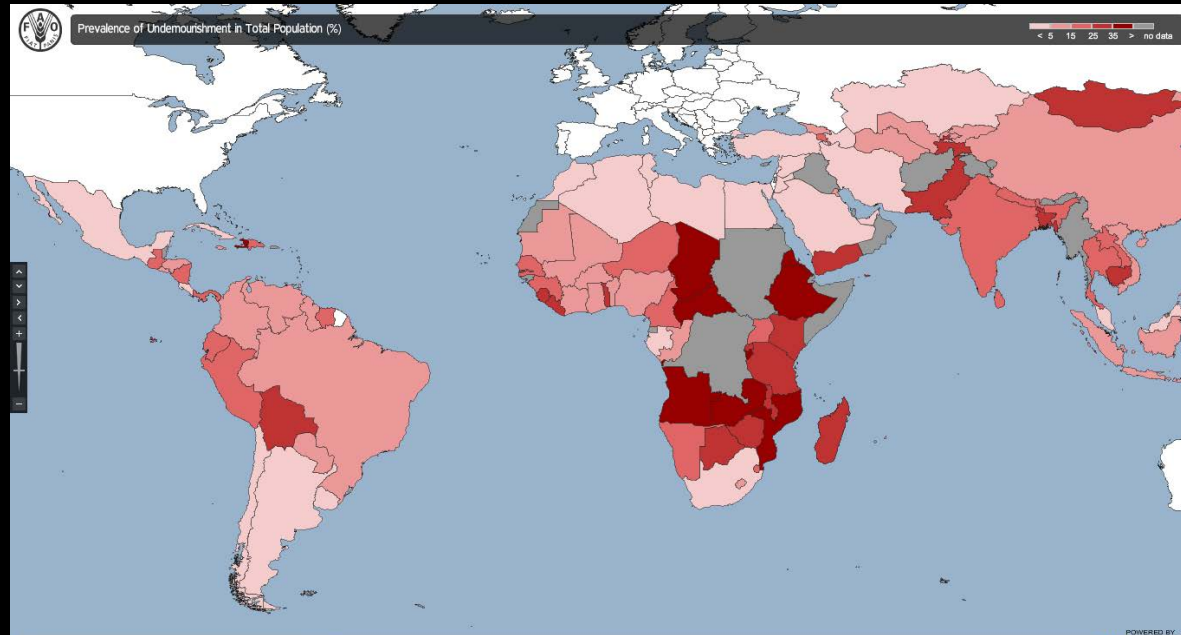
Countries receiving breadfruit plants as part of Global Hunger Initiative



OCEANIA	CARIBBEAN	CENTRAL AMERICA	AFRICA		ASIA
American Samoa	Haiti	Costa Rica	Ghana	Mozambique	Myanmar
Guam	Jamaica	Honduras	Kenya *	Nigeria	
Hawaii		Nicaragua	Liberia *	Tanzania	
Tahiti *			Madagascar		

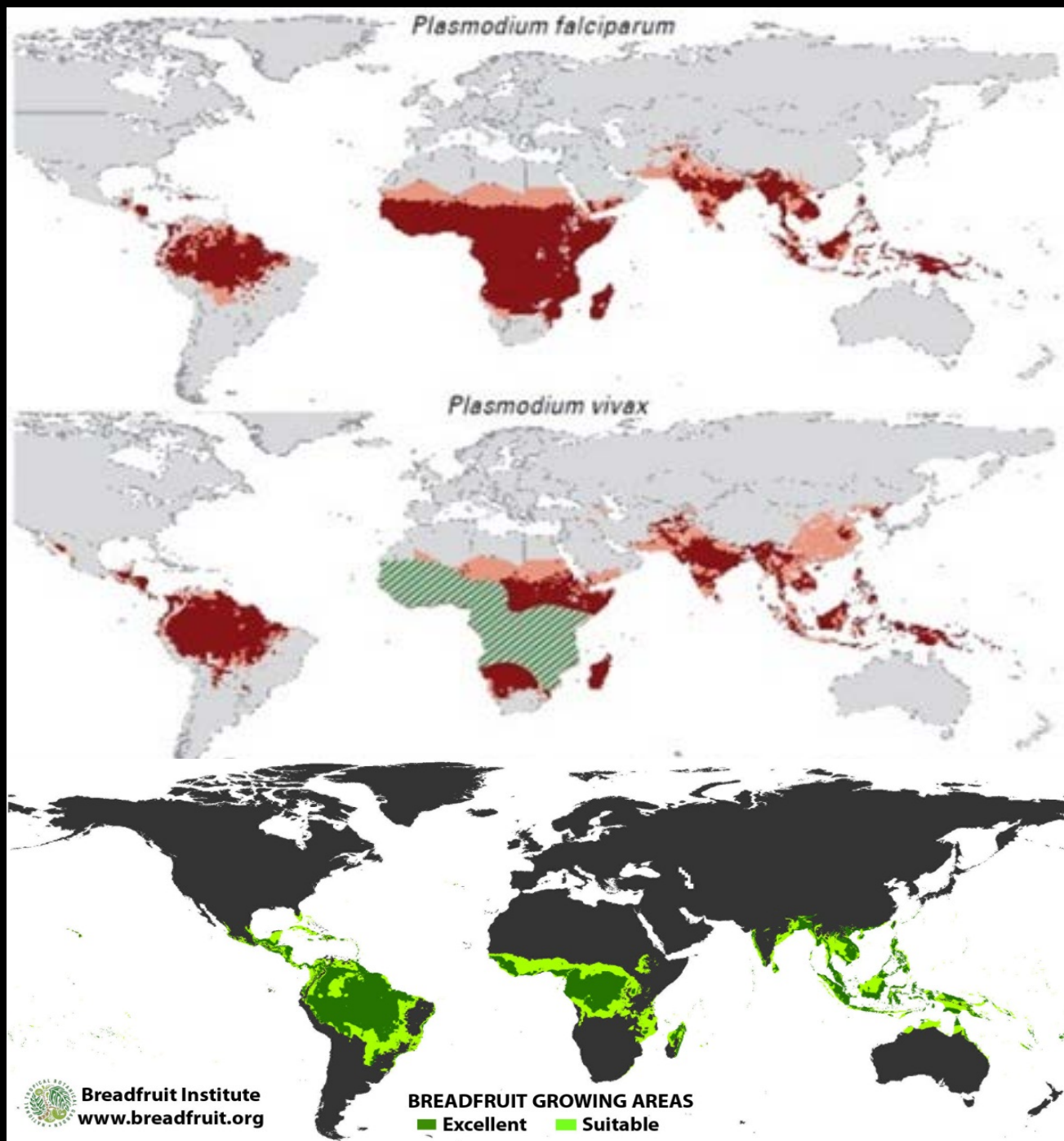


Asia and the Pacific region is home to over half the world's population and nearly two thirds of the world's hungry people (Source: *FAO news release, 2010*)



Malaria Regions

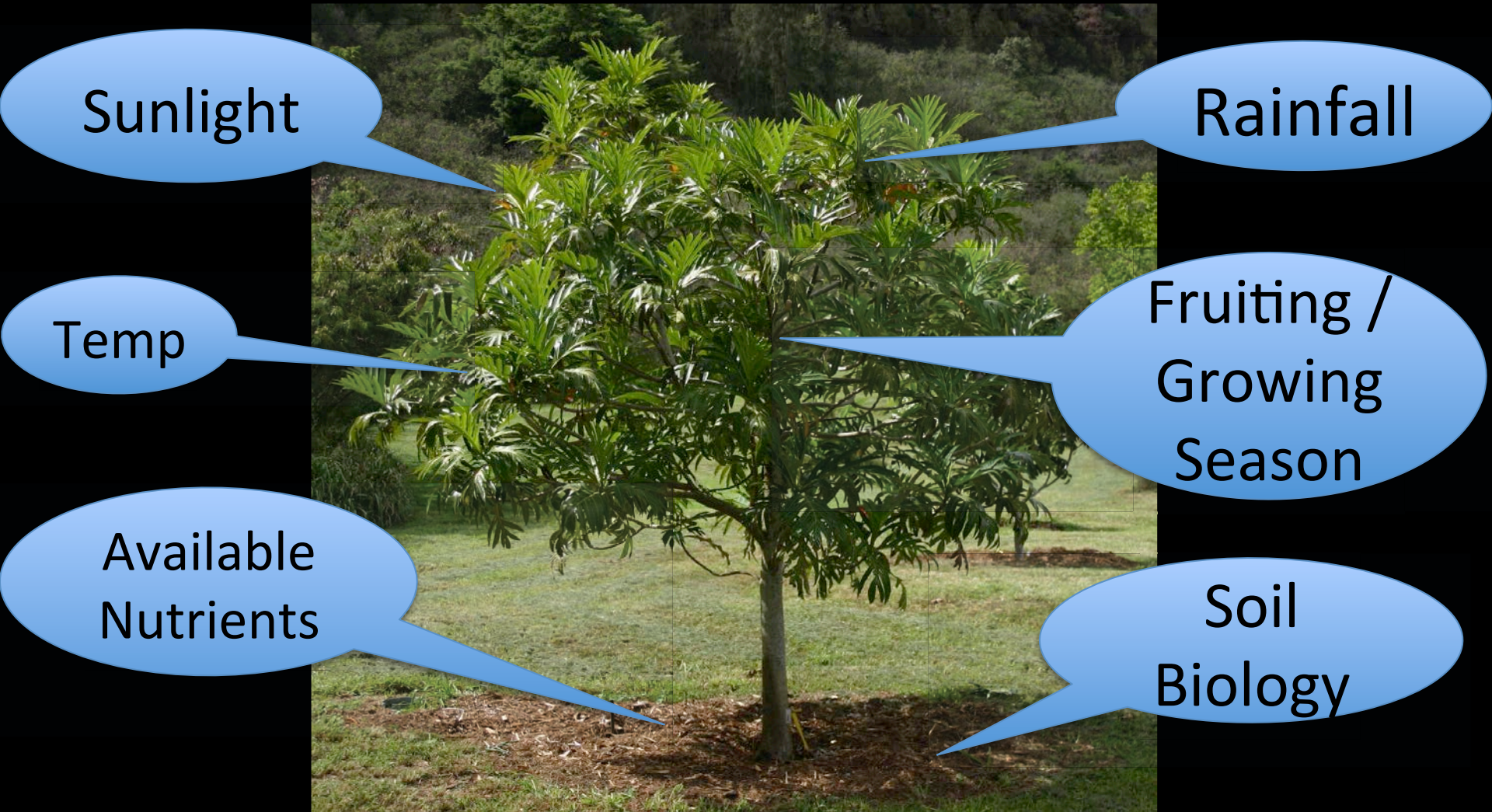
(*Plasmodium falciparum* & *Plasmodium vivax*)



A photograph of a large, mature tree with a thick, textured trunk and dense green foliage. The tree is situated in a botanical garden or park, with other trees and a grassy area visible in the background. A yellow rectangular box with a black border is overlaid on the right side of the image, containing text. The ground is covered with fallen leaves and a path is visible in the lower right corner.

How do we
PROPERLY care
for this collection?

Tree growth is active, Tree care must be active too!



Sunlight

Rainfall

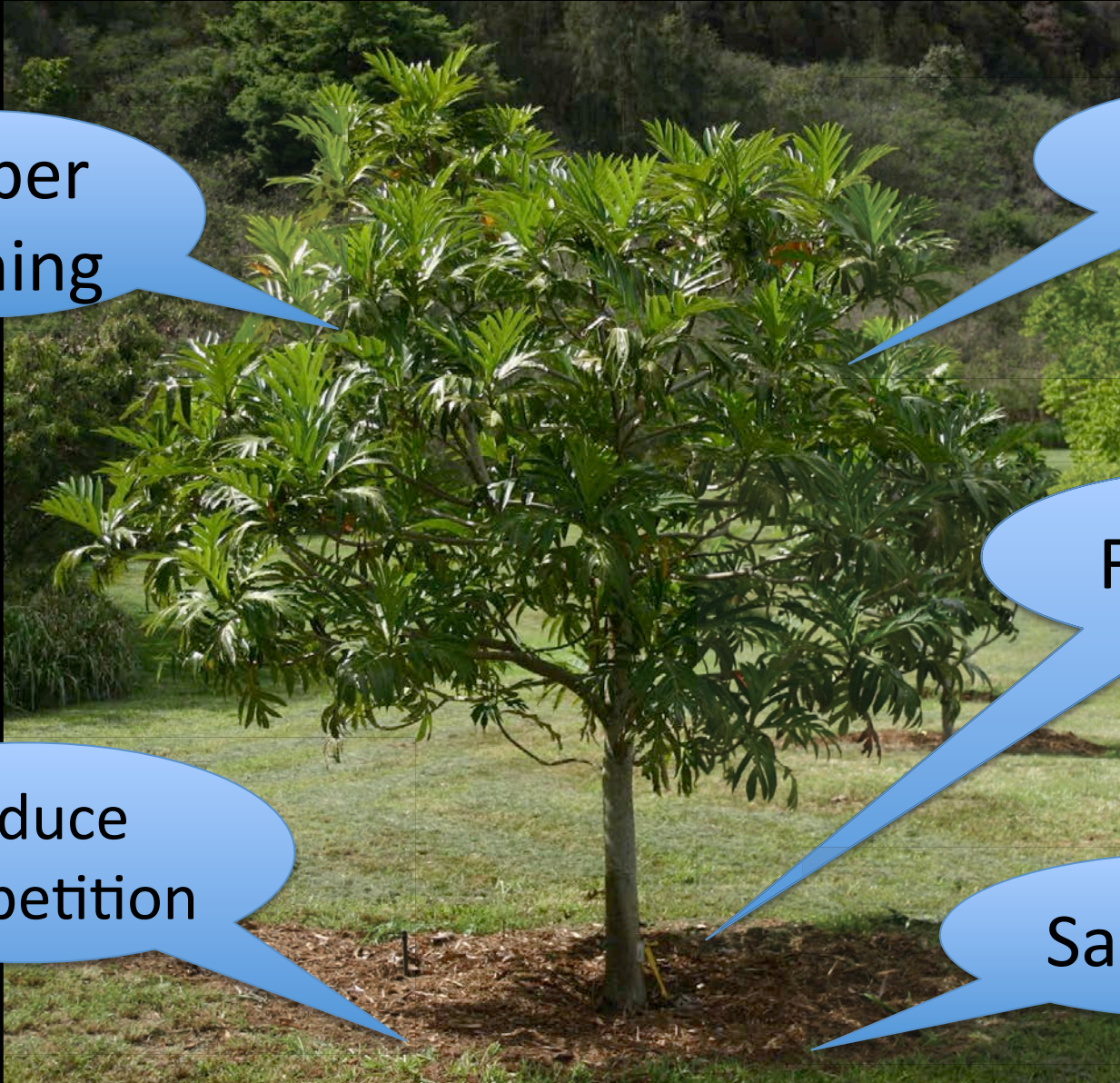
Temp

Fruiting /
Growing
Season

Available
Nutrients

Soil
Biology

Tree Health(care)



Proper
Pruning

Repair
damage

Fertilizer

Reduce
Competition

Sanitation

Sanitation



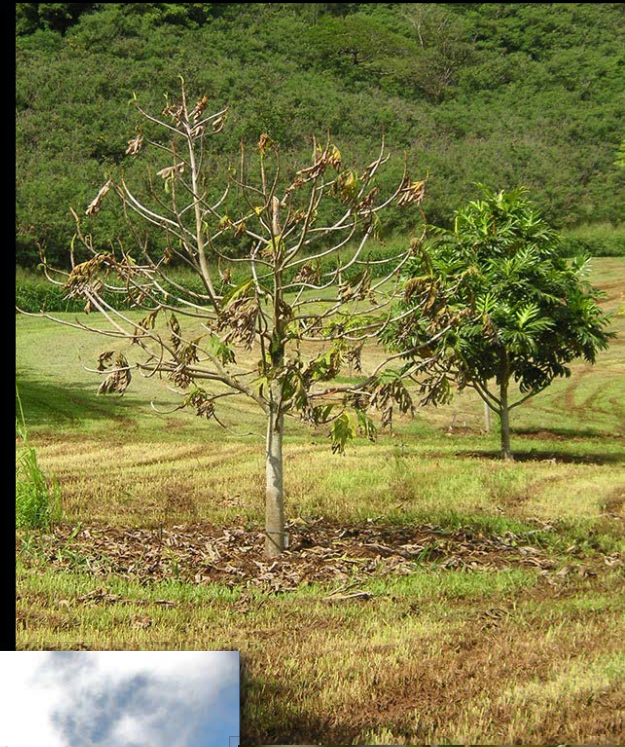
- Best way to keep your trees healthy and producing fruit!
- Remove as much as you can (fruit, branches, anything that can rot)



**No Care =
Disease and
Decline**



Fruit Disease and Tree Decline



Breadfruit diseases are in Hawaii and can affect fruit, stems, leaves, and damaged areas of trunk



Fusarium

- *Phytophthora*
- fruit Anthracnose
- *Fusarium* twig rot
- *Rhizophus* soft rot



Phytophthora



Phytophthora



Fruit anthracnose



Phytophthora





**Fruit trees NOT
landscape plants**



Tree health
begins from the
ground up!

Soil Health
=
Tree Health

Good Mulch:



- High quality material makes the best mulch [“trash in--trash out”]
- Provides nutrients to trees and soil
- Provides habitat and nutrients to beneficial micro-organisms
- Encourages feeder-root growth

Bad Mulch

- Too close to trunk (should not be touching)
- Improper material provides little to no nutrients to the trees and can harbor pathogens



Tree Health:

GOAL: to have the healthiest, most productive trees possible with a practical amount of management



- Proper Pruning
- Sanitation
- Soil Health
- Nutrition
- Best Practices

Management Practices:

- Available management will dictate planting, pruning, etc
- Goals and objectives must be realistic



Fertilizer

- For best results we recommend a soil test (UH / CTAHR or elsewhere)
- Mulch
- Compost



- Cal-Pril
- Rock Phosphate
- Azomite
- Perfect Blend 4-4-4
- 9-9-9 iron

CTAHR free publications

Cover Crops

- Benefit soil structure
- Benefit microorganisms
- Suppress weeds
- Habitat for beneficial insects
- reduce nutrient loss (leeching)



Lab-Lab
(*Lablab purpureus*)

Benefits provided by lablab

EXCELLENT as a cover crop to suppress weeds and provide soil erosion control

VERY GOOD N-fixer and green manure to increase soil organic matter and improve soil structure and quality

TOLERATES acidic, low fertility soils and drought

GOOD forage production, nutritional quality, and palatability

AVOID climbing varieties; tends to be invasive

USE IN rotation with annual crops including vegetables, herbs, cut flowers, annual ornamentals, and root crops such as dryland taro





Tree Pruning

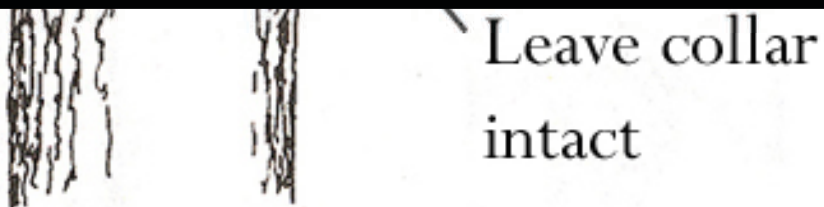
- **why** are you pruning?
- for **what** reason? (harvest, safety, etc.)
- suspected outcome / objectives?



Tips / Suggestions:



Who is Liable???



We recommend proper pruning (by a professional) annually following fruiting for mature trees, and as needed for young (>4yr old) trees











Breadfruit are tough and proper pruning can yield successful and healthy trees



Tree Spacing

- What is the practical amount of management?
- What are the trees going to be used for?
- How much time / effort / money do I have to spend?







Tree Spacing



35'

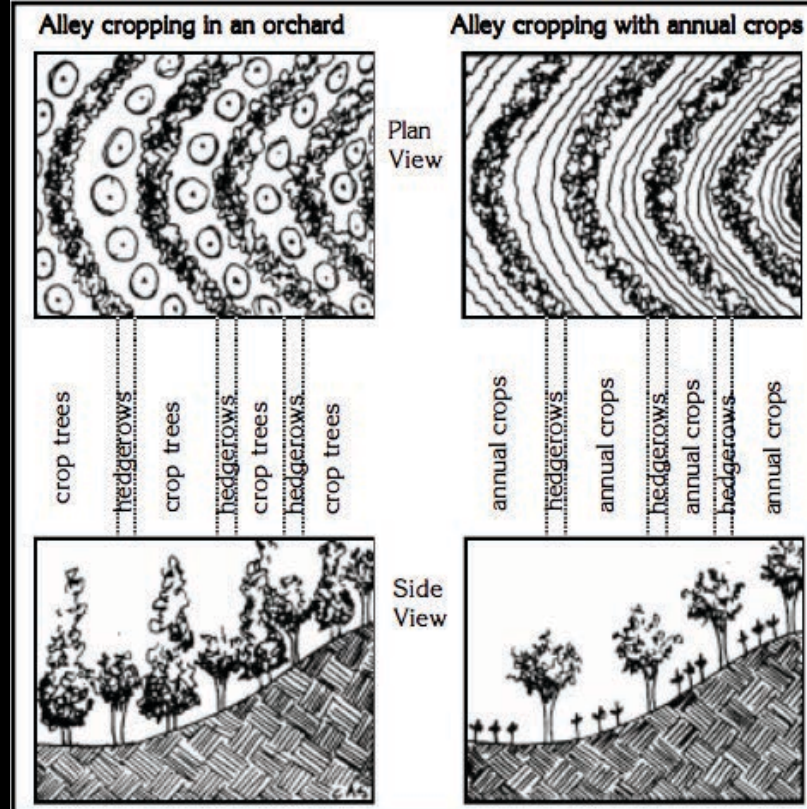


~35' trunk-to-trunk
Space for equipment
Sun for grass / weeds / cover crops

Tree Spacing

- Could include management
- Help yourself out with materials, etc.

agroforestry.net



Uses of NFTs in Cropping Systems



- Windbreak
- Living fence
- Fodder
- Timber
- Wildlife Habitat



- Mulch bank
- Fodder bank
- Timber/pole wood
- Wildlife Habitat
- Shade
- Bee forage
- Nurse trees



- Contour hedgerows
- Alley cropping
- Fodder hedges
- Erosion control

What is the best variety to plant for..

- My location / elevation
- Abundance (year round harvest)
- My business / customers





Afara



Lemae



Ma'afala



Maopo



Meiarephe



Meion



Meitehid



Meiuhpw



Meinpadahk



Otea



Piipiia



Puaa



Puou



Rotuma



Toneno



Ulu



Ulu fiti



Ulu tala



White



Yap

Harvesting Fruit



- When to harvest
 - Green
 - Mature
 - Ripe
- All varieties are not the same
- Best method to harvest
 - depends on size of tree

Could also be different based on VARIETY











September 2011



February 2012







What are the specific needs / conditions of *your* trees?



Why are you growing breadfruit?

- Personal / Family use
- Small scale farming
- Orchard / Commercial scale
- Forestry / Shade
- Urban





eat more `ulu

www.breadfruit.org



