

TRENDS IN AQUAPONICS

Advanced Aquaponics, Aquaculture and Micro Farming Workshop

New London, Ohio

August 12, 2017

Chris Weeks

Regional Aquaculture Specialist
MSU/ NCRAC

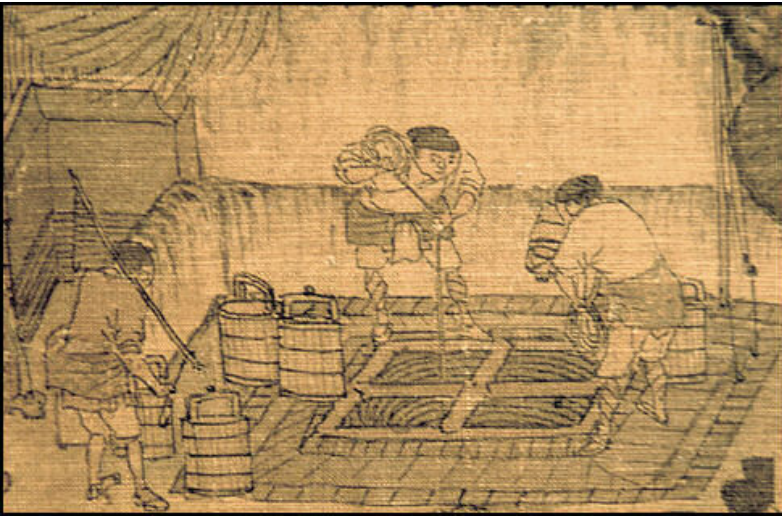
MICHIGAN STATE
UNIVERSITY



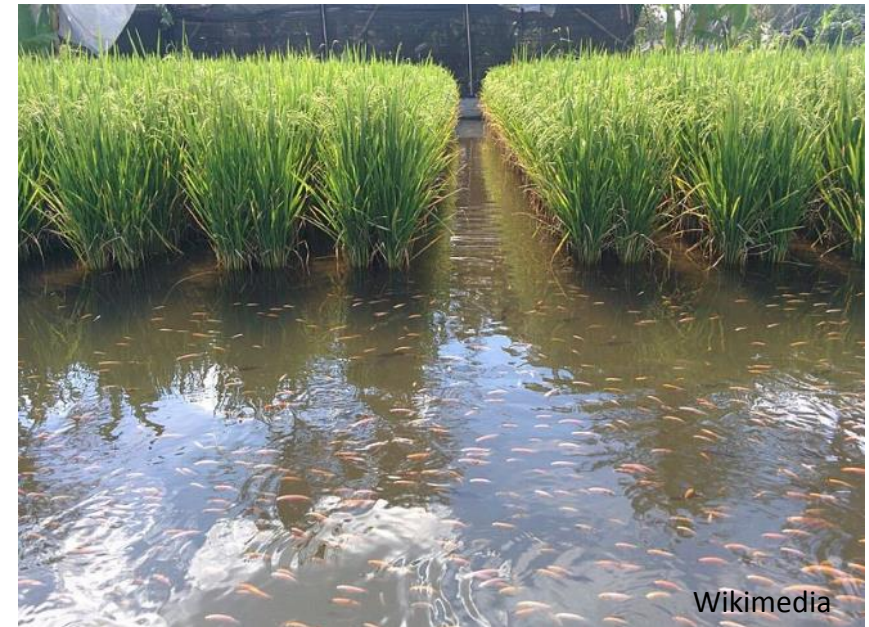
Historical Practices

- 600 BC – Hanging Gardens of Babylon?
- 1st-9th century China – cultivation of farmed rice in paddy fields containing fish

10th century fish farming



Current rice / tilapia cultivation in Indonesia



Wikimedia

- 1100 AD Mexico (Aztecs)
“Chinampa” means “man-made garden”

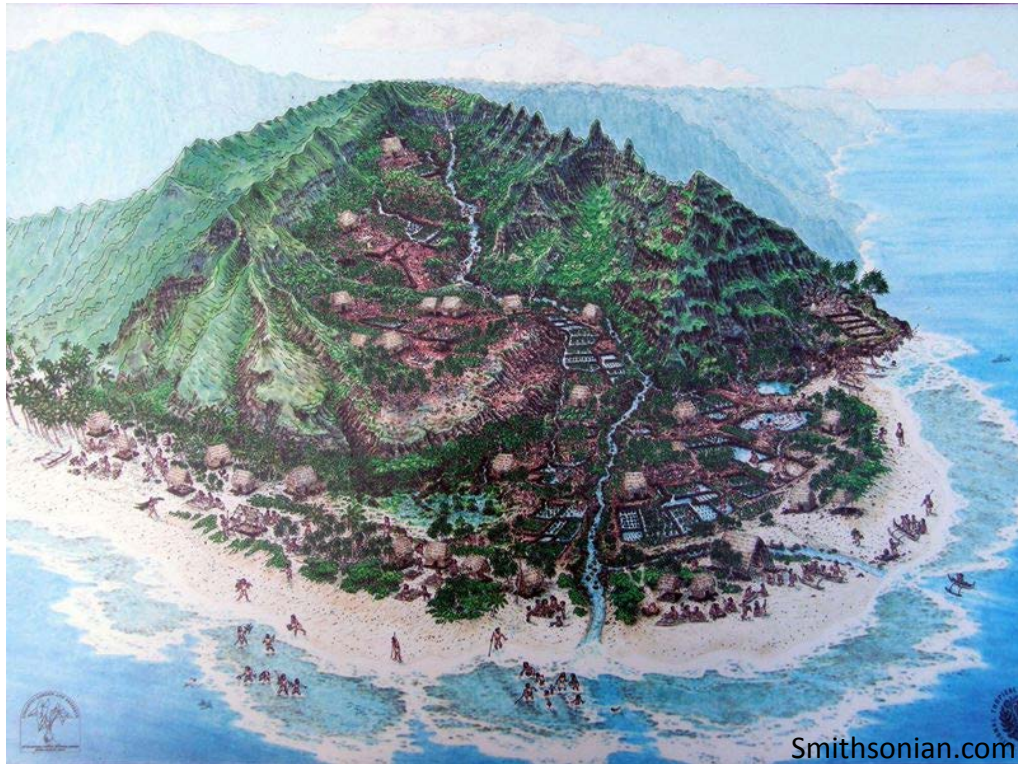


Aztec capital of Tenochtitlan



By Jflo23 –Wikimedia Commons

- 14th century – Hawaii
Taro Ponds



1960s Sustainable Agriculture R&D

1960s Sustainable Agriculture R&D

- 1969 New Alchemy Institute, Hatchville, Massachusetts (Cape Cod)
John Todd, Nancy Jack Todd, and William McLarney

Bioshelter Arks



Cape Cod Ark

The Green Institute



Prince Edward Island Ark



Fish culture in
solar algae ponds

1970s – 1980s

- Sneed et al (1975)
Published the first description of an aquaponic system, which diverted aquaculture effluent through plants
- Naegel (1977)
Combined production of fish and plants in recirculating water
- Lewis et al (1978), Southern Illinois University Carbondale
Use of Hydroponics to Maintain Quality of Recirculated Water in a Fish Culture System - possibly the first “recirculating aquaponic system”

1970s – 1980s

- Rakocy, (1980) graduated Auburn University
Joined team at University of Virgin Island
- Watten and Busch (1984) and Naire et al. (1985)
University of Virgin Island
Research on tilapia and tomatoes in an early UVI closed recirculating water system

1990s

“Sustainable Agriculture”

Lehman et al. (1993):

A process that does not deplete any non-renewable resources that are essential to agriculture in order to sustain the agricultural practices.

Lehman, H.; Clark, E.A.; Weise, S.F. Clarifying the definition of Sustainable agriculture. J. Agric. Environ. Ethics 1993, 6, 127–143.

1990s – 2000s

- Rakocy, Shultz and company solidified the utility of the UVI System
- Growing Power



Wikimedia commons



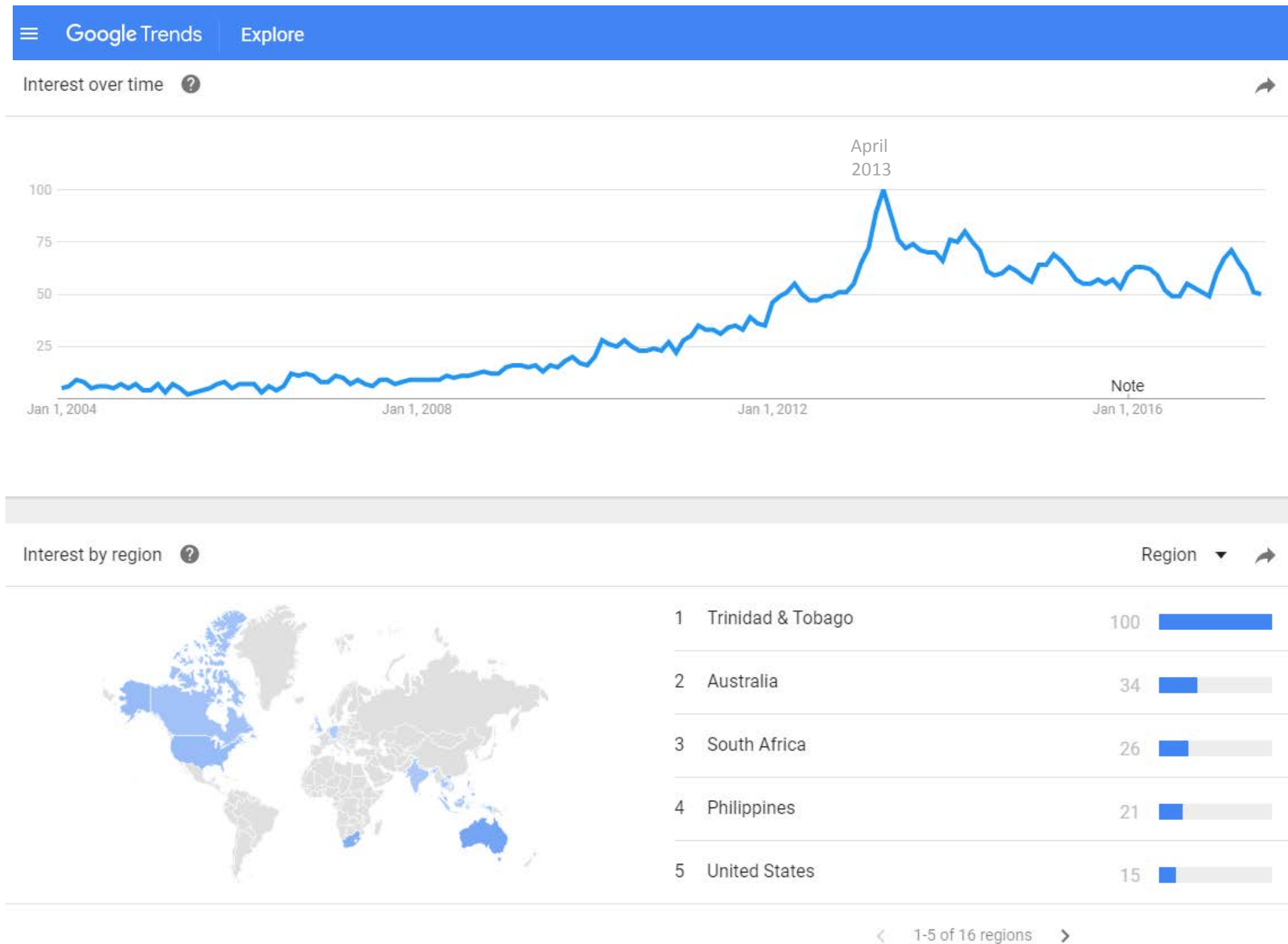
uvi.edu



From Past to Present

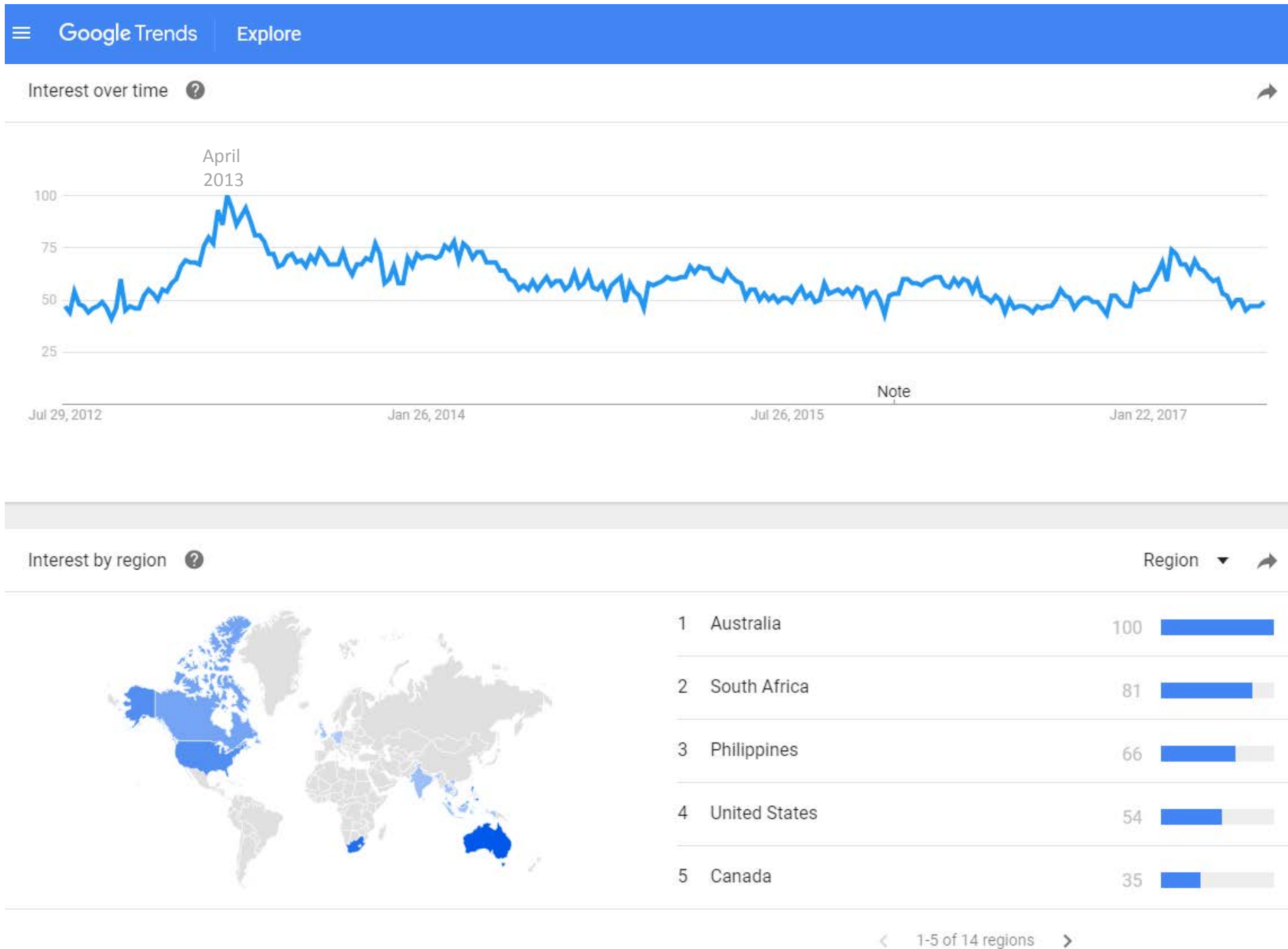
“Aquaponics”

2004-current



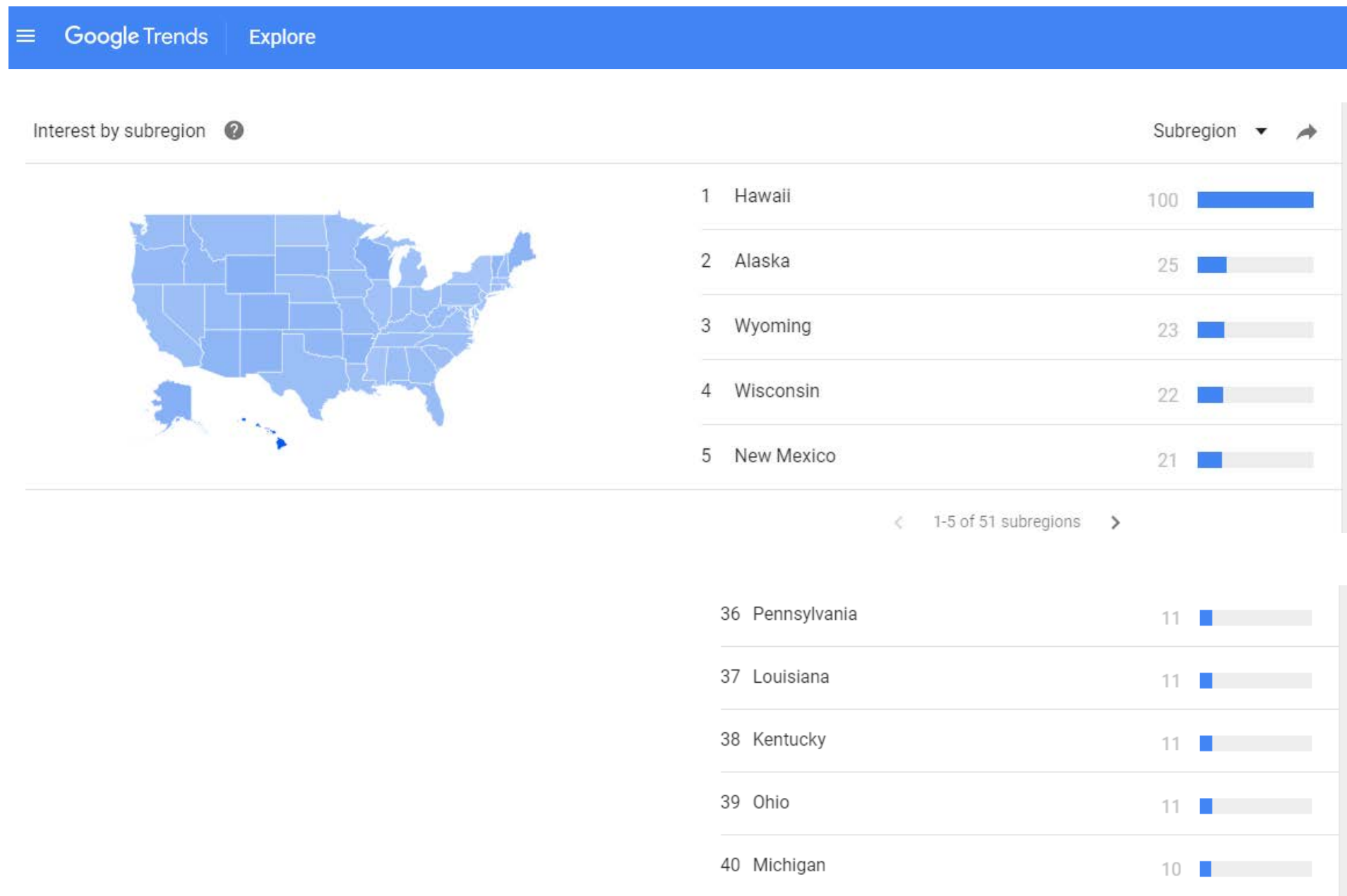
“Aquaponics”

Past 5 years



“Aquaponics”

Past 5 years





“Aquaponics”

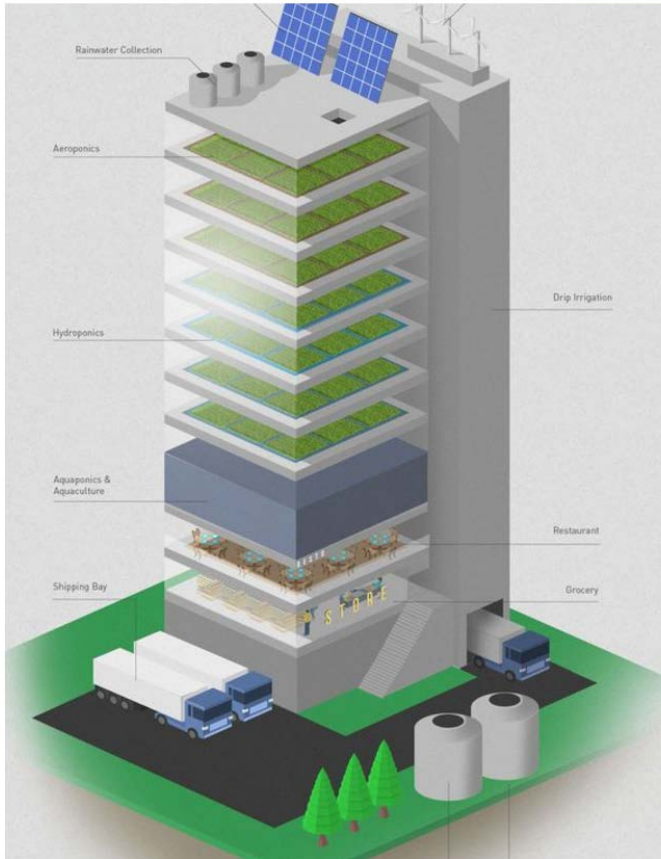
Past month: 164,000

“Aquaculture”

Past month: 194,000



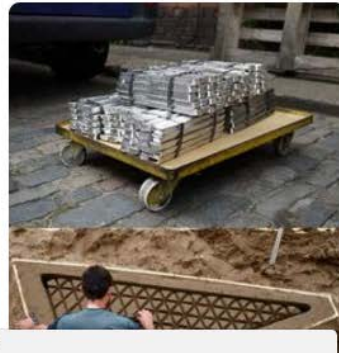
Search



The first vertical farm showdown: Why you need to know...

sky greens vertical farm in singapore

Peak Agriculture Hydroponics



Human Habitat | The Impact Farm - greenhouse ideas?

Melanie Nesteruk Green



By incorporating the rotating 'scent wheel' with the gutter or pipe methods of growing strawberries below you get:



#Aquaponic spinning wheel. Wow! Yes interesting sci fi...

Karen Waggoner Greenhouses, aquap...



Canadian entrepreneur thrives with self-developed...

Epic Gardening | G... Gardening Ideas



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Promoted by Wayfair.com



Filters ▾

This year ✕

About 436,000 filtered results



Worms in Aquaponics!

Home Farm Ideas

10 months ago • 92,136 views

I got some more worms from Uncle Jim's Worm Farm and added them to my aquaponic grow beds:) Fun fun fun! I added a lot ...



What are the best fish for Aquaponics?

desima

11 months ago • 111,268 views

<http://1aquaponics.info/desima> Get Your FREE Report On Aquaculture & Horticulture Integration (Aquaponics) Andrew is kindly ...



Learn How To Make A Real Profit In Aquaponics

Doodley Dee's Farm

8 months ago • 23,756 views



Aqua Vida Organic Aquaponics setup

Steven Gibson

11 months ago • 51 views

Aqua Vida Organics our aquaponics setup and explanation.



How a Sustainable Aquaponics Farm Grows 7000 Heads of Lettuce a Week

Learn Organic Gardening at GrowingYourGreens

8 months ago • 246,828 views

John from <http://www.growingyourgreens.com/> goes on a field trip to Sustainable Harvesters, one of the largest commercial ...

Systems

- Media fill beds
- Nutrient film technique (NFT)
- Vertical tower
- Deep water culture

Systems

- **Media fill beds**
- Nutrient film technique (NFT)
- Vertical tower
- Deep water culture



Expanded clay (Hydroton)
Shale
Gravel, stone
Key: pH Neutral

Loyola University

Systems

- Media fill beds
- **Nutrient film technique (NFT)**
- Vertical tower
- Deep water culture



Wikimedia



Iowa State University



Systems

- Media fill beds
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Systems

- Media fill beds
- Nutrient film technique (NFT)
- Vertical tower
- **Deep water culture**



Wikimedia



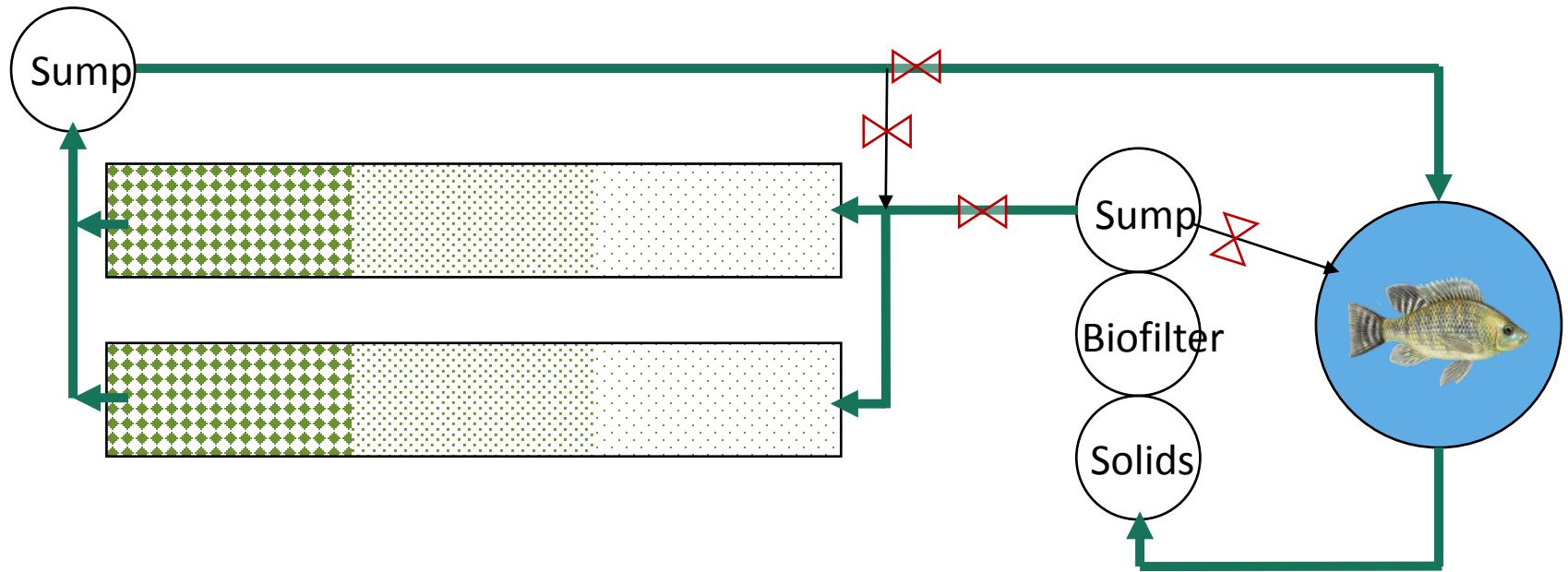
Lettuce in Dubai



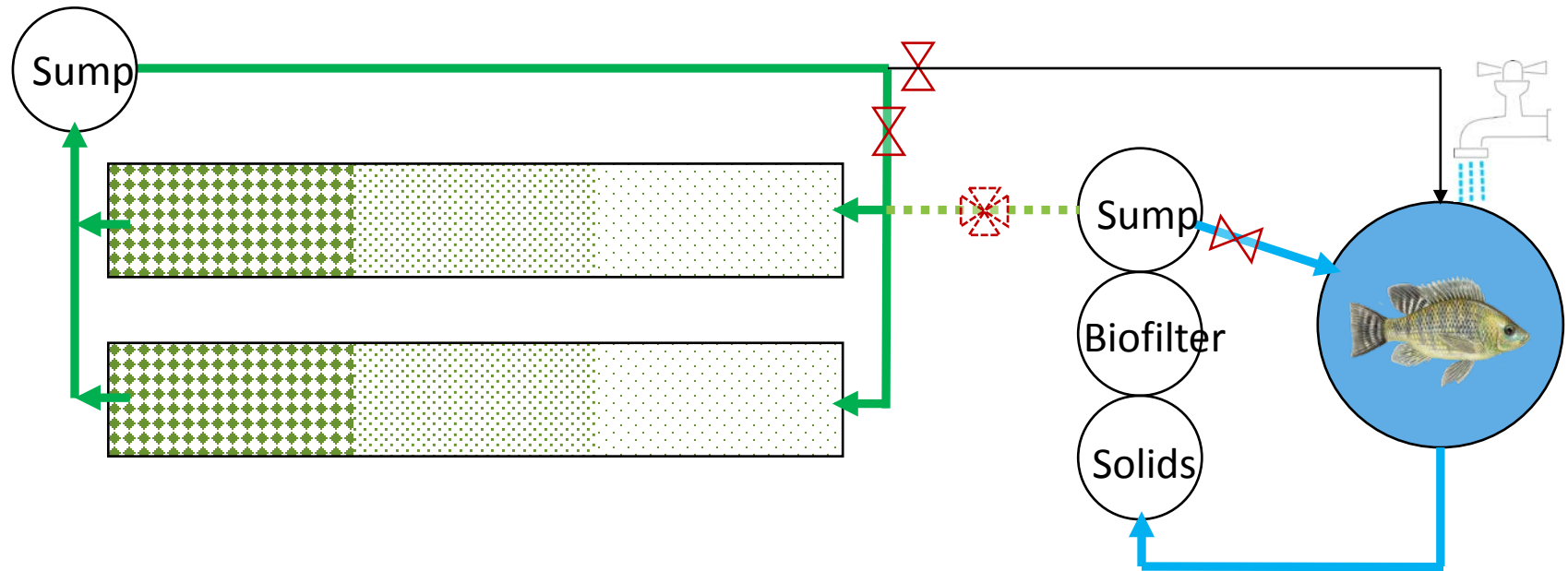
MPR News

Urban Organics St. Paul, MN

Coupled



Uncoupled



Hobby Systems



Backyard system – Chatham University, Pittsburgh



<https://docandhorse.com/>

Small scale “Fully Integrated” Aquaponics Systems

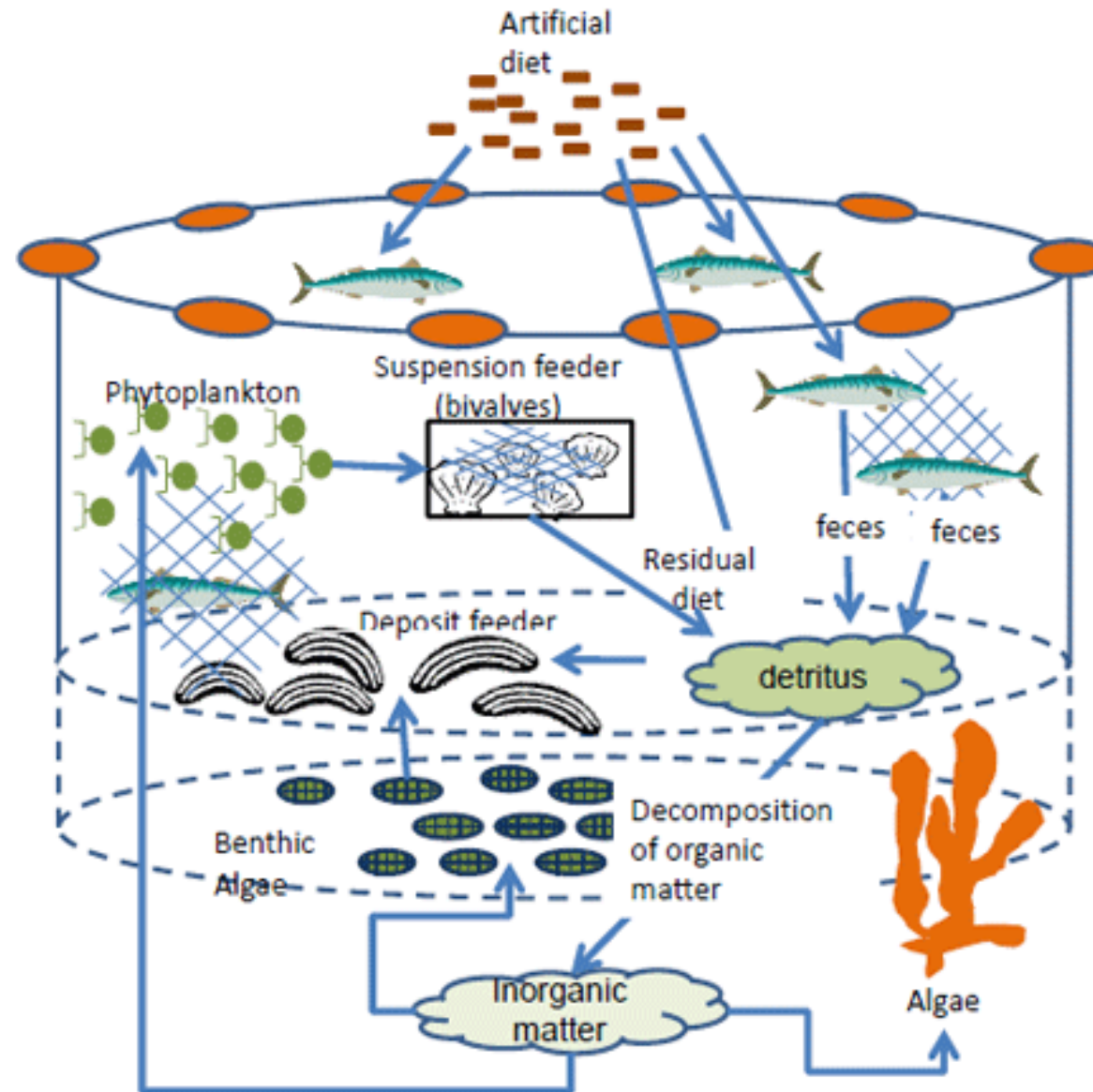


Source: Huffington Post
Design by Green Towers



Available at Amazon

Integrated Multi-Trophic Aquaculture (IMTA)







star2.com

Commercial AP

Weeks AP list					
Ouroboros Farms	CA	Half Moon Bay	Aqua Vita Farms	New York	Yaphank
Sustained Harvest Farms	CA	Goleta	Bluegreen Farms	OH	Beavercreek
AFS Group (Aquaponics Farming System)	Canada	Alberta	Oasis Aqua Farm	OH	Wellington
Argus Control Systems Canada	Canada	Alberta	Lettuce Heads Farm	OH	Plain City
Colorado Aquaponics	CO	Denver	RainFresh Harvest Farms	OH	Richwood
Fresh Farm Aquaponics	CT	Glastonbury	Fresh Harvest Farms	TX	Houston
Chatterson Farms	Fla	Orlando	Indoor Harvest Corporation	TX	Karnack
Gyro Greens	Fla	Ponte Vedra Beach	Doodley Dee's Farm	TX	Mansfield
Green Acre Aquaponics	Florida	Brooksville	Green Phoenix Farms	TX	
Friendly Aquaponics	Hawaii		Lilly Pad Farm	UK	South Wales
Metroplitan Farms	IL	Chicago	Pontus Aqua	UK	
Get Fresh Farms	IN	Fort Wayne	Byspokes	WI	Milwaukee
Falling Waters farm	IN	Indianapolis	Growing Power	WI	Northfield
Get Fresh Farms	IN	Fort Wayne	Superior Fresh	WI	Bangor
Berry's Cherries Hydroponic Produce and Lincoln Bait	MN		Lyfe Gardens, LLC,	WI	Milwaukee
Garden Fresh Farms	MN	ST Paul	Central Greens		
Urban Organics	MN	MN St. Paul	Family Fish Farms		
Lucky Clays Fresh	NC		Southern Star Farms	TX	

Engle (2015)

Economics of Aquaponics

- USDA-NASS 2013 reported 71 aquaponics farms in US
- 75 % < \$25,000 sales
- Most are operated as a type of lifestyle choice or hobby, returning perhaps some supplemental revenue
- This distinction is important in a discussion of the economics of aquaponics

Engle (2015)

Economics of Aquaponics

- Key economic considerations: for any type of business
 - 1) the overall investment required to construct
 - 2) annual costs to operate the system
 - 3) realistic estimates of market prices

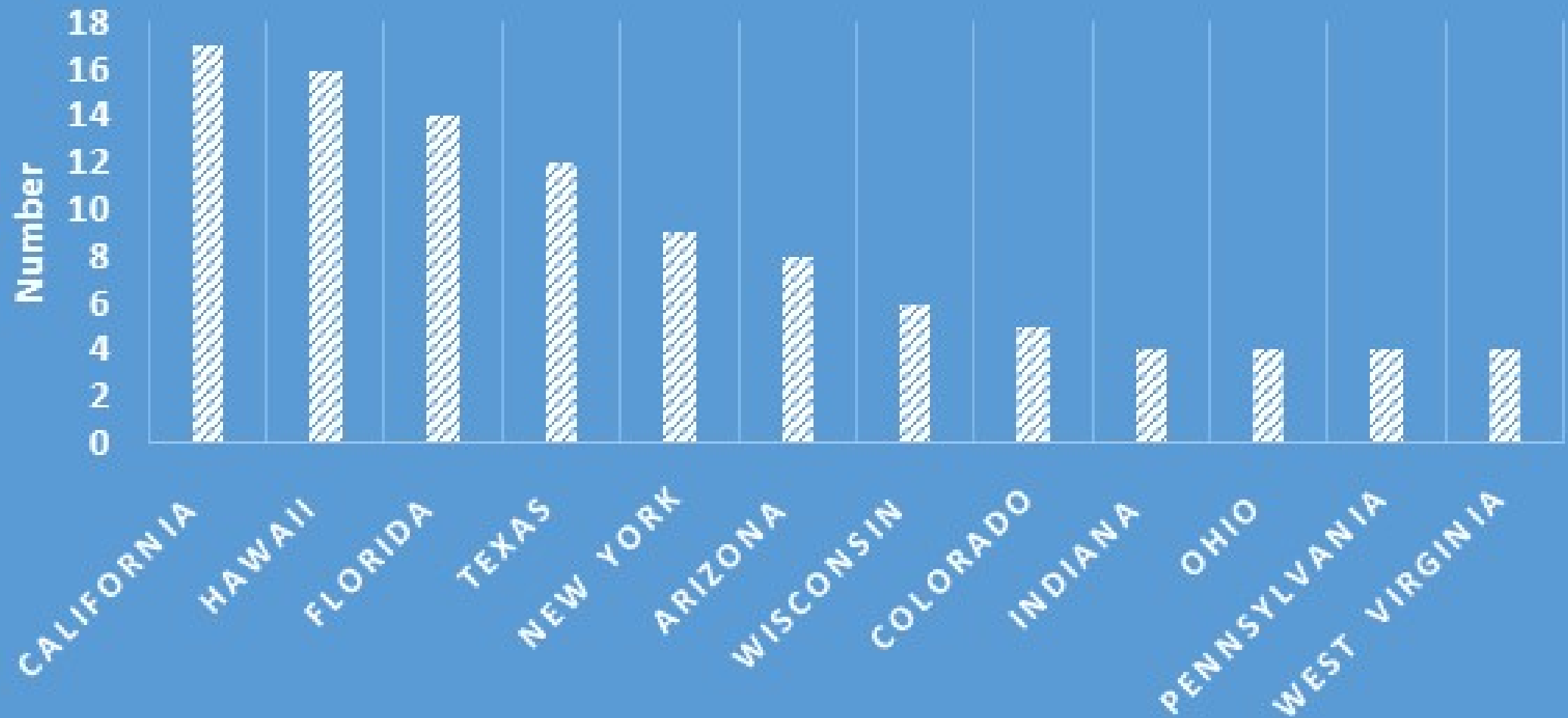
Love et al. (2014) Surveyed producers of aquaponics-related food or non-food products and services

- 257 respondents met criteria of the survey
- 188 respondents sold aquaponics-grown fish or plants
- 198 Lived in the US (81%)
 - Australia (5%), Canada (4%)
- 80% used a greenhouse (indoor and/or outdoor)
- 20% inside a building only
- 162 sold aquaponics related materials and services
 - Equipment, training, consulting
 - Equates to 63%

Media Type	%
Raft, media bed	26
Raft	14
Media bed	13
Raft, media bed, NFT	10
Raft, media bed, NFT, vertical tower	9
Raft, media bed, vertical tower	8
Raft, NFT	3
Media bed, vertical tower	3
Vertical tower	3
Raft, media bed, NFT, vertical tower, wicking bed	2
Other combinations of methods	10

Love et al. (2014)

NUMBER OF COMMERCIAL AQUAPONICS BY STATE



Fish Species

Tilapia	69%
Ornamentals	43%
Catfish	25%
Other	18%
Perch	16%
Bluegill	15%
Trout	10%
Bass	7%

Other: shrimp, prawns, crayfish, minnows, carp, pacu, barramundi, pangasius

Ornamentals were 2X likely to be raised by those who engaged in the sale of materials and services compared to those who only sold plants or fish

Plant Species

Basil	81%
Salad greens	76%
Non-basil herbs	73%
Tomatoes	68%
Head lettuce	68%
Kale	56%
Chard	55%
Bok choy	51%
Peppers	48% (<i>Capsicum annuum</i>),
Cucumbers	45%

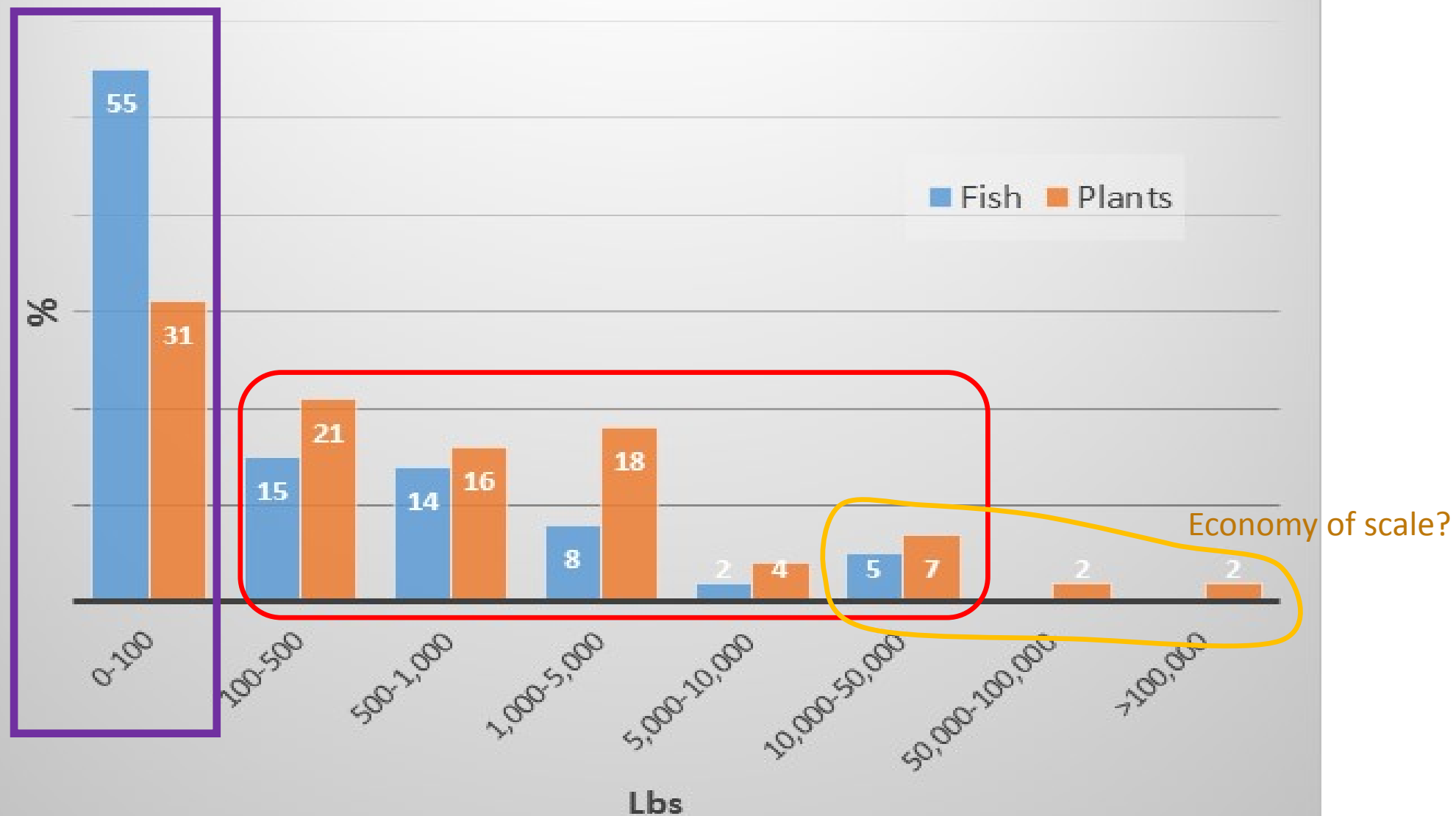
Gross Sales Revenue	2013 USDA	Love et al. 2014
< \$25,000	75%	84%
\$25,000-\$50,000	14%	
\$50,000-100,000	4%	7%
\$100,000-500,000	6%	7%
\$500,000-1,000,000	1%	2%
>\$1,000,000		

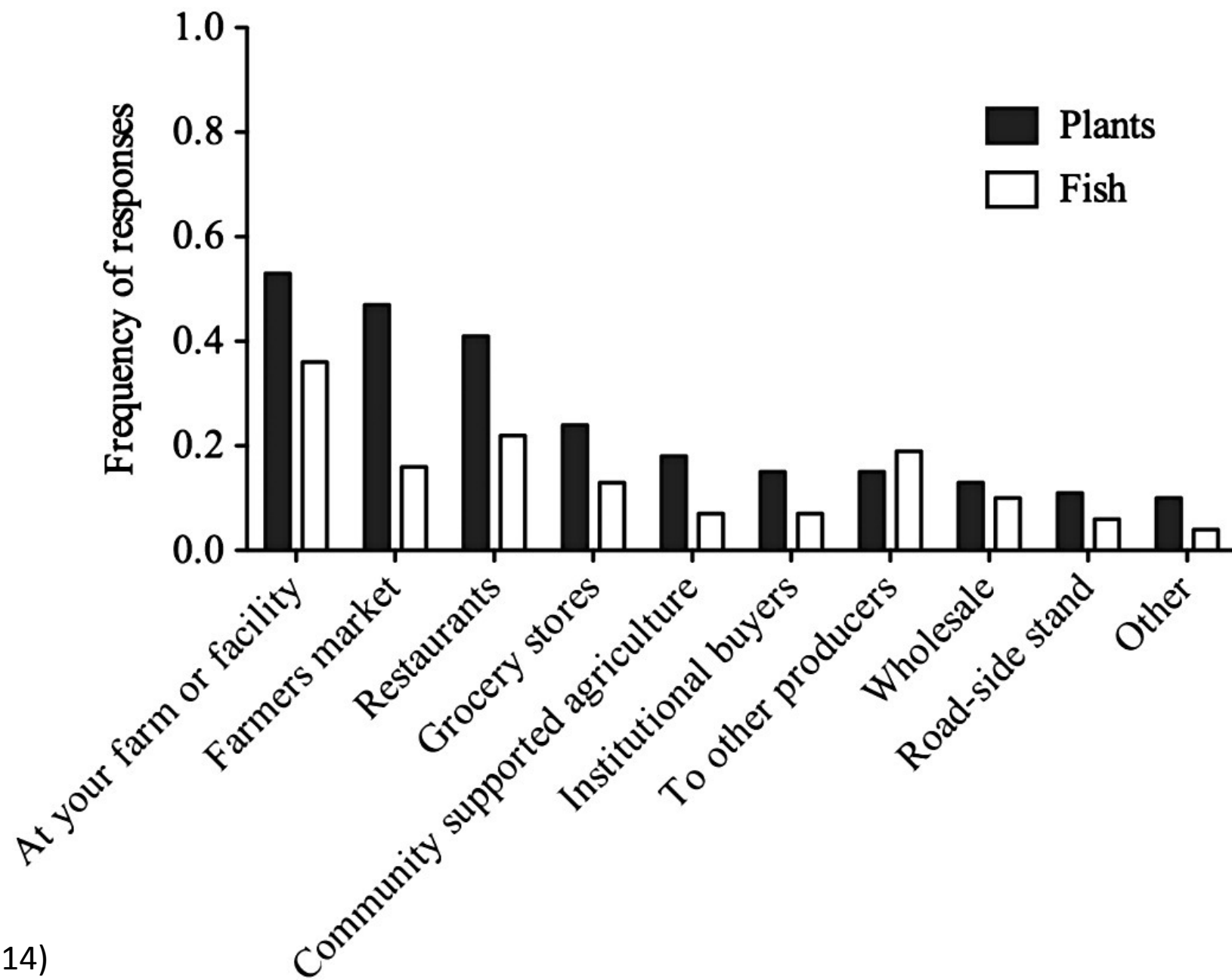
The median wage for workers US
4th quarter of 2016 was \$44,148

Bureau of
Labor Statistics

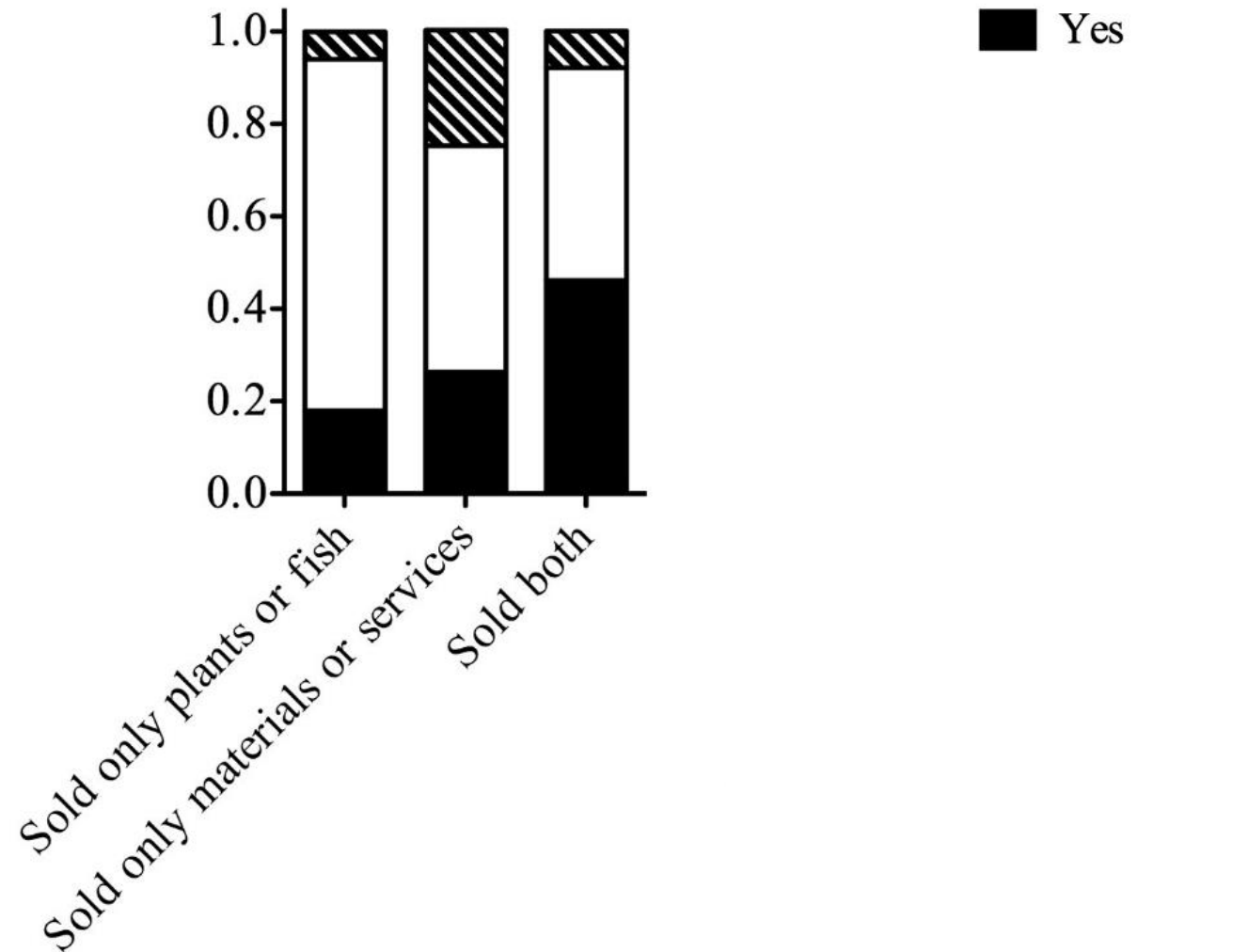
Reasonably assume then that ~ 80% of AP producers
receive gross sales under the median wage

Previous 12 Month Harvest

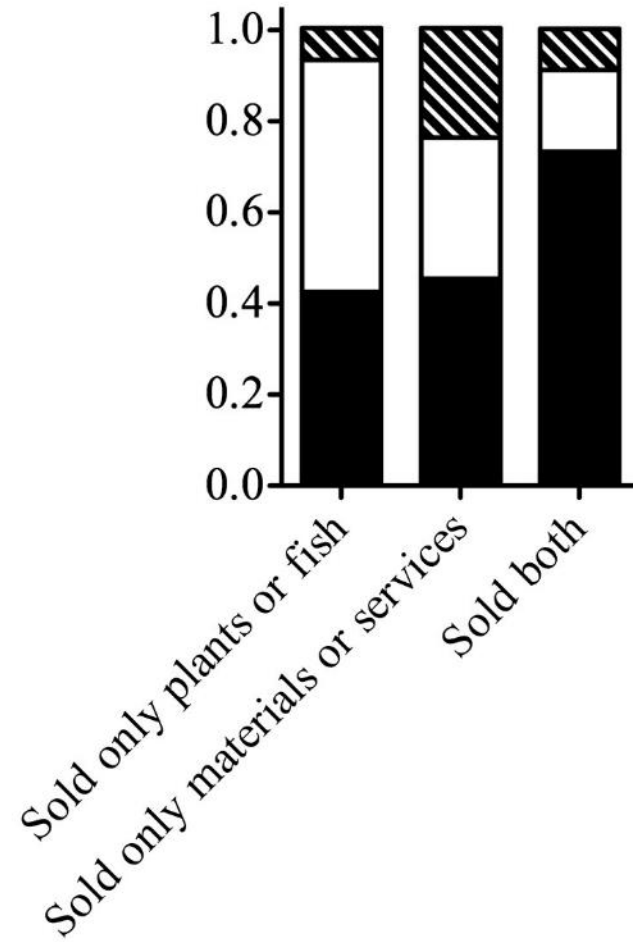




Was the aquaponics portion
of your business profitable in
the previous 12 months?

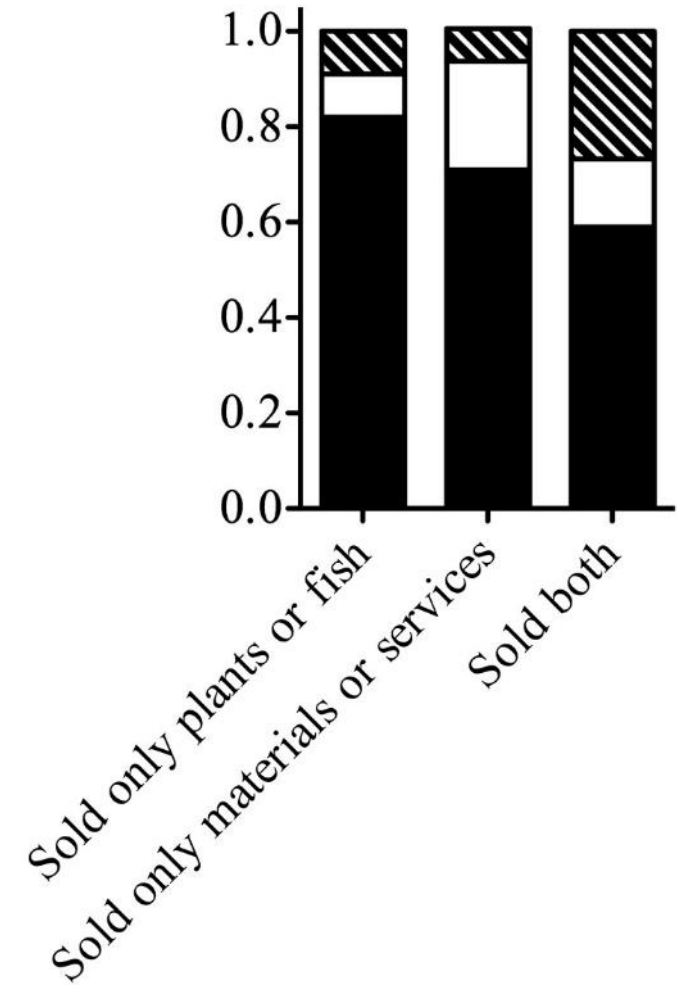


Will the aquaponics portion
of you business be profitable
in the next 12 months?



Prefer not
to disclose
No
Yes

Will the aquaponics portion
of you business be profitable
in the next 36 months?

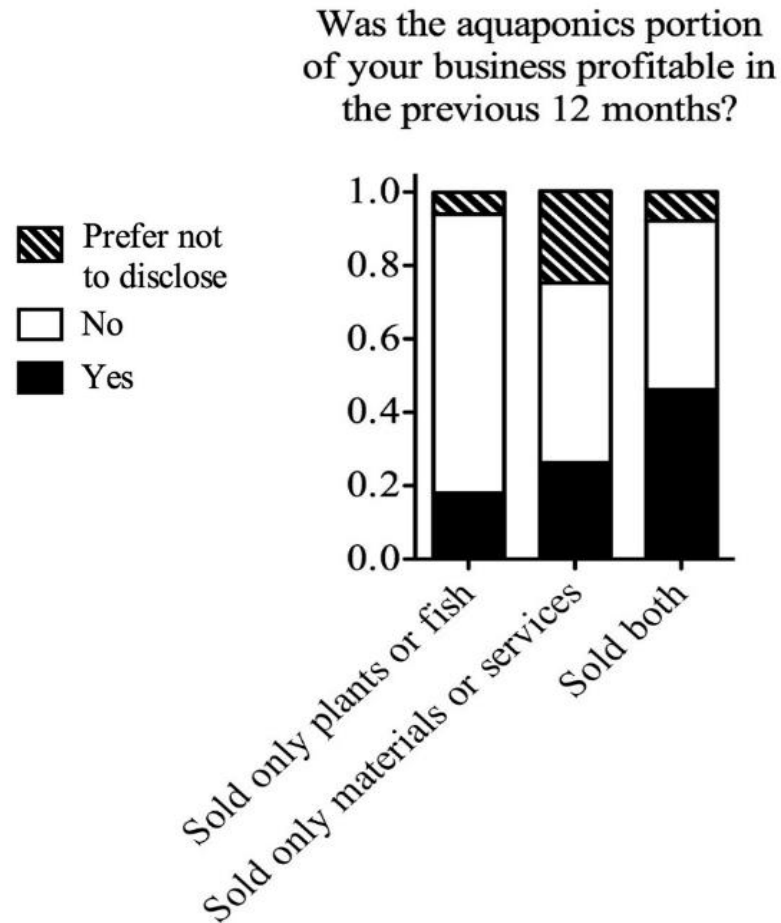


Commercial Success and Failure Rates

Low

High

but improved if
services included



Finding unbiased source based information regarding success rate of commercial AP and hydroponic startups is difficult if not impossible

Retail + Training Model

Home

Our Farm

Tours

Classes

Produce

Event Space

Supplies

Consulting

Public
1 Day/mo
1.5 hr
\$15.00

Scheduled
\$100/class

Farm stand
Online
Restaurant

Equipment
Kits
small
medium
commercial

Private
2 hrs
\$15 /p or
\$150

News Letter

Facebook



aquaponics training



About 597,000 results (0.45 seconds)

Commercial Aquaponics Training - Friendly Aquaponics

<https://www.friendlyaquaponics.com/trainings/> ▼

The most comprehensive commercial **aquaponics training**, from the people who developed the first profitable aquaponic systems in 2007.

Classes and Seminars | Nelson & Pade, Inc.

<https://aquaponics.com/learn> ▼

Nelson and Pade, Inc.® offers a variety of **training** options for anyone looking to learn more ... Rebecca Nelson and John Pade have been doing **aquaponics** and ...

Aquaponics Classes | The Aquaponic Source

<https://www.theaquaponicsource.com/aquaponics-class-list/> ▼

Aquaponics Classes offered in Home Gardening, Greenhouses and Farming as a Business. ... Flourish Farm Manager, **Aquaponics** Guru and **Training** Master.

The Aquaponic Farming Course | Green Acre Aquaponics

www.greenacreaquaponics.com/commercial-aquaponics-training/ ▼

Three days of lectures and hands-on **training** on how to develop ... Find out what students have to say about The **Aquaponic** Farming Course experience ...

Aquaponics-Trainings - Living Mandala

www.livingmandala.com/Living_Mandala/Aquaponics-Trainings.html ▼

He has been designing and implementing commercial scale **aquaponic** systems since 2007. Rob combined his years of hands on experience with **training** from ...

The Aquaponic Farming Course

aquaponicfarmingcourse.com/ ▼

living_mandala.com/aquaponics-trainings.html s recommend this course. As Managing

5-Day Intensive Aquaponics Commercial Farm Training – Aquaponics ...

aquaponicsinstitute.org/939/ ▼

Nov 19, 2012 - Murray Hallam of Practical **Aquaponics** is the Teaching Team leader for this intensive 5-day **training**, the most comprehensive Commercial ...

Classes | Recirculating Farms Coalition

www.recirculatingfarms.org/classes/ ▼

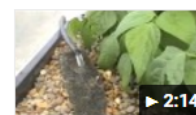
Friendly Aquaponics, HI: Technology and Commercial **Aquaponics Training** (several types of courses available) www.friendlyaquaponics.com/trainings/group- ...

Aquaponic Gardening: Growing Fish and Vegetables Together | Udemy

<https://www.udemy.com/aquaponic-gardening/> ▼

Teacher **Training** ... Grow an entire dinner right in your backyard with **aquaponics**! ... This course is based on my book, "**Aquaponic** Gardening: A Step by Step ...

Commercial Aquaponics Training & Hydroponic Setup - YouTube



<https://www.youtube.com/watch?v=q4lzsuL3Drg> ▼

Jan 18, 2012 - Uploaded by ScottyHifte

Get more info about **Aquaponics Training** here <http://tinyurl.com/DiyAquaponicsPlans> Aquaponics has been ...

Aquaponics Master Class - Aug 17-19 Register Now

www.aquaponics.com/ ▼

Learn from the best, nelson and pade, the most trusted name in **aquaponics**.

Hands-On Learning · State-Of-The-Art Training

Highlights: Experienced & Knowledgeable Instructors, State-Of-The-Art Training Facility...

[Get Your System](#) · [The Master Class](#) · [About Aquaponics](#) · [About Nelson & Pade](#)

Looking For Aquaponic Classes? - The Best Instructors Are Here

www.theaquaponicsource.com/ ▼

Aquaponics Home Gardening to Farming as a Business. Start Learning Today

You've visited theaquaponicsource.com 3 times. Last visit: 5 days ago

[Aquaponics Classes](#) · [Run Your System](#) · [Build Your System](#) · [School Aquaponics](#) · [Faqs](#) · [Directions](#)

	Days	Cost (\$)	
Nelson and Pade	3	995-1,195	Aquaponics Master class
	1	499	Business and Investment Opportunities
	1/2	69	Intro Seminar with Greenhouse Tour
	7-21	1,200 /wk	Extended Stay Learning Program (ESLP)
UW Stevens Point / Nelson and Pade	semester	UW tuition cost	Principles (2 cr - online), Introduction to Aquaponics (3 cr)
The Aquaponics Source	4	1,195	Flourish Farm AP Course
	2	295	Greenhouse Design with AP
	2	295	Aquaponics Immersion
	1	95	Basics and Build
Growing Power	3	600	
@ UW School of Fresh Water Sciences	1	200	
Oko Farms	3hr	175	Intro to Aquaponics
Friendly Aquaponics	5	1,995	Aquaponics technology, green house day, profitable day
	3	995	Aquaponics technology
Green Acre Aquaponics	3	995	
Living Mandala	4	1,295	Closed-Loop Aquaponics
Morningstart Fishermen	28	2,000	
	5	999	
	3	599	
	1	199	
Sahib Aquaponics	1/2	75	Aquaponics 101
	1	175	Aquaponics made easy
	2	395	Backyard and small urban farming
University of Virgin Islands	3	800	

Comparable Model Discussion



Organic Certified?



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Organic Aquaculture

USDA Guidance

USDA does not currently certify organic aquaculture production. The USDA National Organic Program (NOP) is in the process of developing organic practice standards for aquaculture. Specific labeling guidance will be detailed after these standards are implemented. Certification of aquatic animals will not be available until new standards are complete.

The "National Organic Program-Organic Aquaculture Standards" Action *proposes* "to establish standards for organic production and certification of farmed aquatic animals and their products in the USDA organic regulations."

See:

National Organic Program - Organic Aquaculture Standards. Proposed Rule. 81. Fed. Reg. 111 (June 9, 2016). *Federal Register: The Daily Journal of the United States*. Wed. 9 June 2016.

- <https://www.gpo.gov/fdsys/pkg/FR-2016-06-09/html/2016-12899.htm>
- <https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=&RIN=0581-AD34>

Organic Aquaculture Standards: Navigating Potential USDA Regulations.

The National Agricultural Law Center



USDA Certified Organic Fish Feed

Now your fish can be as organic and sustainable as the rest of your aquaponics system!

Formulated for Tilapia, Koi and other omnivorous pond fish by a team of aquaculture, organic pet food, and aquaponics experts.

Contains certified organic agricultural products or ingredients that conform to the NOP's national list of materials acceptable for organic agriculture production. No GMO's, no fish meal, and no soy! Can be easily be crushed to a size that is suitable for fry and fingerlings.

Crude Protein	(min).....	32.000 %	Lysine	(min).....	1.7%
Crude Fat	(min).....	4.680 %	Calcium (Ca)	(min).....	0.700 %
Crude Fiber	(max).....	8.700 %	Calcium (Ca)	(max).....	1.200 %
			Phosphorus (P)	(min).....	0.400 %

Ingredients:
Organic Wheat Middlings, Organic Rice Bran, Organic Canola Meal, Organic Corn, Organic Linseed Meal, Dicalcium Phosphate, Lactobacillus Acidophilus Fermentation Product, Reed Sedge Peat, Monosodium Phosphate, Magnesium Oxide, Sodium Sulfate, Manganous Oxide, Folic Acid, Niacin, Choline Chloride, Biotin, Riboflavin, Vitamin A Acetate, Vitamin B12, Vitamin D3, Vitamin E, Calcium Pantothenate, Ethylenediamine Dihydrochloride, Beta Carotene, Pyridoxine Hydrochloride, Ascorbic Acid, Yeast Culture, Thiamine Mononitrate, Ferric Choline Citrate Complex, Organic Dried Kelp, Zinc Amino Acid Complex, Cobalt Choline Citrate Complex, Salt, Copper Choline Citrate Complex, Manganese Amino Acid Complex, Potassium Chloride, Attapulgitte Clay, Organic Fenugreek, Organic Grape Seed Extract, Organic Lecithin, Enzyme Product, Organic Aloe Vera Juice, Calcium Carbonate, Sodium Selenite, Citric Acid, Calcium Hydroxide, Copper Sulfate Pentahydrate, Zinc Sulfate Monohydrate, Manganese Sulfate, Organic Garlic, Diatomaceous Earth, Silicon Dioxide, Organic Dried Whole Milk, Organic Sugar, Potassium Citrate, Calcium Sulfate, Magnesium Sulfate, Active Natural Source Mg, Fe, K, Organic Potato Starch, Organic Dry Whole Egg, Organic Tomato Powder, Organic Sources of (Orange Peel Powder, Cayenne Pepper, Dandelion Root, Dandelion, Cloves, Sage, Peppermint, Fennel, Hops, Parsley, Thyme, Lemon Grass, Elder Flowers, Chamomile Flowers, Licorice, Basil, and Ginger), Fumaric Acid, Organic Oat Groats, Yucca Schidigera Whole Plant Product, Organic Water Extracts, Organic Gelatin, Iron Polysaccharide, Copper Polysaccharide, Magnesium Polysaccharide, Manganese Polysaccharide, Zinc Polysaccharide, Zinc Sulfate, Pectin, Granite Dust, Perfect Food Berry, Ferrous Sulfate, Zinc Oxide, Sulfur, Organic Rice Protein, Copper Sulfate, Yeast, Cobalt Carbonate.

Directions:
Feed at the rate equal to 3.0% of the live weight of the fish. Fish may be fed once or twice per day well after sunrise and before dusk.
Fish should consume all feed in less than 30 minutes. Fish will usually consume more when the water temperature is 70 to 85 degrees Fahrenheit.
Spot Feed in the same location at the same time each day.

CAUTION: Do not feed more than 30 pounds of feed per acre per day.

Manufactured for:
The Aquaponic Store
Certified Organic by: Indiana Certified Organic, LLC.

Store in a cool, dry place.

FPD610-2

USDA Organic Certification for Production of Aquatic Animals and Plants

Formal recommendation to the National Organic Program by:

- National Organic Standards Board (2008)
- Aquaculture Working Group USDA Recommendations (2015)

Fish meal and fish oil from wild caught fish and other wild aquatic animals, except if produced from environmentally responsible food grade wild caught fisheries and fed in the following step-wise levels maximum combined total of:

- **25% during year 1 - 5**
- **15% during year 6 - 8**
- **10% during year 9-10**
- **5% during year 11-12**

Aquaponics All in One Fish and Plant Food



32% Protein for Tilapia



The Only Fish Food Formulated to Feed the Fish and the Plants

Predigestive Technology with Whole Nutritional Ingredients (No By-Products)
Resulting in Complete Digestion

Reducing Undigested Solids in an Aquaponics System

Biological Technology Included to Assist pH Stability of the System

GUARANTEED ANALYSIS

Crude Protein	(min).....	32.000 %	Lysine	(min).....	1.7%
Crude Fat	(min).....	4.680 %	Calcium (Ca)	(min).....	0.700 %
Crude Fiber	(max).....	8.700 %	Calcium (Ca)	(max).....	1.200 %
			Phosphorus (P)	(min).....	0.400 %

INGREDIENTS:

Organic Wheat Middlings, Organic Rice Bran, Organic Canola Meal, Organic Corn, Organic Linseed Meal, Dicalcium Phosphate, Lactobacillus Acidophilus Fermentation Product, Reed Sedge Peat, Monosodium Phosphate, Magnesium Oxide, Sodium Sulfate, Manganous Oxide, Folic Acid, Niacin, Choline Chloride, Biotin, Riboflavin, Vitamin A Acetate, Vitamin B12, Vitamin D3, Vitamin E, Calcium Pantothenate, Ethylenediamine Dihydrochloride, Beta Carotene, Pyridoxine

Aquaponics All in One Fish and Plant Food



50% Protein for Perch



The Only Fish Food Formulated to Feed the Fish and the Plants

Predigestive Technology with Whole Nutritional Ingredients (No By-Products)
Resulting in Complete Digestion

Reducing Undigested Solids in an Aquaponics System

Biological Technology Included to Assist pH Stability of the System

GUARANTEED ANALYSIS

Crude Protein	(min).....	50.0 %	Calcium (Ca)	(min).....	0.80 %
Crude Fat	(min).....	4.7 %	Calcium (Ca)	(max).....	1.30 %
Crude Fiber	(max).....	3.0 %	Phosphorus (P)	(min).....	1.50 %
Lysine	(min).....	1.7%			

INGREDIENTS:

Herring Meal, Corn Gluten, Organic Wheat Middlings, Organic Rice Bran, Organic Canola Meal, Organic Corn, Organic Linseed Meal, Dicalcium Phosphate, Lactobacillus Acidophilus Fermentation Product, Reed Sedge Peat, Monosodium Phosphate, Magnesium Oxide, Sodium Sulfate, Manganous Oxide, Folic Acid, Niacin, Choline

25% during year 1 - 5

15% during year 6 - 8


10% during year 9-10

5% during year 11-12

AQUAORGANIC



AquaOrganic feed is the best option for you and your fish. Not only because it contains no-GMOs and is certified organic, but also because it contains special ingredients formulated to nourish your aquaponics fish AND your plants!

 **\$11.95–\$99.95**

WEIGHT

20 Pound ▼

Clear

\$78.95

- 1 +

ADD TO CART

SKU: AFFAB0030_w20 Category:
Fish Food

<https://www.theaquaponicsource.com/shop/run-your-system/fish-food/aquaorganic-fish-feed/>

Confusion Over Hydroponics Grows at National Organic Standards Board Meeting

APRIL 25, 2017 by JILL ETTINGER

52

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Source: Organic Authority

Def.

Crop. Pastures, cover crops, green manure crops, catch crops, or any plant or part of a plant intended to be marketed as an agricultural product, fed to livestock, or used in the field to manage nutrients and soil fertility.

Cornucopia Institute

“Soilless systems are not organic systems because they are removed from the regenerative organic practices that capture carbon and nitrogen from the atmosphere into the soil.”

“The NOP should adopt the European standard that requires that organic crops be grown in the soil in the ground,

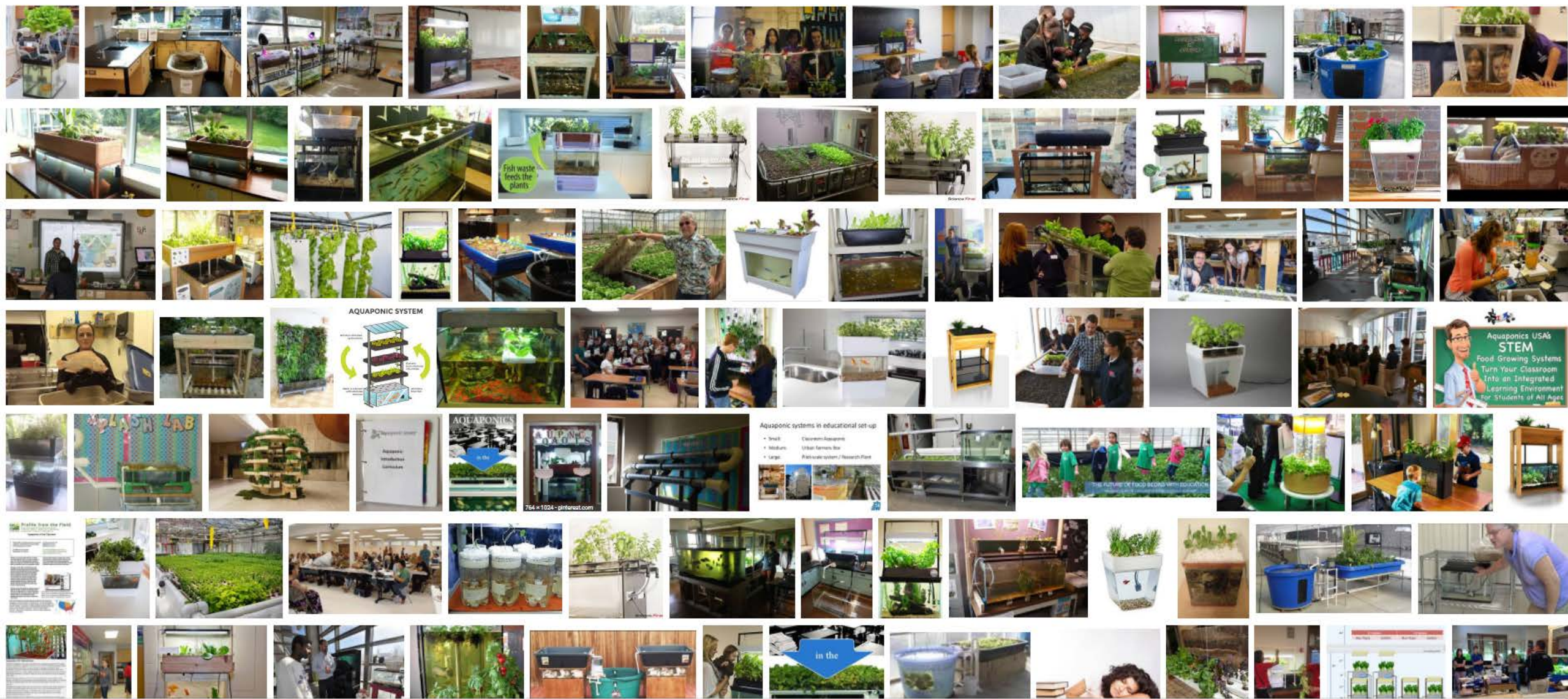
NOSB next meeting:

10/31/17 in Jacksonville, Florida

Educational



Aquaponics USA Installs a Food Forever™ Growing System at Davis Bilingual Elementary School





Profile from the Field

Contact: Marie Flanagan, NCR SARE Communications Specialist
120 BAE, Univ. of Minnesota | 1390 Eckles Ave. | St. Paul, MN 55108
ph. 612.625.7027 | f. 612.626.3132 | mart1817@umn.edu

Aquaponics in the Classroom

Project Title: Sustainable Agriculture: Instruction, Application, and Community Outreach Utilizing recirculating Aquaponics Systems

Coordinator: Kevin Savage

Participant: Gary Delanoy

Location: Cincinnati, OH

SARE Grant: \$2,000

Duration: 2013-2014

To read the full project report, go to www.sare.org/projects and search for project number YENC13-067.

Students at Cincinnati Hills Christian Academy are being exposed to their core science concepts in a new way. They are learning biology, chemistry, physics, and other core scientific concepts through hands-on modules based on an aquaponics system.

Cincinnati Hills Christian Academy has assisted with aquaponics projects at other schools as well. They've participated in developing aquaponics systems in locations such as the Cincinnati Zoo and Botanical Gardens and the Krohn Conservatory.



Profile from the Field

Contact: Marie Flanagan, NCR SARE Communications Specialist
120 BAE, Univ. of Minnesota | 1390 Eckles Ave. | St. Paul, MN 55108
ph. 612.625.7027 | f. 612.626.3132 | mart1817@umn.edu

Aquaponics in School

Project Title: Rethinking Urban Agriculture:
An Aquaponics Approach

Duration: 2012-2013

Coordinator: Robert Dillon

To read the full project report, go to
www.sare.org/projects and search for
project number YENC12-039.

Location: Maplewood, MO

SARE Grant: \$2,000

Aquaponics is a food production system that combines aquaculture, the raising of fish, with hydroponics, the soil-less growing of plants in water, into an integrated system. The first year of this project included purchasing and building an aquaponics system consisting of a grow bed, breeding tank, growing tank, and scientific equipment to maintain water quality and quality control throughout the system. The project began with one tank. Currently, there are three tanks with more expansion planned.



Maplewood Richmond Heights students built an aquaponic grow bed, breeding tank, and growing tank and are producing tomatoes and lettuce.

Photo by Judith Moses.

TOPICS > SCIENCE

Nonprofit hopes to spread aquaponic farming to schools around the country



BY CAT WISE June 23, 2015 at 4:30 PM EDT



SchoolGrown's aquaponics farm and headquarters in Half Moon Bay, California. The organization shares space with Ouroboros Farms, a commercial aquaponics facility. Photo by SchoolGrown

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Aquaponics Across the Spectrum:

Bridging Science Education to STEM-Based Careers and Eco-Stewardship

Sheila Raja





THEATER

MUSIC

WORKSHOPS

FARM DINNER

VENUE
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Introduction to Aquaponics



August 11, 2016

6:30 PM - 8:30 PM

Eden Hall Campus - Field Labs

Registration has closed. Please contact Chloe Bell at cbell@chatham.edu for additional information.

Fee : \$25 materials cost

Location : Eden Hall Campus - Field Labs

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- COMPOSTING

Aquaponics

Introduction

The Ecodome, our 3,100 square-foot greenhouse, is home to two aquaponics systems. Aquaponics is the combination of aquaculture and hydroponic practices (plant culture without soil). Beneficial bacteria colonized within the system convert the toxic components of fish waste into a usable form of plant nutrients.

Aquaponics offers solutions to fish farmers who dispose of nutrient-rich fish waste and to hydroponic growers who require constant inputs of nutrient additives. The systems are located indoors and operate in all seasons, allowing a continual harvest of sustainably grown produce.

Aquaponics is a popular technique in urban agriculture as it employs small space intensive growing techniques to provide an abundance of sustainably grown produce in an indoor setting. *The Plant and Farmed*

APPLY NOW

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URBAN AGRICULTURE



**A Conversation with
Urban Agriculture
Coordinator Kevin
Erickson**





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Aquaponics Workshop

UVI Aquaponics Workshop

Workshop Dates	Maximum Participants
March 2018 - to be announced	25
May 2018 - to be announced	25

Dates for 2018 workshops will be announced in October and registration accepted in January.

Email dbailey@live.uvi.edu for information and to be added to a contact list.





Aquaponics

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Minnesota Aquaponics Symposium

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Aquaponics Resources



» [EDUCATION](#) » SPRING 2015 FINAL PROJECTS

Spring 2015 Final Projects

[Food Safety Hazards Associated with Smooth-Textured Leafy Greens Produced in Aquaponic, Hydroponic, and Soil-Based Systems With and Without Roots at Retail](#) (.pdf)

Caitlin Barnhart, Laura Hayes, Danielle Ringle

[Identifying aquaponics information gaps: An examination of educational resources available to home hobbyists in Minneapolis garden center sites](#) (.pdf)

Natalie Campbell, Lindsey Miller, Abigail Reynolds

[Comparing Multiple Forms of Light on Different Cultivars of Swiss Chard in an Ebb and Flow Bench Aquaponics System](#) (.pdf)

Benjamin Gebhardt, Michael White, Christina Montouri, Vinzenz Karl

[A Comparison of Rockwool, Lava Rock, Expanded Clay Aggregate, and Coconut Coir as Growing Substrate in a Floating Raft Aquaponic System Examining Growth Rates of 'Improved Amethyst' Basil and 'Nancy' Butterhead Lettuce](#) (.pdf)

Laura Robinson, Thomasina Roth-Krosnoski, Marie Sorensen

Auburn University aquaponics project supplying fresh food for campus dining

Published: Feb 08, 2017

[Miranda Nobles](#) | Office of Communications & Marketing



On-campus dining has come a long way since the days of mystery meat and stale pizza. Students today enjoy options that can easily rival restaurant-quality meals. A new initiative at Auburn University is taking campus dining to a new level, using a farm-to-table approach to feed the bodies and minds of students.

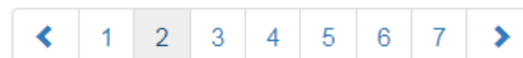
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The aquaponics project—a collaborative effort among the E.W. Shell Fisheries, the College of Agriculture's Department of Horticulture and the Food Systems Institute—gives students a hands-on educational experience while providing Campus Dining with locally grown food to serve up some of the freshest meals in town.

At Auburn, the aquaponics project starts at Fisheries – a 1,600-acre space that includes natural habitats for research, education and outreach in aquaculture, fisheries management and aquatic sciences. There, an above-ground pond holds approximately 7,400 tilapia that are fed nitrate-rich food. The discharged water is used to supply nutrients to plants like cucumbers, bell peppers and tomatoes as part of the project, and Campus Dining serves the produce in dining locations across campus.

"Dining's role is that we're the beneficiary," said Glenn Loughridge, director of Campus Dining. "We are very fortunate to be able to access some of the healthiest foods that you can possibly have."

Because the foods are served within days of being picked from the vine, consumers are eating a product that is more nutritious than something they might buy from a grocery store.



A cucumber from the aquaponics initiative will soon be picked and served at a dining location on Auburn University's campus.



Aquaponics

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Aquaponics at UW-Stevens Point

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Commercial aquaponics facilities operating globally and growing exponentially

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Countries and all 50 states represented in taking the Aquaponics Master Class

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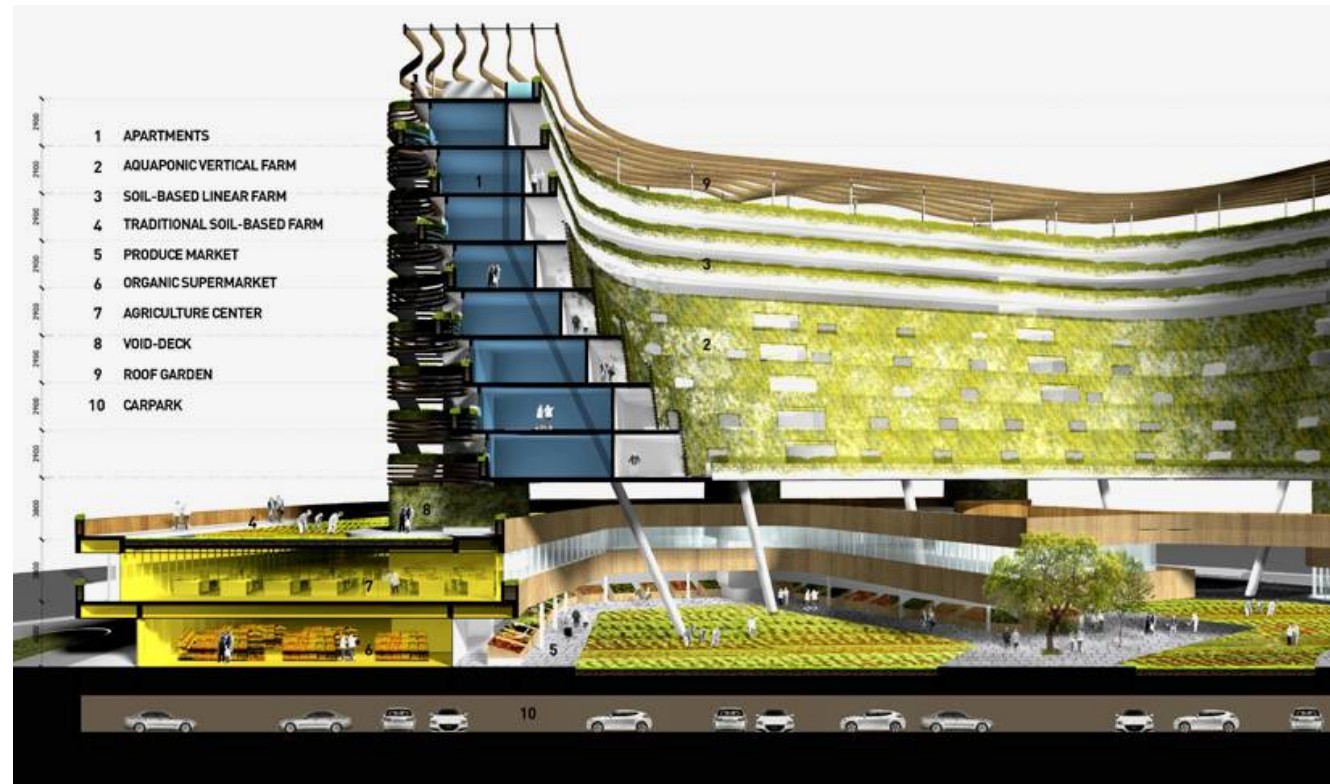
252

Undergrads and 17 Graduates completed the UWSP Aquaponics Courses since 2011

Future?



mnn.com





Out of business 2016?

Green Sky Growers, Winter Garden, Fla

The Globe (Hedron) urban rooftop farm
WGSN Article by Gemma Riberti, May 16, 2012



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Download our Fresh Sheet PDF
to see what we're picking.
Includes pricing and
purchase information.

[Green Sky Fresh Sheet](#)

Welcome to Green Sky Growers

Green Sky Growers, a rooftop farm, is located on top of the Garden Building in Winter Garden, Florida, and is the first Certified Green building in the world with commercial-scale, Aqua-Dynamic farming on the rooftop. Green Sky Growers produces tons of fresh vegetables and fish on an annual basis without the use of harmful pesticides.

- Environmentally friendly growing practices include the harvesting of rainwater that is recycled in the Aqua-Dynamic growing systems.
- All the growing systems continuously recycle 100% of the nutrients and water.

See our fresh lettuces, herbs,
edible flowers and fish for sale!

Green Sky produce available
through FreshPoint Distribution.



Farmers' Market



A parent-funded greenhouse sits on top of a Manhattan school at P.S. 333 Study Science. (BARRY WILLIAMS/FOR NEW YORK DAILY NEWS)





The Concept House was designed by students in a sustainability program at the University of Rotterdam. Credit NY Times, Helly Scholten and Mark de Leeuw

RainFresh Harvests, Ohio

Photo: SARE Reporting System





Design Concept from
Japan Aquaponics

Inland Sea, Iowa, Atlantic Salmon, 2019?

RAS2020 - MODULAR RECIRCULATING AQUACULTURE SYSTEM

Veolia



Case Study

INDUSTRIAL

→ Sundsfjord Smolt AS

Krüger Kaldnes has signed an agreement with Sundsfjord Smolt for the delivery of a Recirculating Aquaculture System (RAS) for reuse and quality management of process water for land based fish farming - Kaldnes® RAS.

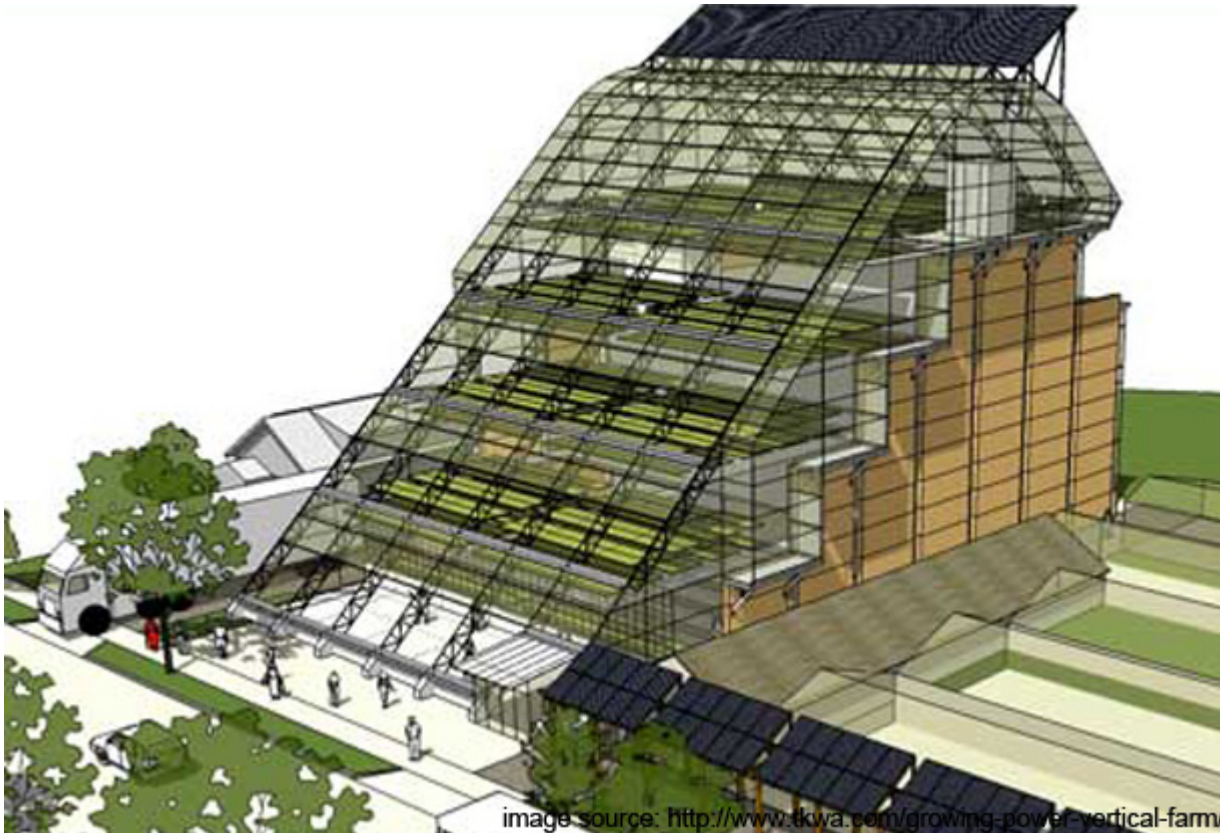


image source: <http://www.tkwa.com/growing-power-vertical-farm/>

Growing Power Vertical Farm

<http://www.tkwa.com/growing-power-vertical-farm/>

Growing Power, Milwaukee



Wikimedia commons

1990s “Sustainable Agriculture”

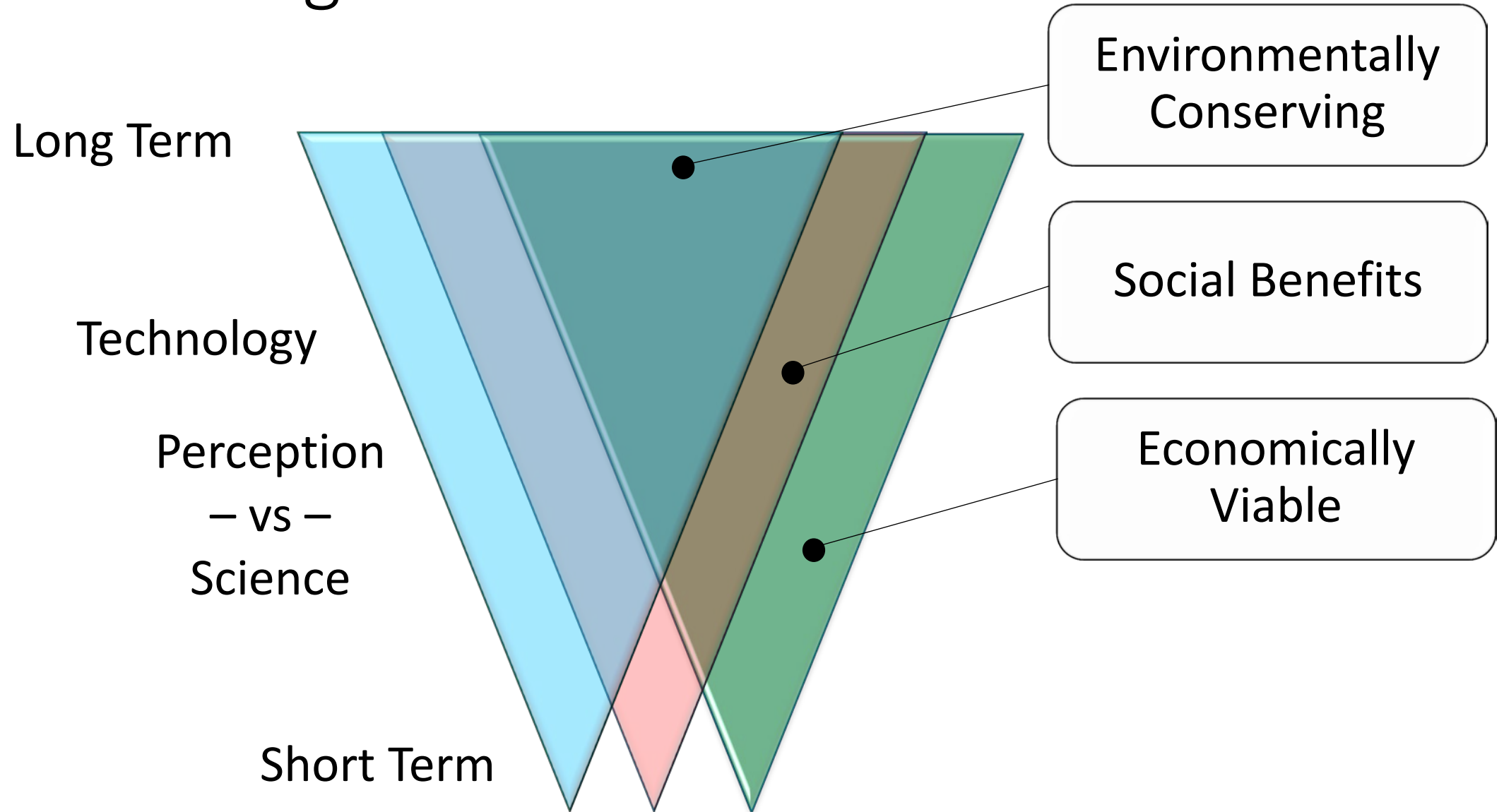
Lehman et al. (1993)

A process that does not deplete any non-renewable resources essential to agriculture in order to sustain the agricultural practices.

Food and Agriculture Organization (2005; abbreviated)

Sustainable development conserving (land), water, plants and genetic resources, that is environmentally non degrading, technologically appropriate, economically viable and socially acceptable.

Sustainable Agriculture



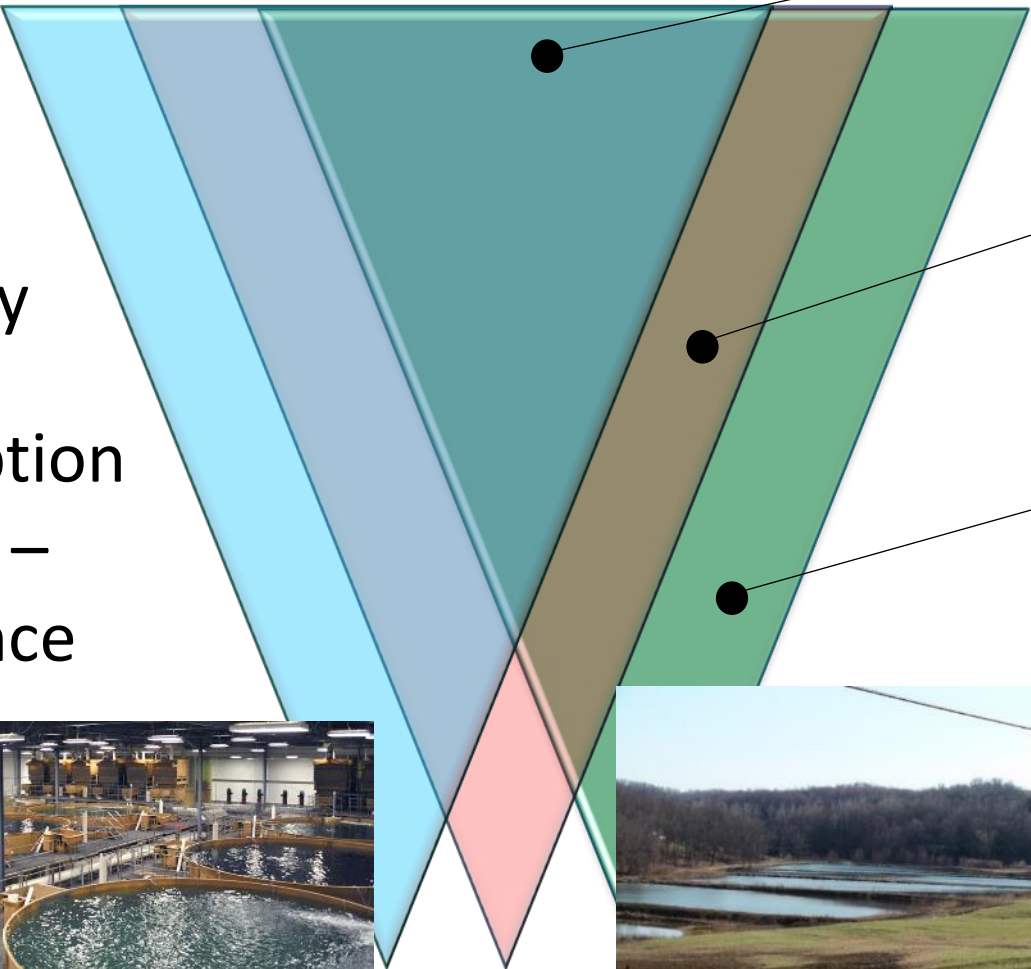
Sustainable Agriculture



Term

Technology

Perception
— vs —
Science



Environmentally
Conserving

Social Benefits

Economically
Viable





**Sustainable
Agriculture**

Questions or Comments?



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