

# Aquaponics in the Classroom

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“It is a jungle in there.” *Grace Mann*





“

Fresh clean veggies and sane protein from your own backyard in your own mini-ecosystems: it doesn't get better than that....and you can quote me on that

”

Ted J. Hill, Riverside, California



Randy Mann

- Teacher
- Gardner
- Aquaponics Enthusiast



# The Origins of Aquaponics

## AQUACULTURE

Is the farming of aquatic organisms such as fish, crustaceans, mollusks and aquatic plants. (Aquafarming)



Started: 2,000 - 1,000 BC in China

## HYDROPONICS

The cultivation of plants by placing the roots in a liquid nutrient solution rather than soil.

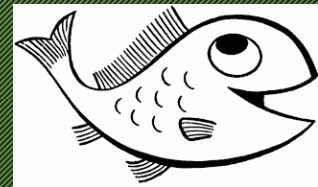
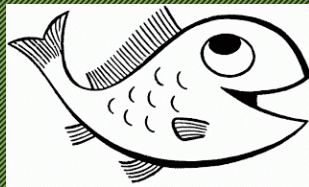
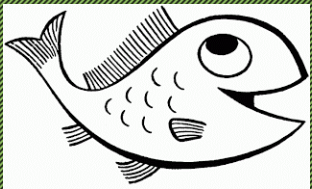


Started: 600 BC The Hanging Gardens of Babylon



# Aquaponics Defined

**A SYSTEM OF AQUACULTURE IN WHICH THE WASTE PRODUCED BY FARMED FISH OR OTHER AQUATIC ANIMALS SUPPLIES NUTRIENTS FOR PLANTS GROWN HYDROPONICALLY, WHICH IN TURN PURIFY THE WATER.**





# Beginning Aquaponics-Two Possibilities

## Aztec “chinampas”

- “floating garden system”
- Evidence in the Valley of Mexico
- Used prior to Aztec civilization
- Became more systematic under Aztecs

## 6<sup>th</sup> Century Asian Farmers

- South China-Thailand-Indonesia
- Rice paddy’s with carp
- Ancient Chinese integrated aquaculture (finfish, catfish, ducks, plants)

<https://www.milkwood.net/2014/01/20/aquaponics-a-brief-history/>



# Backyard Aquaponics

- The term aquaponics is often attributed to Dr. Mark McMurtry at North Carolina State University.
- Mid 1980's, Mark McMurtry and Professor Doug Sanders created the first known closed loop aquaponic system. Effluent from fish tanks trickled through sand filled containers and back into fish tanks.
- In 1969, John and Nancy Todd and William McLarney founded the New Alchemy Institute. Created the "Arc" self-sufficient, solar-powered, bio-shelter
- Early 1990's, Missouri farmers Tom and Paula Speraneo introduced their bioponics gravel grow beds (S&S AquaFarm).
- The Australian connection Murray Hallam (Practical Aquaponics) and Joel Malcom (Backyard Aquaponics book and magazine).  
<https://www.milkwood.net/2014/01/20/aquaponics-a-brief-history/>

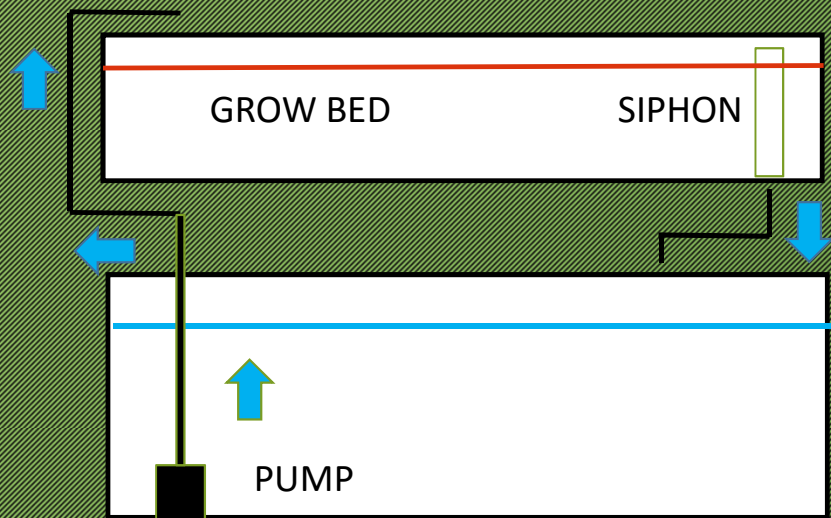


# My Guru's

- Travis Hughey (Barrel-ponics) “the system” free PDF. Created [F.A.S.T.](#) Faith and Sustainable Technologies. He uses his Barrel-ponics system in third world countries to produce vegetables and protein for the local inhabitants.
- Sylvia Bernstein ([Aquaponic Gardening](#)) “the science”. The most comprehensive book for layman (like myself) regarding the science behind aquaponics. Easy to read and great illustrations. Created [The Aquaponic Source](#) *hands down the best website going for all the information you need on doing aquaponics right. (IMHO)*



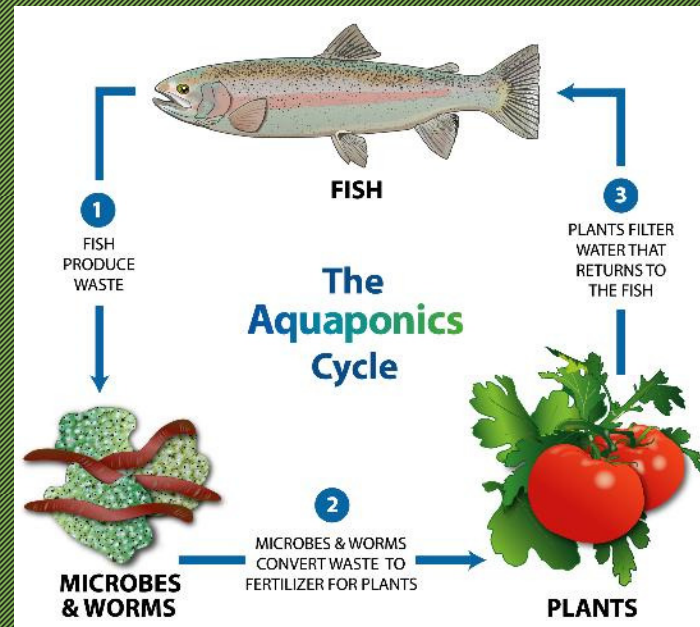
## The System: Flood and Drain



The simplest of all systems to understand and assemble!



# How it Works: **The Easy Explanation!**



<http://www.theaquaponicsource.com/>



“

“The greatest service which can be rendered any country is to add a useful plant to its culture.

”

Thomas Jefferson



# Aquaponic Players

## Grow Beds & Tanks

- 1:1 ratio of grow bed to fish tank
- Solid Construction
- Non-toxic Food Safe
- Inert
- 50 gallon tank for plate size fish
- Medium: [Hydroton or Gravel](#)
- Biofilter: "[Nitrifying Bacteria](#)"

## Fish & Water

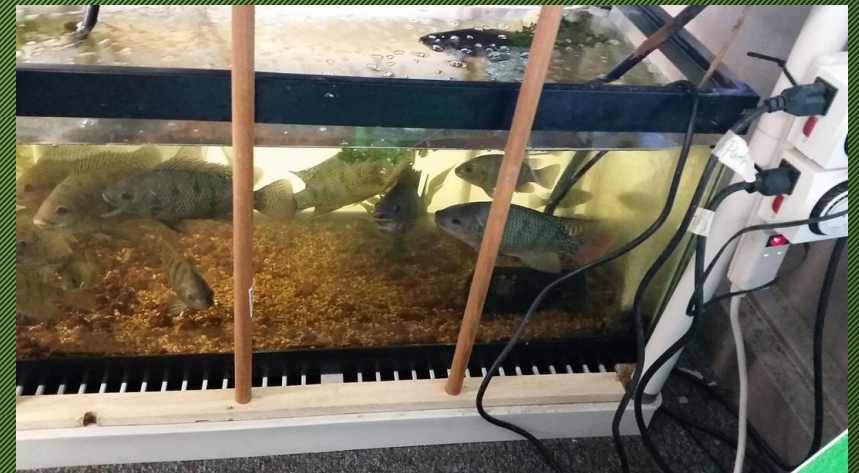
- One pound of fish per 5-10 gallons of fish tank water. (beginners)
- [Tilapia](#)-Goldfish-Catfish-Koi
- [Fish Food](#)
- Shrimp-barramundi-pacu-perch-trout-Oscars-fresh water lobster
- [Water pH 6.8-7.0](#) (power of hydrogen) balance plants & fish
- [More oxygen](#)
- [Cycling](#)

## Plants

- Plants with a pH of 6.9-7.1 have a hard time growing in aquaponics systems.
- What can you [grow](#)?
- Root Vegetables?
- Air-Structure-Temperature-[Sunlight](#)
- Seeds-Plugs-Cuttings-Starts
- Plant Health/Insects
- Plant Density



# In the Classroom





# What to Teach: *Aquaponic Source*

- *Biology* – What role does nitrifying bacteria play in aquaponics? Where does it come from?
- *Physics* – How does water move throughout the system? What light spectrums grow plants best?
- *Chemistry* – What happens to the uptake of iron in plants if pH gets too high? How is oxygen in the water affected by temperature?
- *Horticulture* – What does a plant need in order to grow properly?
- *Zoology* – What do fish need in order to grow properly?
- *Ecology* – What happens if a eco-system becomes out of balance? What role do composting red worms play in aquaponics?
- *Nutrition* – What is the difference between freshly picked food you grew yourself and food from the grocery store?

