

CHALLENGES AND OPPORTUNITIES OF SOIL-LESS FARMING IN HAWAII

Windward Community
College

July 23, 2011

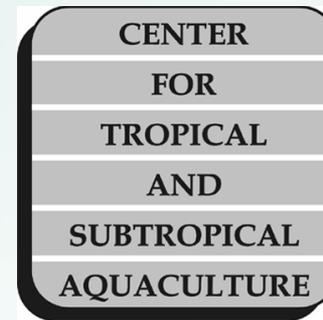


Who is Clyde Tamaru and Why is He Here? Provide technical assistance to aquaculture stakeholders and now includes Aquaponic



Sponsors of the Workshop

- UH CTAHR
- HDOA Aquaculture and Livestock Support Services Department of Agriculture
- CTSA
- UH Vice Chancellor for Research
- NOAA



MAHALO TO OUR PRESENTERS

- James Hollyer, CTAHR
- Harry Ako, CTAHR
- Richard Ha, Hamakua Springs, Hawaii
- Paul Singleton, Waipoli Springs, Maui
- Tim Mann, Suzanne Friendly, Friendly Aquaponics, Hawaii
- James Channel, Foodland, Oahu
- Litisha Uyehara, Armstrong Produce, Oahu



WORKSHOP AT A GLANCE

- **Introductions**

- Ground Rules, Why This Workshop
- James Hollyer, Food Safety
- Harry Ako, Armchair economics
- Richard Ha, Hamakua Springs
- Paul Singelton, Waipoli Greens

- **Coffee Break**

- Tim Mann/Suzanne Friendly, Friendly Aquaponics
- Fred Lau, Mari's Garden
- James Channel, Foodland
- Tish Uyehara, Armstrong Produce
- **PANEL DISCUSSION**

- Evaluation and Two Wishes

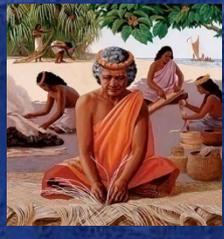
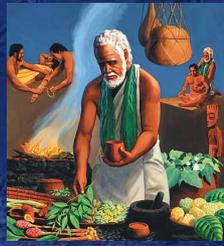


Ground Rules

- Respect Others
- Listen to understand and avoid interrupting others
- Be clear and concise
- Avoid side conversations while someone else has the floor
- Maintain an open and positive attitude
- Everyone needs to participate
- Put cell phones and pagers on the Joy setting



For over a thousand years ancient Hawaiians were completely isolated from the rest of the world.



Hawaii

Currently, over 80% of our food and 90% of our energy is imported

Image IBCAO

Image © 2010 TerraMetrics

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image © 2010 DigitalGlobe

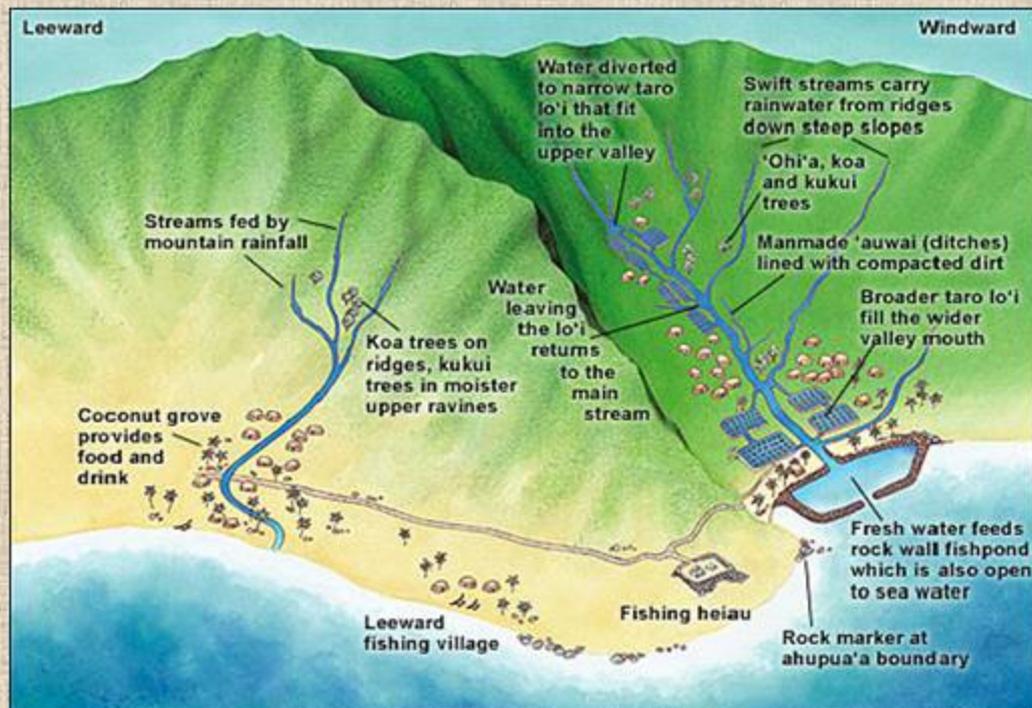
28°29'04.70" N 164°27'33.91" W elev 0ft

©2009

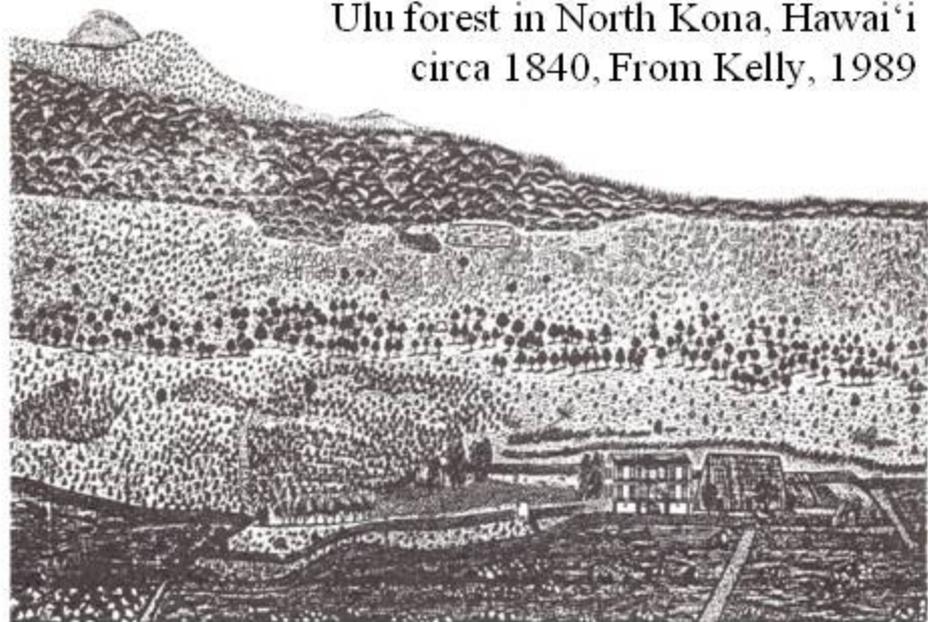
Eye alt

The Ahupua'a : A Model of Resource Management

Waikalua
Loko,
Kaneohe
Ahupua'a,
1927



Ulu forest in North Kona, Hawai'i
circa 1840, From Kelly, 1989



Heeia
Loko,
Heeia
Ahupua'a,
1940

LIFE IN THE AHUPUA‘A

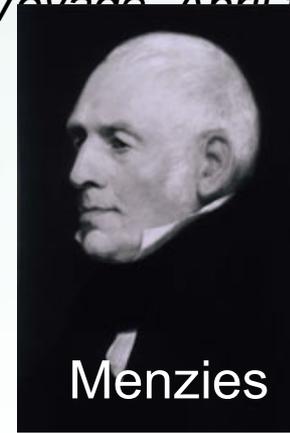
Food Was Grown



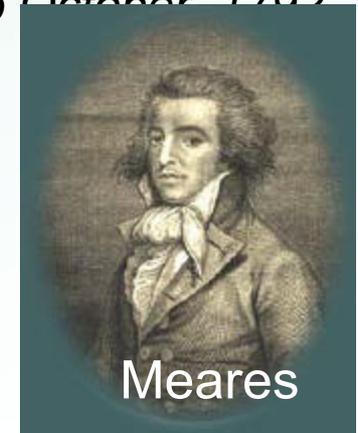
- “Some large ponds which appeared to be full of fish. He [the king] mentioned he had some others with a great quantity of turtle” - J. Meares – 1789
- “for industry of cultivation and agricultural improvements they could scarcely be exceeded in any country in the world” – Archibald Menzies - *Menzies' Journal of Vancouver's Voyage, April to October, 1792*



Vancouver



Menzies



Meares



Who is CTAHR Why are We Here?

CTAHR will:

- actively help Hawai'i diversify its economy
- ensure a sustainable environment
- strengthen its communities
- and will be the premier resource for tropical agricultural systems and natural resource management in the Asia-Pacific region.



“Centennial” – white anthurium bred by UH scientists to celebrate 100th birthday



Challenge and Opportunity for Hawaii



Juvik and Juvik, 1998. Atlas of Hawaii 3rd Edition



What Would be the Impact of Food Import Replacement?

- Replacing just 10% of the food imported would:
 - Amount to approximately \$313 million
 - Assuming 30% farm share that would mean \$94 million at the farm gate
 - Additional \$188 million in sales
 - \$47 million in earnings
 - \$ 6 million in tax revenues
 - 2,300 jobs

Food Self Sufficiency in Hawaii

A Hawaii Department of Agriculture White Paper



Hawai'i Department of Agriculture
1428 South King Street
Honolulu, Hawai'i 96814
Phone: 973-9550
Fax: 973-9613
Website: <http://hawaii.gov/hdoa>

December 16, 2008

Leung and Loke, 2008



Is Aquaponics Commercially Feasible in Hawaii?



Aquaponics businesses grow, but profits prove hard to reap

Many farmers face challenges in finding markets for their products

Premium content from Pacific Business News - by Sophie Cocke, Pacific Business News

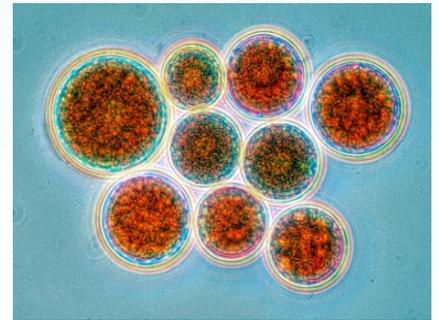
Date: September 26, 2010.

<http://www.bizjournals.com/pacific/stories/2010/09/27/story7.html>



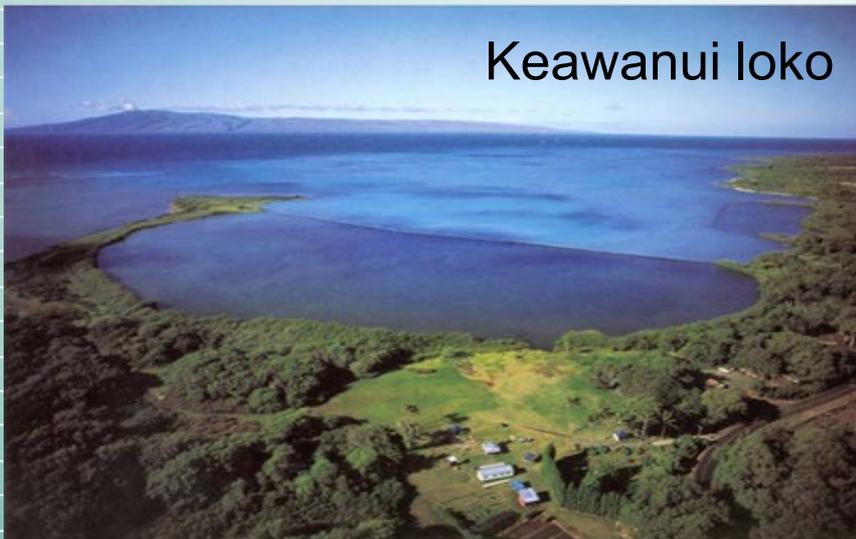
Forms of Soil-Less Farming

- **Aquaculture** - is the art, science and business of cultivating aquatic animals (including finfish, molluscs, crustaceans) and plants in fresh or marine waters.

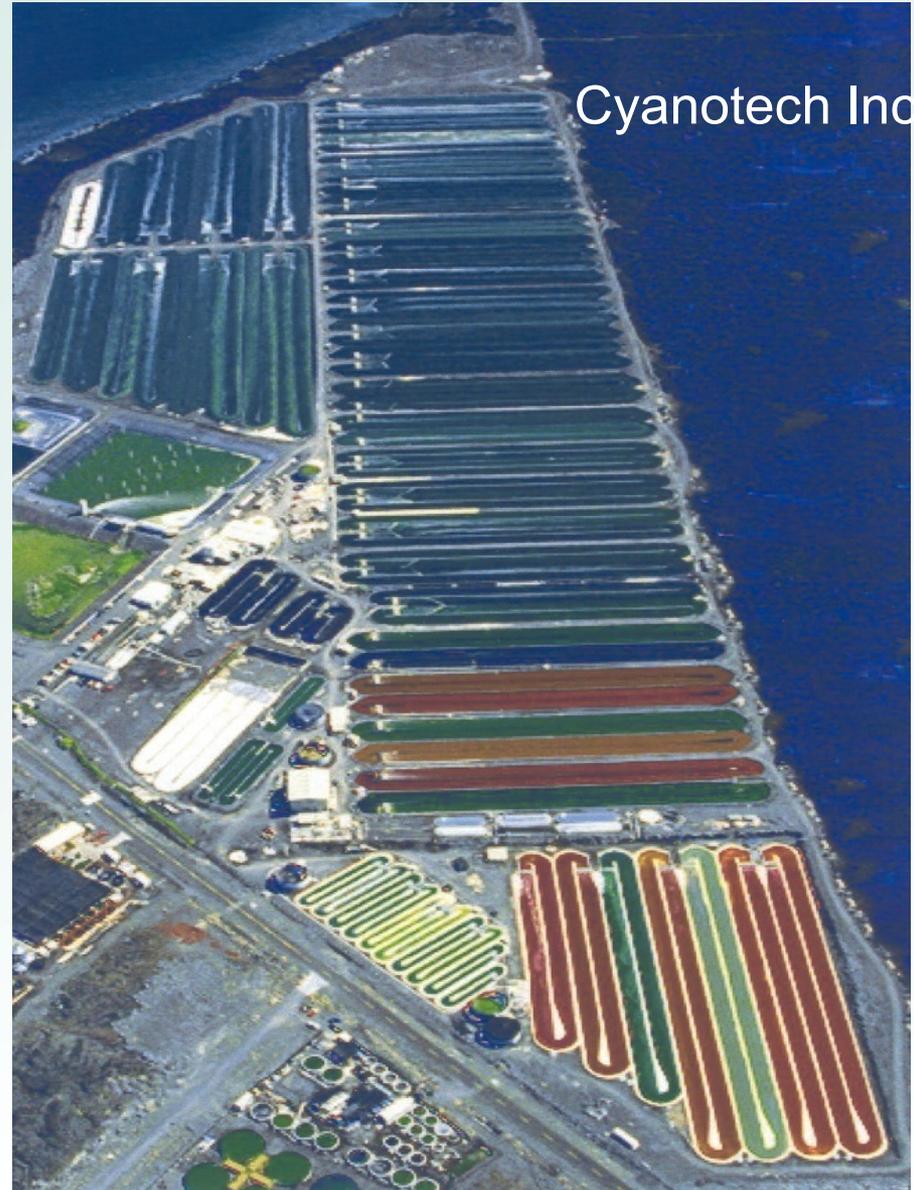




Hukilau Foods Inc.



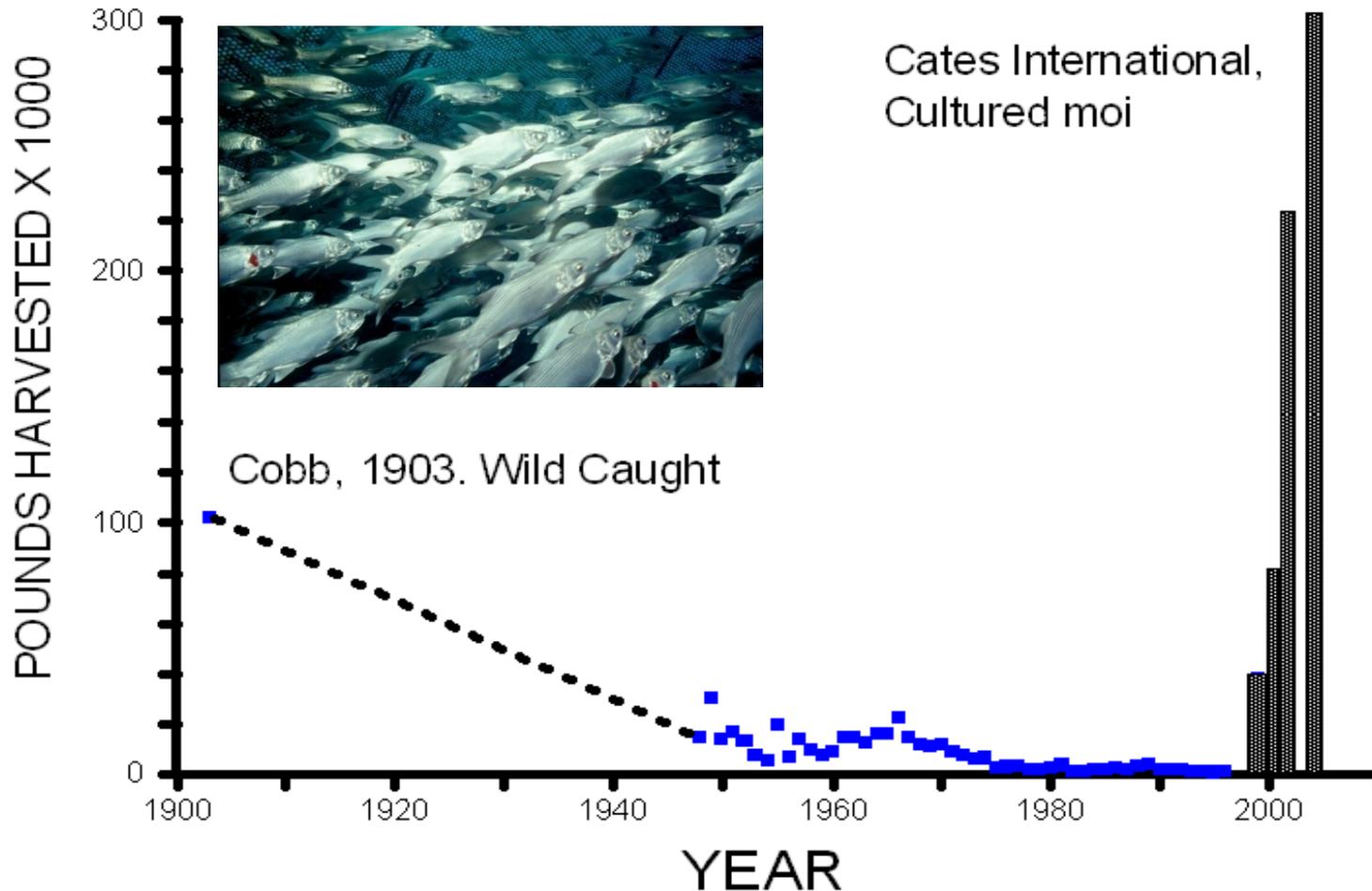
Keawanui loko



Cyanotech Inc



Comparison of Moi Landings versus Commercial Aquaculture Production



Forms of Soil-Less Farming

- **Hydroponics** - a method of growing plants using mineral nutrient solutions, in water, without soil.

<http://en.wikipedia.org/wiki/Hydroponics>



Comparative yields per acre in soil and soil-less culture

Crop	Soil	Soil-Less
Beans	5 Tons	21 Tons
Beets	4 Tons	12 Tons
Cabbage	13,000 lbs	18,000 lbs
Cucumbers	7,000 lbs	28,000 lbs
Lettuce	9,000 lbs	21,000 lbs
Peas	1 Ton	9 Tons
Tomatoes	5-10 Tons	60-300 Tons
Soya	600 lbs	1,550 lbs
Wheat	600 lbs	4,100 lb

Source: *Hydroponics Food Production, Resh (2004) page 33.*





Waipoli Greens, Maui



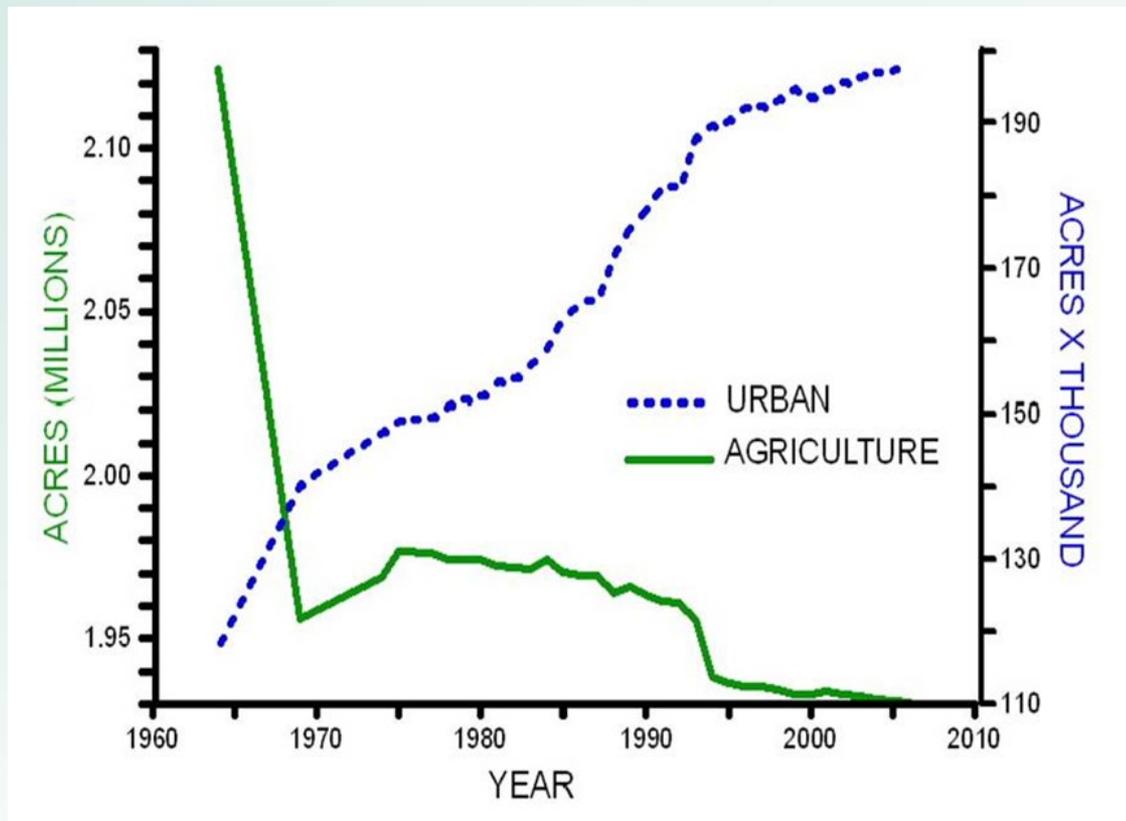
May's Wonder Garden, Oahu



Hamakua Springs, Hawaii



Challenges and Opportunities For Soil-Less Farming



http://hawaii.gov/dbedt/info/economic/databook/Data_Book_time_series



Forms of Soil-Less Farming

- **Aquaponics** - a sustainable food production system that combines traditional **aquaculture** with **hydroponics** in a **symbiotic environment**
<http://en.wikipedia.org/wiki/Aquaponics>

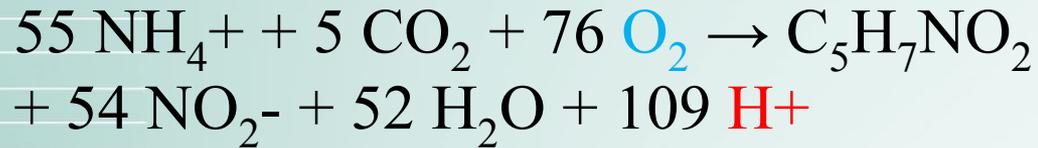


Chemistry of the Nitrification Process

Nitrosomonas



Photo credit: Stan Watson,
Woods Hole Oceanographic
Institute. 2010



Nitrobacter

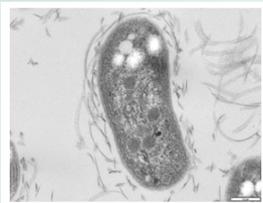
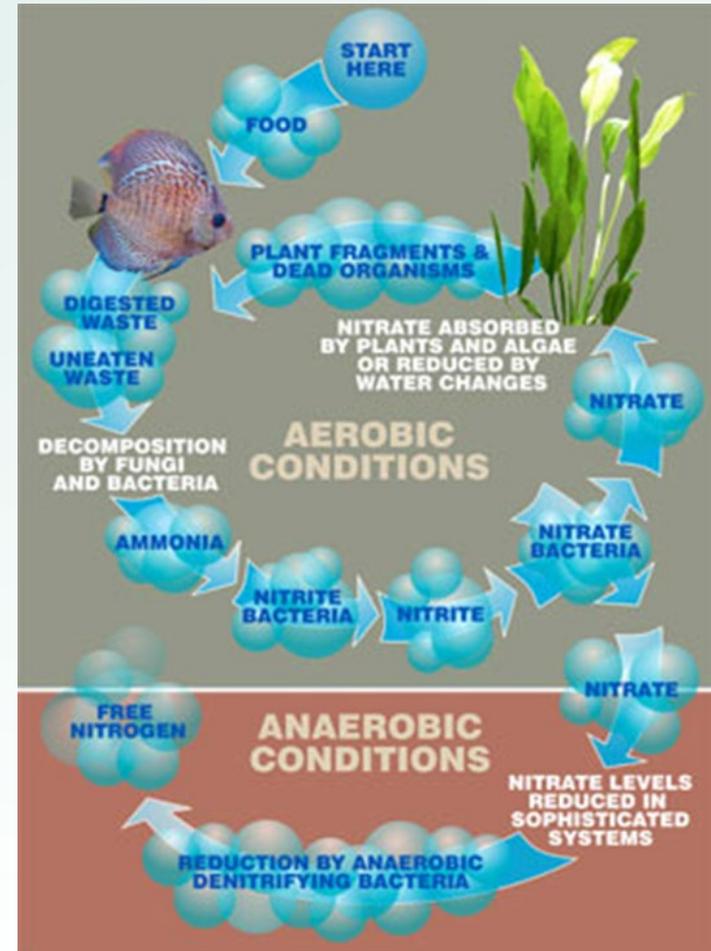
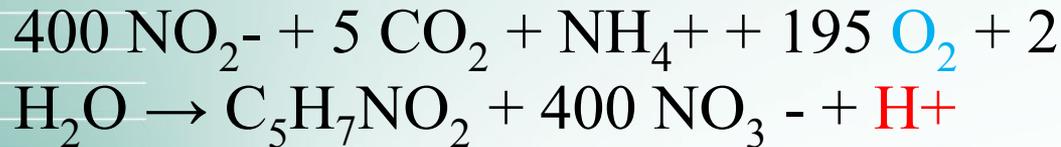
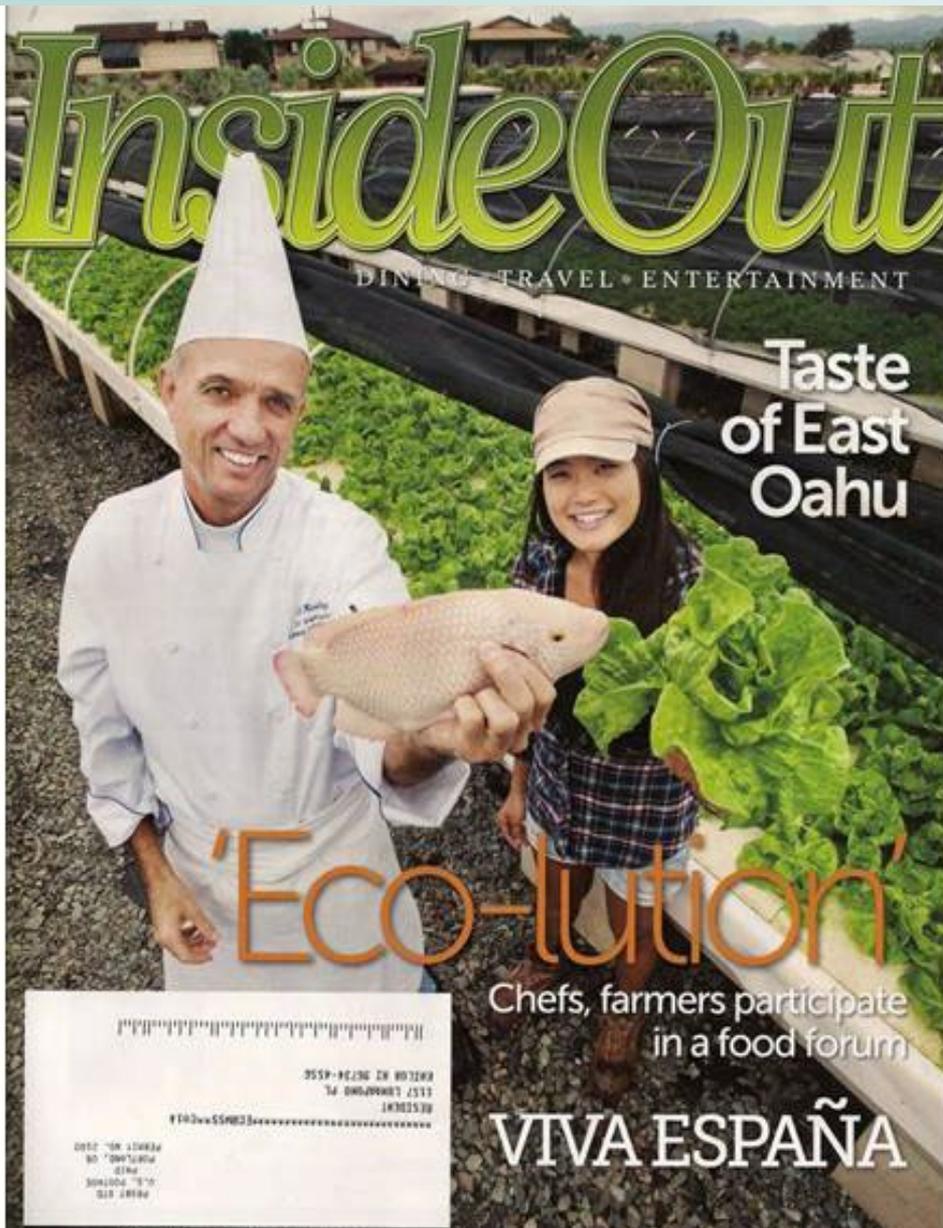
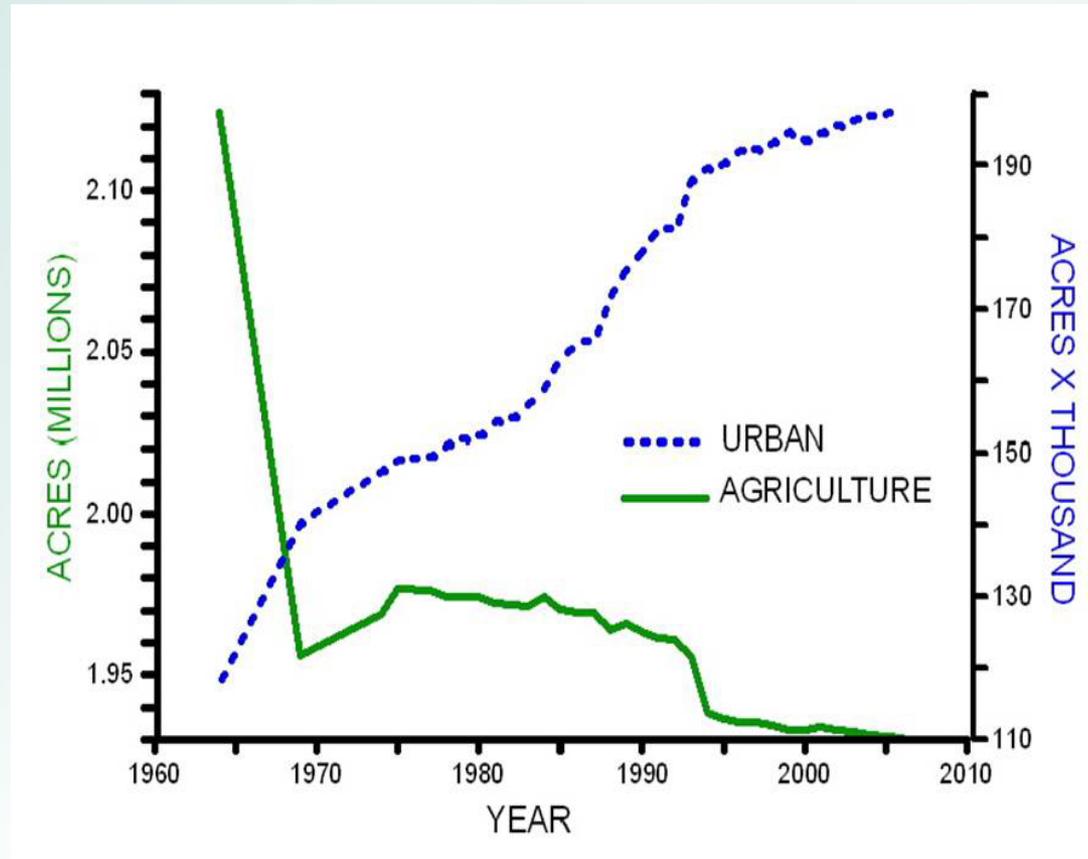


Photo credit: W.J. Hickey,
University of Wisconsin-
Madison, 2006





Challenges and Opportunities For Soil-Less Farming



Source: http://hawaii.gov/dbedt/info/economic/databook/Data_Book_time_s



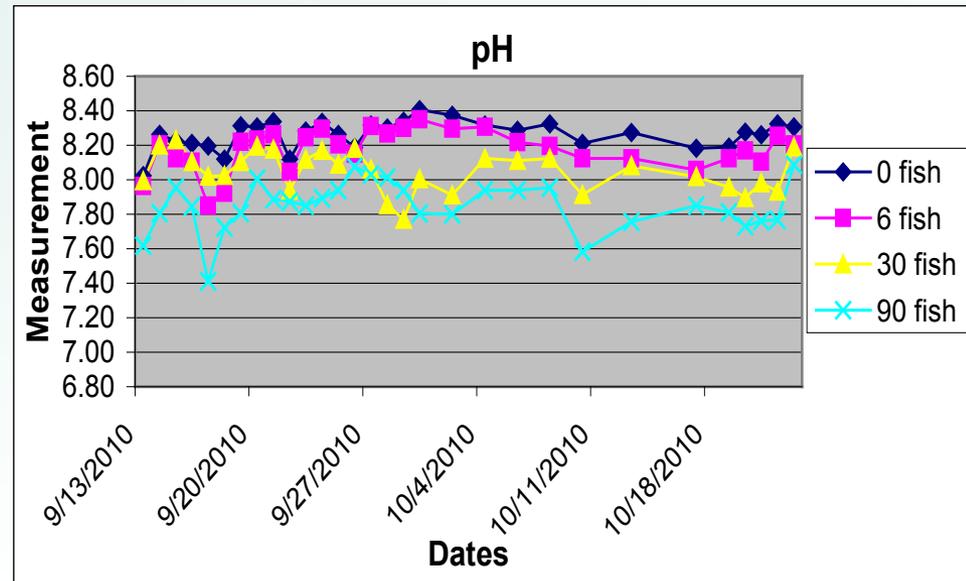
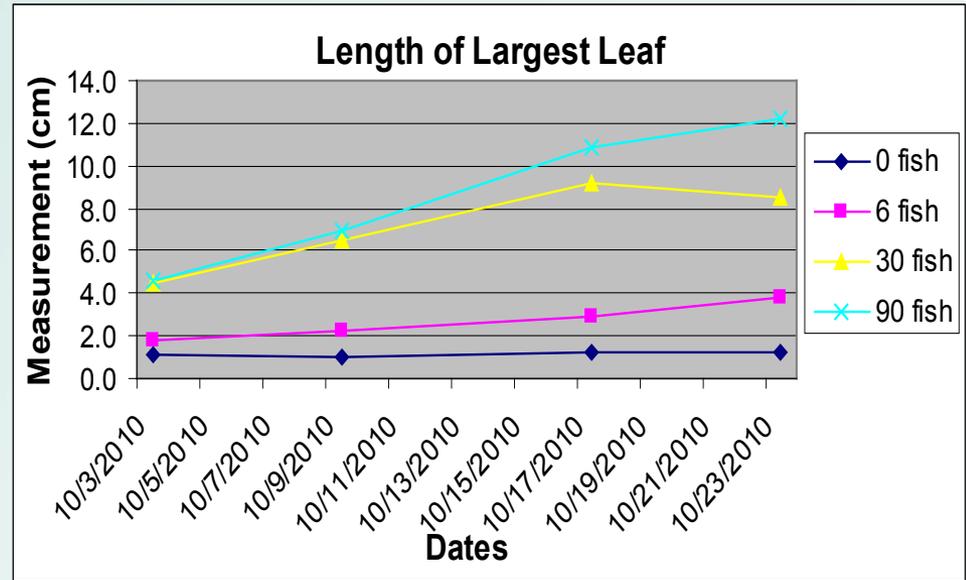
The Effects of Varying Fish Densities on Aquaponically Grown Lettuce

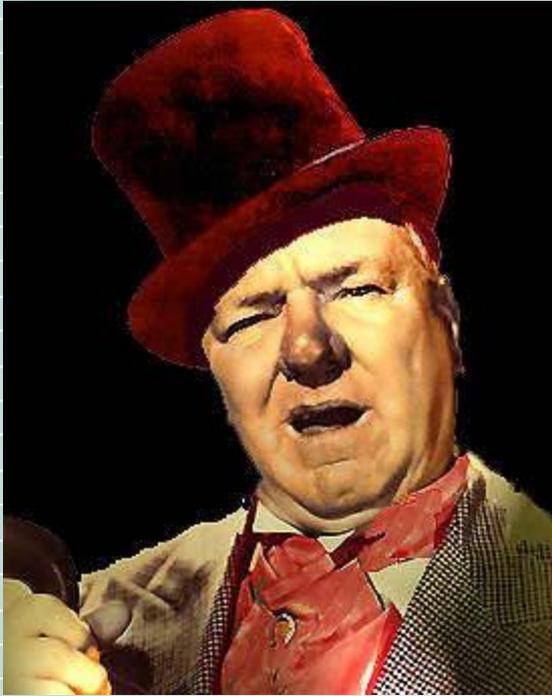
Mari Kajiwara & Jolene Fujita

Grade: 10

Mililani High School

Chemistry Honors 2010-2011





I never drink water
because of the
disgusting things that
fish do in it..

- W. C. Fields

Plants grown in aquaponic systems taste
“Fishy” - Anonymous





The Peoples Open Market Program



Why are we working with soil-less farming?

- Addresses several priority actions outlined in Hawai'i 2050 Sustainability Plan such as:
 - Increase recycling, reuse and waste reduction strategies.
 - Develop a more diverse and resilient economy
 - Create a sustainability ethic.
 - Increase production and consumption of local foods and products, particularly agriculture.

