



**THE OHIO STATE UNIVERSITY**

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COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Aquaponics: The Ohio Experience

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There is a growing interest in aquaponics, a production method combining hydroponics and aquaculture in a recirculating water system. We will discuss the current status of the industry, pros and cons of this technique, and components of both hobby and commercial scale systems.

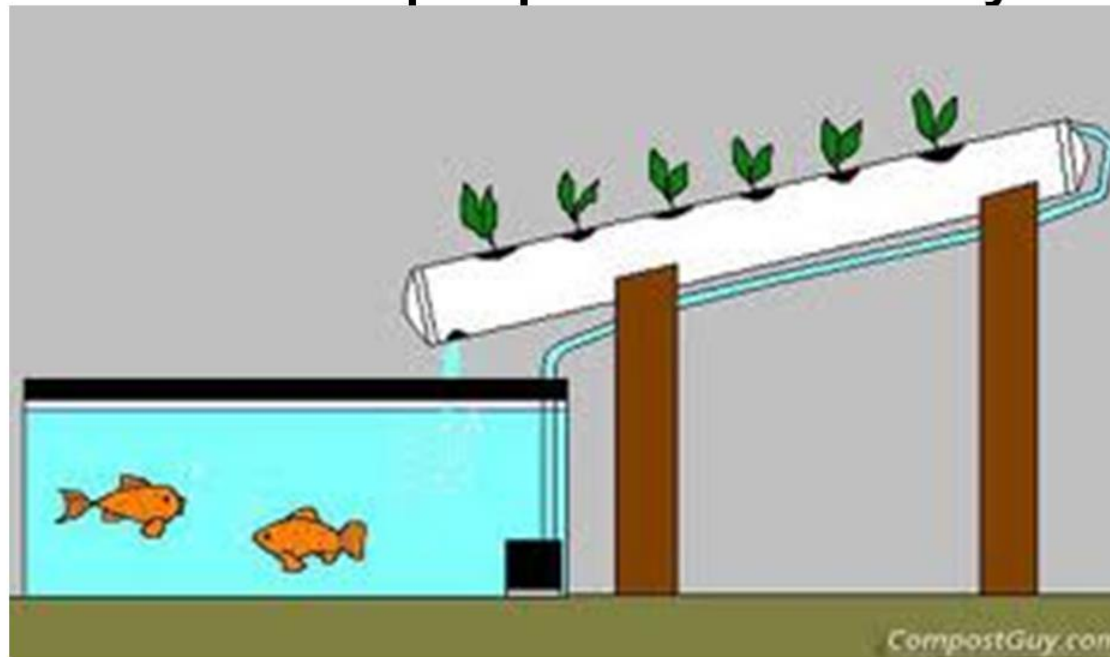


# What is aquaponics?

A RAS system that grows fish and plants together

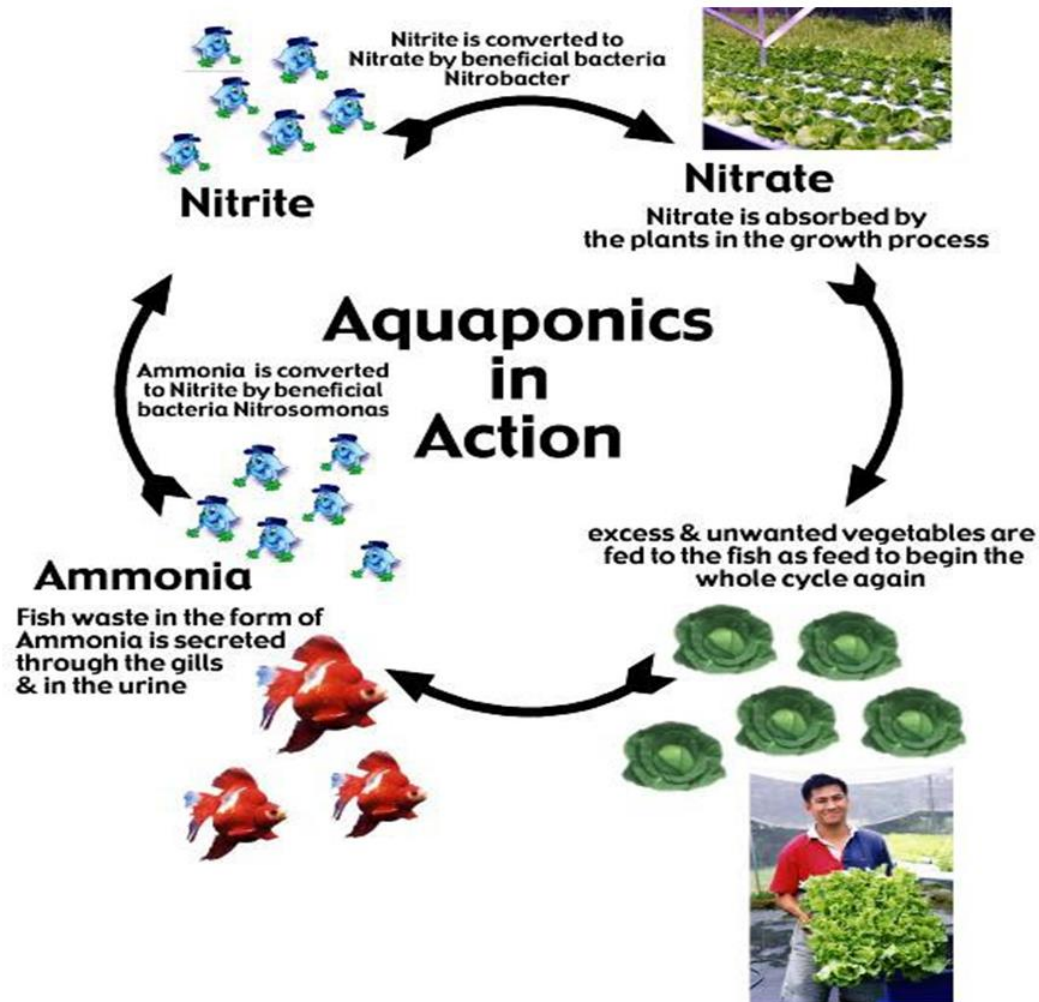
Melds aquaculture with hydroponics

Modern aquaponics: ~35 years





# Nitrogen Cycle in Aquaponics







# Aquaponic Benefits

Two crops - symbiotic relationship between plants and fish

- Reduction in waste-water discharge by recycling nutrients
- Miserly water use - 90% REDUCTION in water use vs. conventional farming techniques
- Minimal need for land- because of their compact nature, facilities may be located very close to the end users (restaurants, green grocers, food manufacturers, public) in a variety of locations (country, city, desert).
- Supports Locavorism
- Produces an organic food source-no herbicides or pesticides can be used
- Year round production for marketing advantage



# Disadvantages of aquaponics

- High start up costs
- Lack of research in temperate climates
- Have to know two systems, fish and plants
- Needs constant monitoring, skilled management
- May not be aesthetically pleasing in your living room
- Moderate energy inputs
- Niche, high-end marketing to be profitable



# Current Trends

Commercial scale

Few, but not proven profitable, need economic data

Urban aquaculture

Mainly home systems

Majority of research available is on the University of Virgin  
Island System

Growing temperate culture research

Coupled vs. Uncoupled Systems

GAP (Good Agricultural Practices)

Food Safety

Alternative energy



# Fish Care 101

Typically Tilapia, but other fish too (bluegill, yellow perch)

Water quality is key

Fish should be:

- Stocked at maximum biomass for profitability
- Fish health imperative
- Eating regularly
- Do not exceed .5 lb/gallon

Important Water quality parameters: pH, alkalinity, temperature, dissolved oxygen

Remove solids before water reaches plants

Two tanks help keep densities optimal

OSU South Centers can help with fish issues





# Plant Care 101

Shortened growing time

Hydroponic subsystem serves as biofilter

Nitrifying bacteria grow on film on grow media & plant roots

Media includes: gravel, sand, perlite, rafts, NFT channels

Oxygen needed for nitrification process

Plants require 16 essential nutrients

Plants require light

Water temperature optimum around 75°F

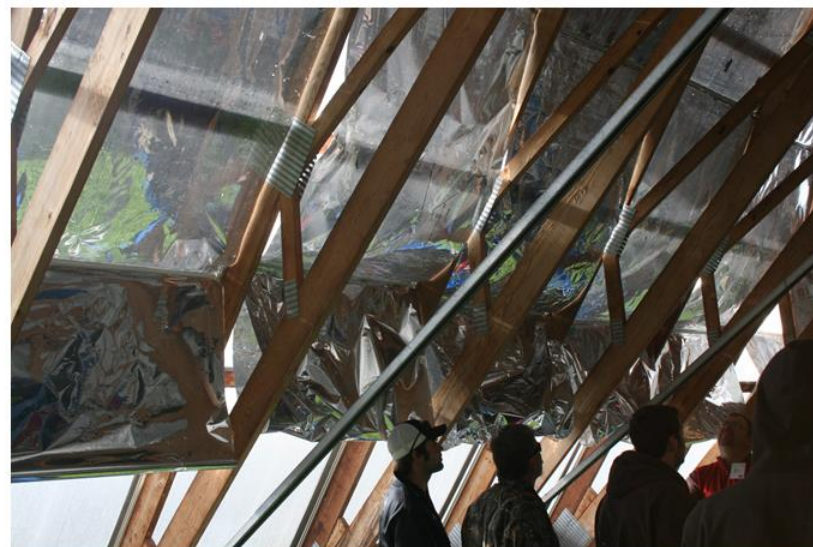
- Test pH every week. System becomes acidic
- Buffer with potassium and calcium buffers to desired pH

OSU horticulture team can help with plants

Species	Food fish	Sport fish	Temp (°F)	Market price (per pound)
Yellow Perch	x	x	55-78	\$2.75-\$4.50
Tilapia	x	x	80-90	\$2.50-\$5.00
Catfish	x	x	75-90	\$2.00-\$4.00
Bluegill/Hybrids	x	x		\$3.00-\$5.00
Largemouth Bass	x	x	55-80	\$4.00-\$6.00
Hybrid Striped Bass	x	x	77-86	\$3.00-\$5.00
Trout	x	x	50-60	\$3.00-\$5.00
Freshwater Prawn	x		77-90	\$10.00-\$15.00
Red Claw Crayfish	x		75-85	?
Baitfish		x	75-85	\$5.00-\$15.00
Ornamentals (Koi)		x	55-80	\$2.00-\$1000.00











2012 Warner Grant: Install a sustainable aquaponics system that can be cost effective for use by family farms in greenhouse high tunnels.







## Max & Marilyn Wulff

- Ashtabula, Ohio
- 200-square-foot aquaponic farm
- 650 gallon tank with 100 fish
- 1,700 plants











## 1 month growth: Arugula, bokchoy, basil, mustard greens







Fresh Harvest Farm – Richwood, Ohio  
Doug and Jeni Blackburn  
[www.freshharvestfarmllc.com](http://www.freshharvestfarmllc.com)





Base Camp Café @ the Cincinnati Zoo  
Learn more at [www.waterfieldsllc.com](http://www.waterfieldsllc.com)





# Ohio State University College of Agriculture Engineering



- Aquaponics in Honduras Capstone Team
- Sponsored by General Motors Foundation
- Design and construct an aquaponics unit in a rural village in Honduras using local materials







Backyard Aquaponics – Ohio (Photo by Chris Hartland)



# OSU Aquaponics Pilot System

1 Aquaculture specialist  
1 Horticulture specialist  
\$1500 Extension  
Innovation Grant  
Lots of aquaculture and  
horticulture parts and  
pieces lying around.



1 unused greenhouse  
1 free Intern  
1 700 gallon tank  
1 biofilter  
3 floating beds  
Yellow perch  
Tilapia







# Three Media



Hydrocorn  
Expanded shale  
Soilless Planting mix (peat, vermiculite & perlite)







# Three crops

Red Leaf Lettuce  
Mizuna  
Red Russian Kale







# Production Results

## Production Results (combined from all phases)

Media	Species	Production (ounces/sqft)
Styrofoam float tray	Mizuna	19.11
Styrofoam float tray	Red leaf lettuce	11.44
Expanded Shale	Mizuna	1.15
Expanded Shale	Red leaf lettuce	8.15
Hydrocorn	Mizuna	1.21
Hydrocorn	Red leaf lettuce	7.44





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# 2015







## In Summary

- Aquaponics more popular than ever
- High energy costs
- Get training
- Avoid shysters
- Use careful business planning
- Start of with a small pilot system
- Be ready to market a high value product
- Keep connected with research organizations



## Resources

- SRAC Factsheets

<https://srac.tamu.edu/>

- Backyard Aquaponics

<http://backyardaquaponics.com/>

- Aquaponics journal–

<http://aquaponicsjournal.com/>

- Aqua-Ohio & Aquaponics list serve–

<http://southcenters.osu.edu/aqua/aqua-ohio.htm>





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