P A L A W A N

The Last Frontier of the Philippines

Palawan has 3,000 islands

Water quality and availability is a growing issue world wide. No mater how many islands surround you, fresh water must be managed in a sustainable manor.

- To manufacture one car, including tires, 147,972 liters of water are used.
- 13% of municipal piped water is lost in pipeline leaks.
- The human brain is 75% water.
- Outdoor watering uses 35 liters of water each minute (over 9 gallons).
- One drop of oil can make up to 25 liters of water unfit for drinking.
- Half of world's wetlands have been lost since 1900.
- Each year, over 89 billion liters of bottled water are sold.

P A L A W A N

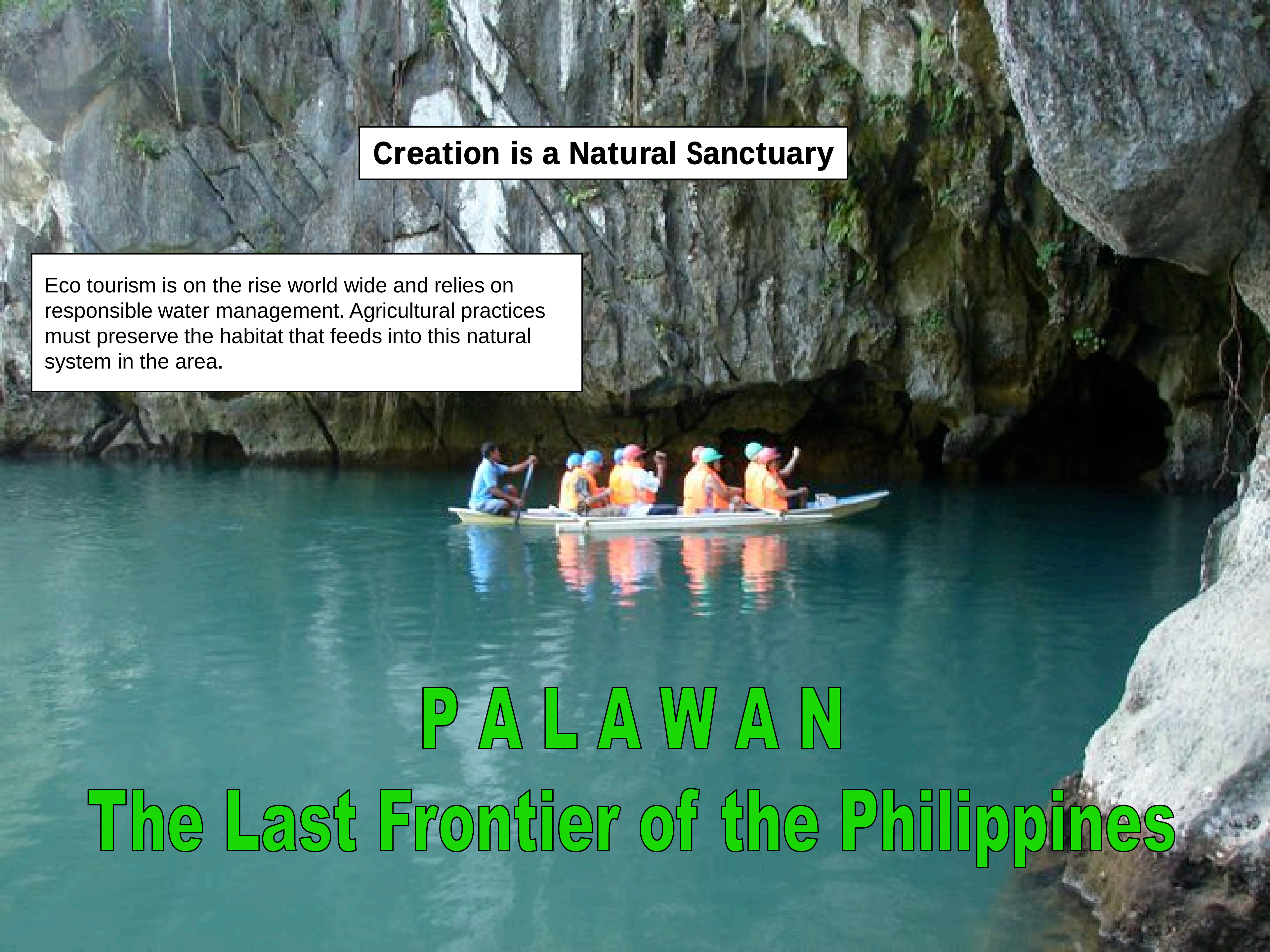
The Last Frontier of the Philippines


Fresh water is essential for terrestrial life. Every house and farm needs water to maintain health and life. Without high quality fresh water life is impossible for plants, animals and humans.
P A L A W A N
The Last Frontier of the Philippines

PALAWAN Crocodile

There is a very complex food chain, a food web actually, that relies on water and produces abundant food if the soil surrounding the water ecosystem is healthy.

Palawan and Puerto Princesa City are host to one of the Seven Wonders of Nature. The water flowing through this complex ecosystem needs to be clean and free of pollution to support life and remain pristine for the enjoyment of the visitors who partake of the eco-tourism activities in the area.



Creation is a Natural Sanctuary

Eco tourism is on the rise world wide and relies on responsible water management. Agricultural practices must preserve the habitat that feeds into this natural system in the area.

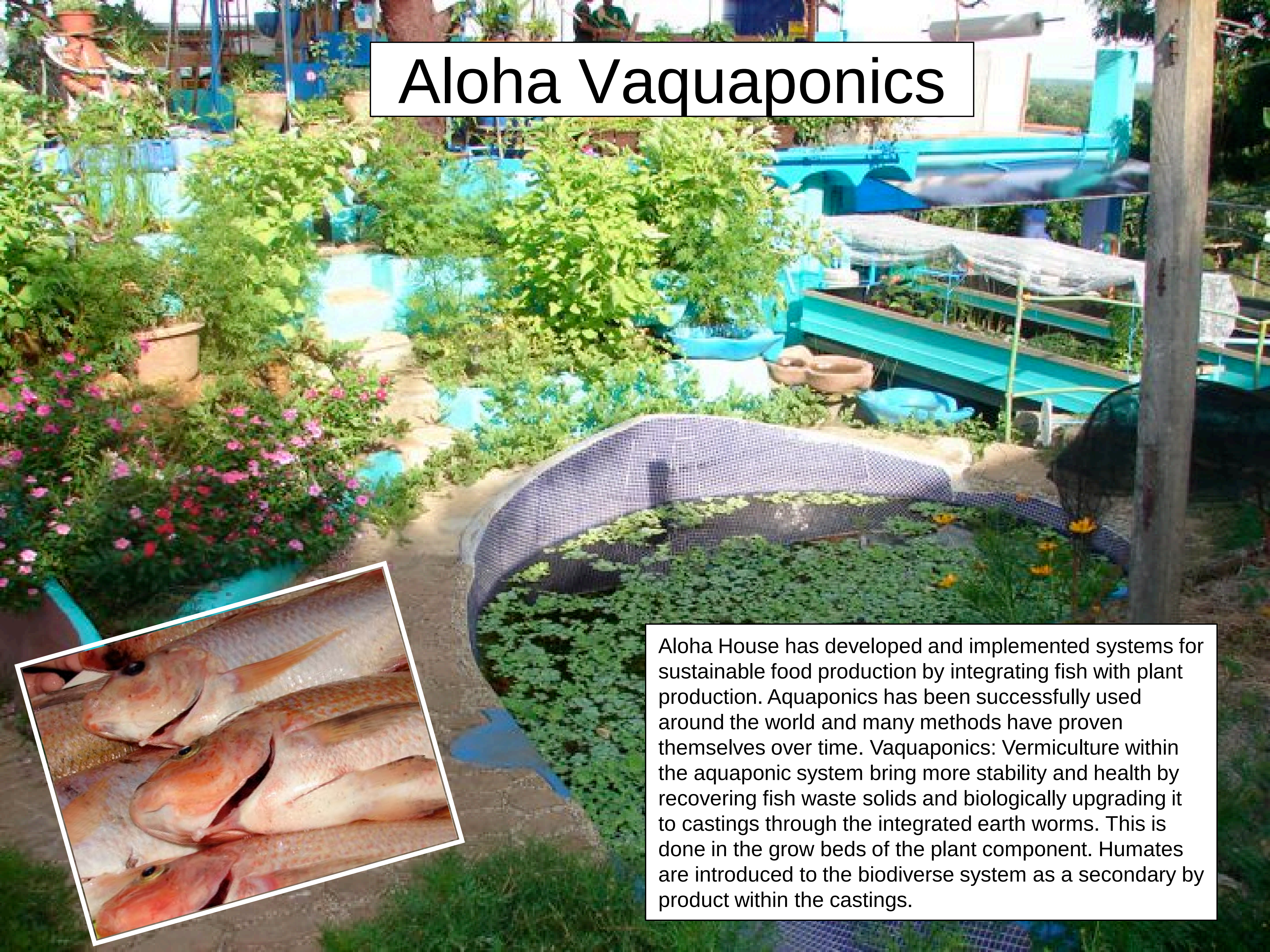
P A L A W A N

The Last Frontier of the Philippines

Agricultural practices in the watershed flowing into the Puerto Princesa subterranean river are not sustainable. They are mostly farmed *conventionally*. That means a regular use of toxic and poisonous chemical treatments that leach into the water system and poison the environment. Sustainable and profitable agriculture can be done with natural means using Nature Farming methods, organic systems and Permaculture techniques.


Aquaponics
Module 1 of 5
Growing more fish and plants for human consumption and enjoyment

Aloha Vaquaponics

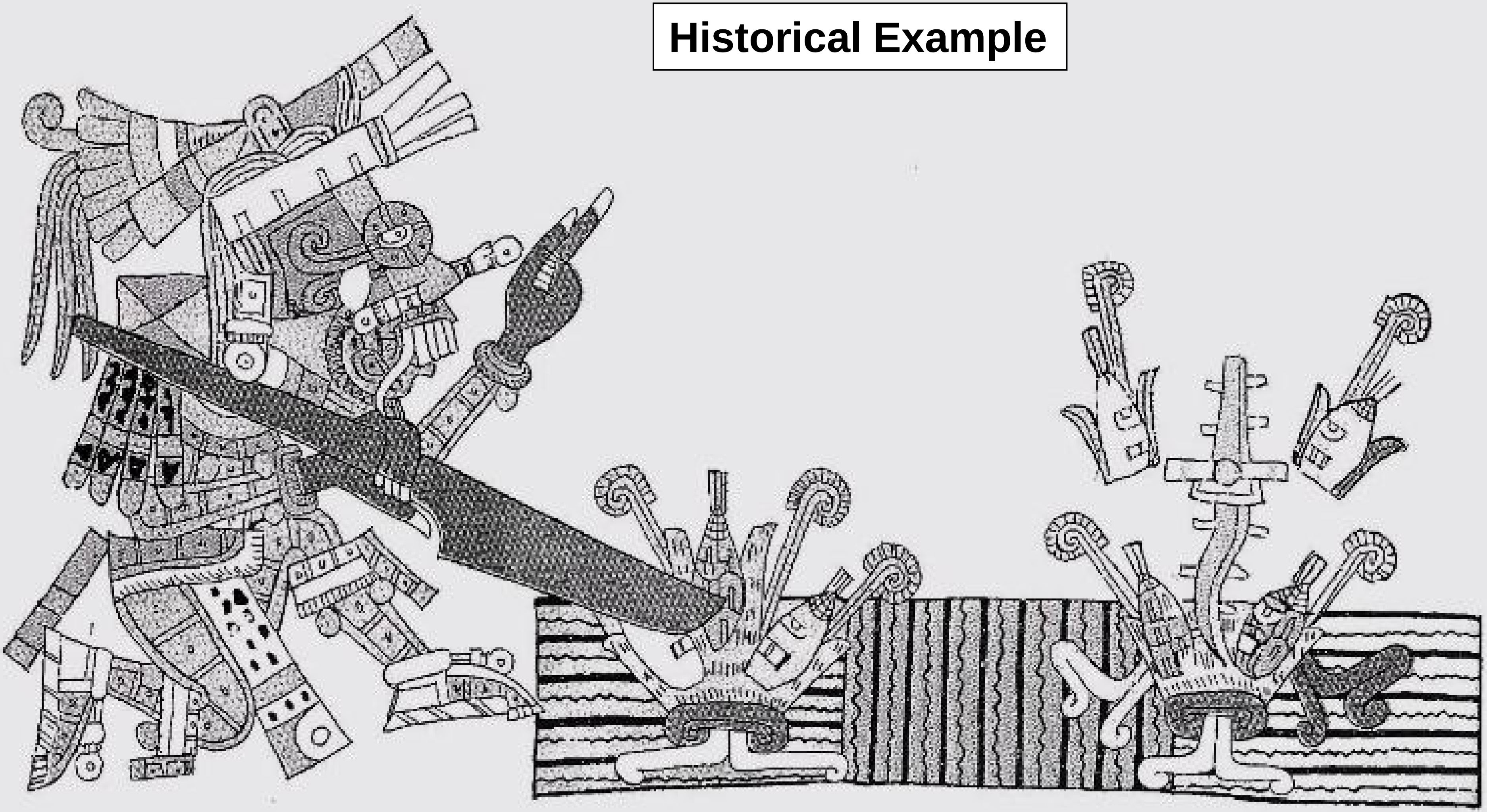


Aloha House has developed and implemented systems for sustainable food production by integrating fish with plant production. Aquaponics has been successfully used around the world and many methods have proven themselves over time. Vaquaponics: Vermiculture within the aquaponic system bring more stability and health by recovering fish waste solids and biologically upgrading it to castings through the integrated earth worms. This is done in the grow beds of the plant component. Humates are introduced to the biodiverse system as a secondary by product within the castings.


What is
aquaponics?


Basil
Plants and fish living together
Gabi/ taro
Kang kong
Start with Nitrate loving leafy greens
1/2 Kilo Nile Tilapia

Historical Example



Chinampas in Xochimilco

The "floating gardens", actually an artificial peninsula.

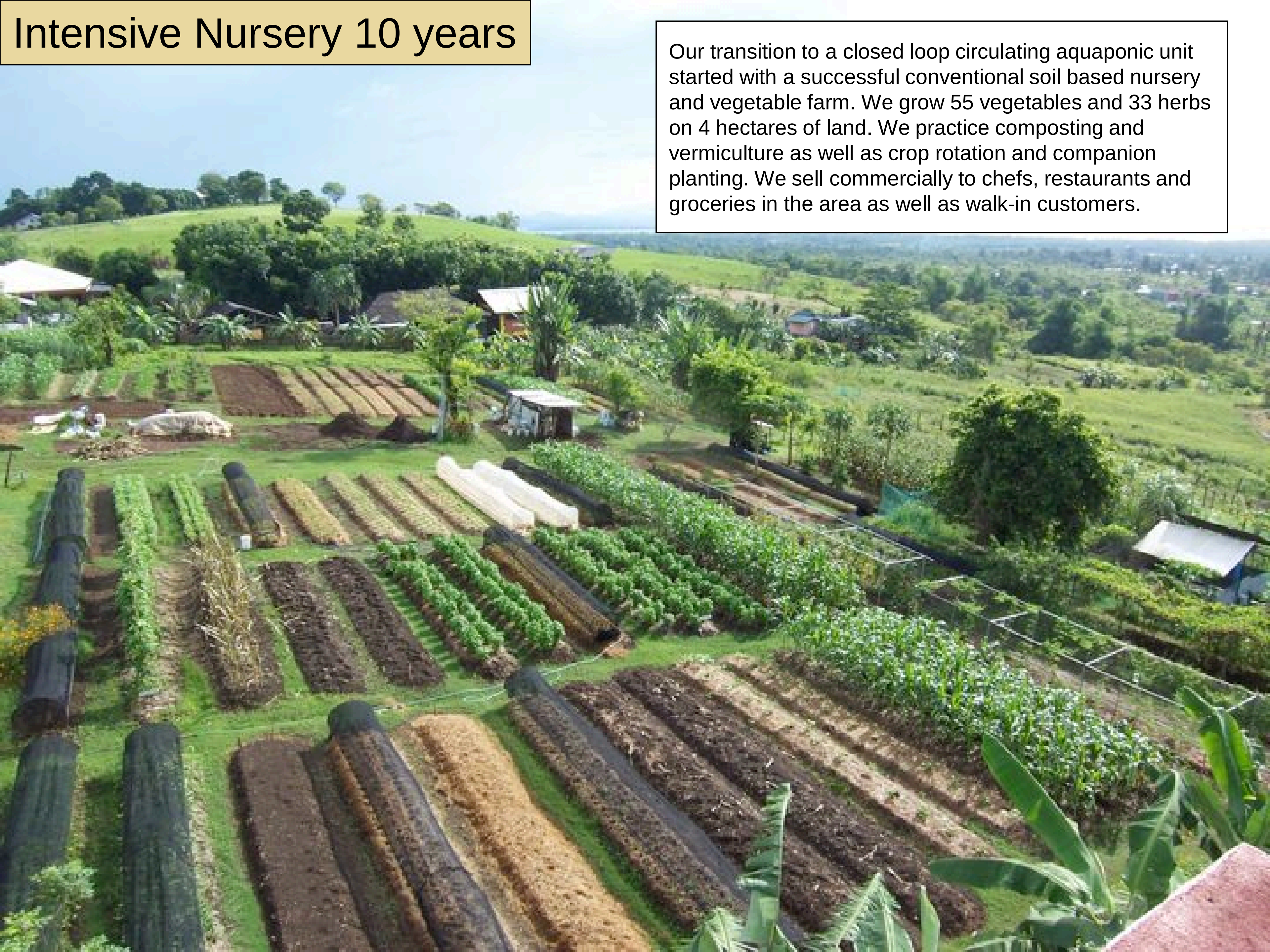
Chinampero scooping up canal muck.

Mucking for blocks

Chinampero, or canal farmer, poking holes and dropping seeds in his soil blocks. Most men are Aztec descendants and have continued on today the craft of canal farming. However, fewer and fewer families are sustained with their farms, due to the drainage of the shallow lake basin to make room for buildings and resorts.

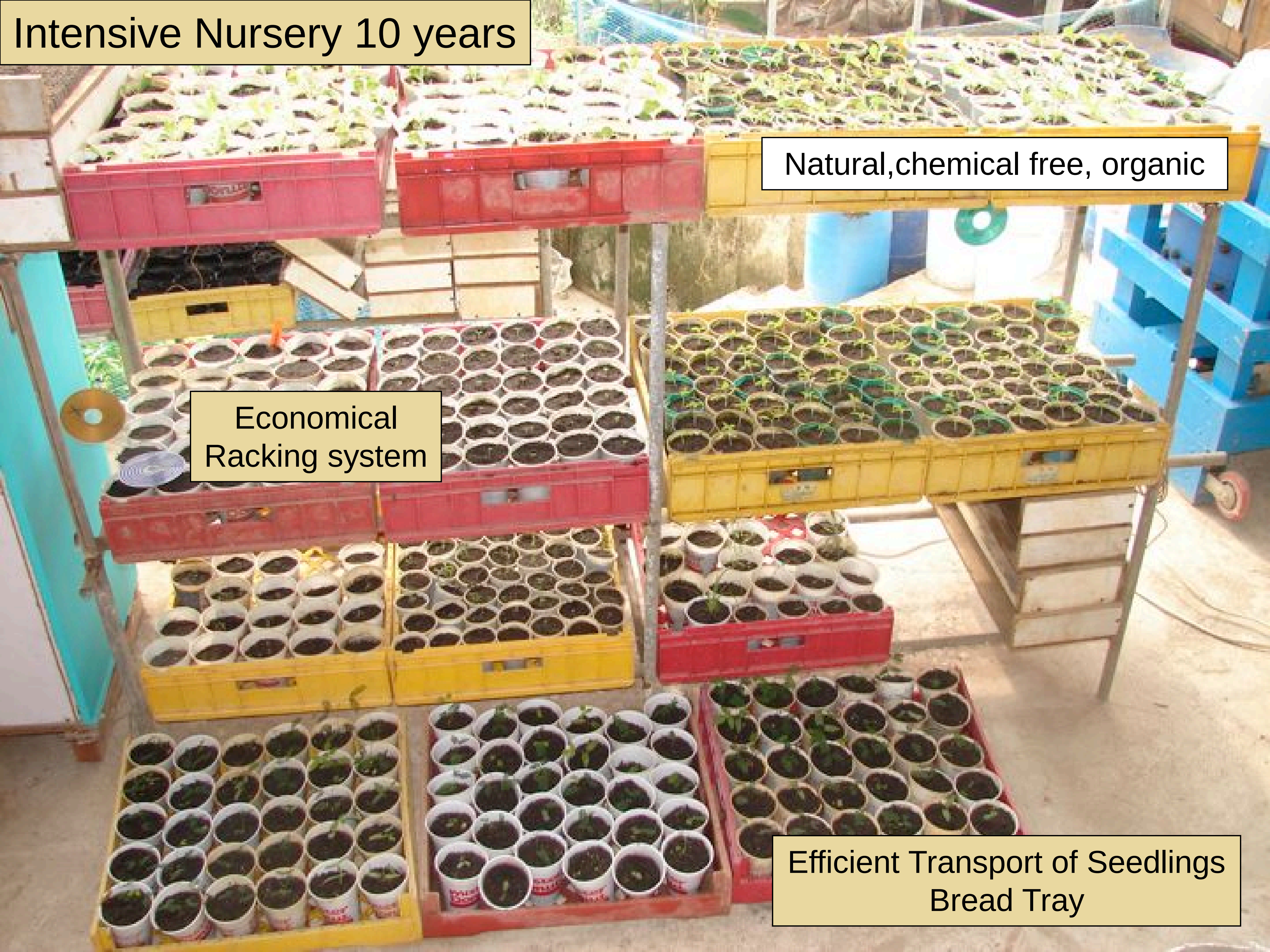
Definition of Chinampas:
An artificial island, or
A long, narrow strip of farm land surrounded on at least three sides by water. Properly maintained, they can produce several crops a year and will remain fertile for centuries without having to lie fallow. Each Chinampa is 300 feet long and between 15-30 feet wide(and *any* size with this proportion). The surface of the garden is a 2-3 feet above the water and is topped every year with the sediment found at the bottom of the water canal that surrounds it.

Intensive Nursery 10 years



Our transition to a closed loop circulating aquaponic unit started with a successful conventional soil based nursery and vegetable farm. We grow 55 vegetables and 33 herbs on 4 hectares of land. We practice composting and vermiculture as well as crop rotation and companion planting. We sell commercially to chefs, restaurants and groceries in the area as well as walk-in customers.


Intensive Nursery 10 years
Natural,chemical free, organic
Economical
Racking system
Efficient Transport of Seedlings
Bread Tray


Intensive Nursery 10 years
Natural,chemical free, organic
Economical
Racking system
Efficient Transport of Seedlings
Bread Tray

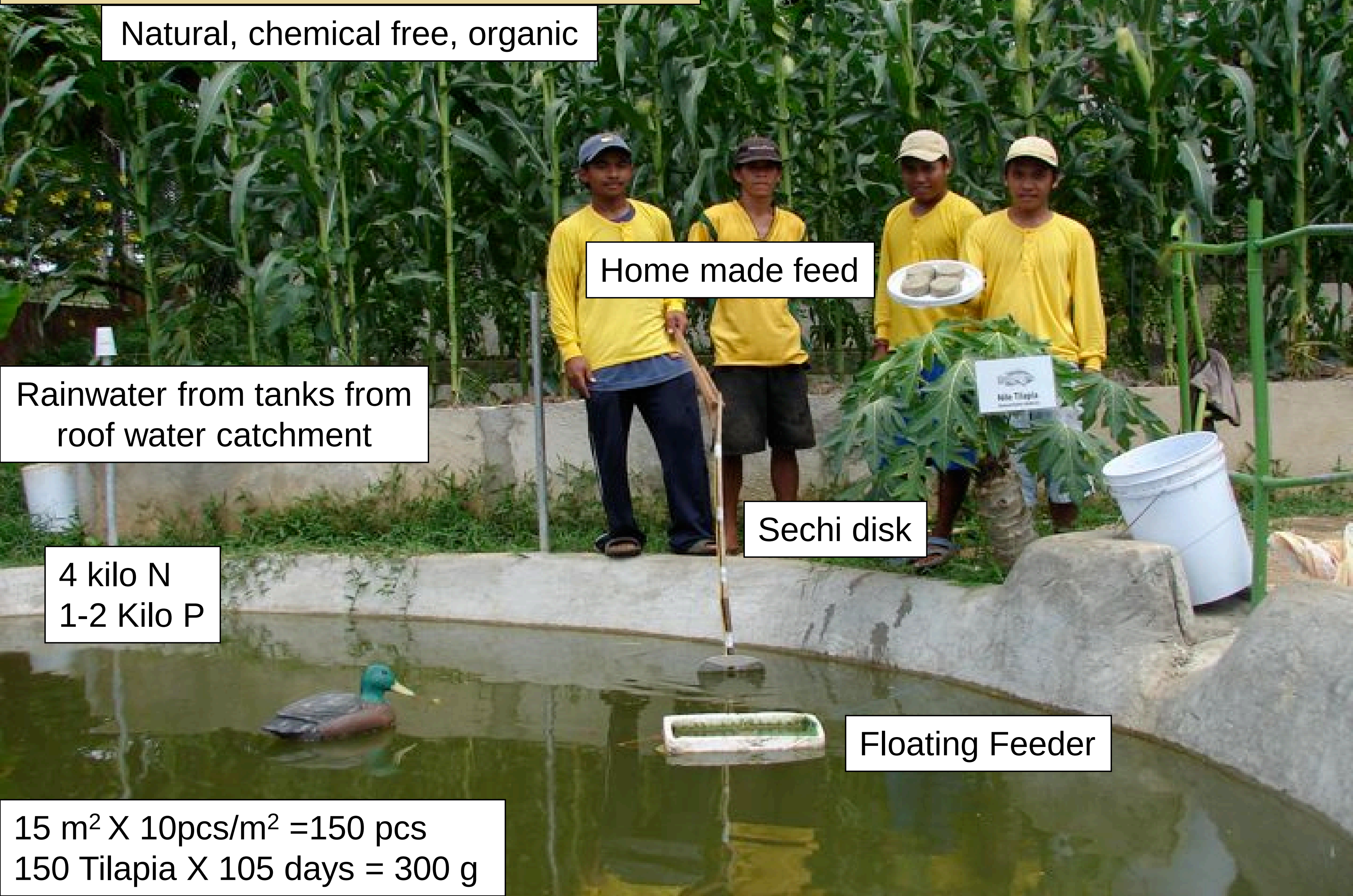
Intensive Nursery 10 years

Intensive Nursery 10 years

Natural,chemical free, organic

Overflow of Seedlings
Designed for Bread Tray

Semi-intensive Fish Pond 7 years "Static Pond"




Semi-intensive Fish Pond 7 years
Oreochromis niloticus
Natural,chemical free, organic
Nile Talapia
15 m² X 10pcs/m² =150 pcs
150 Tilapia X 105 days = 300 g


Semi-intensive Fish Pond 7 years
Bokashi Fish Feed
Home made feed
Natural,chemical free, organic
Homemade feed Sinks

Semi-intensive Fish Pond 7 years

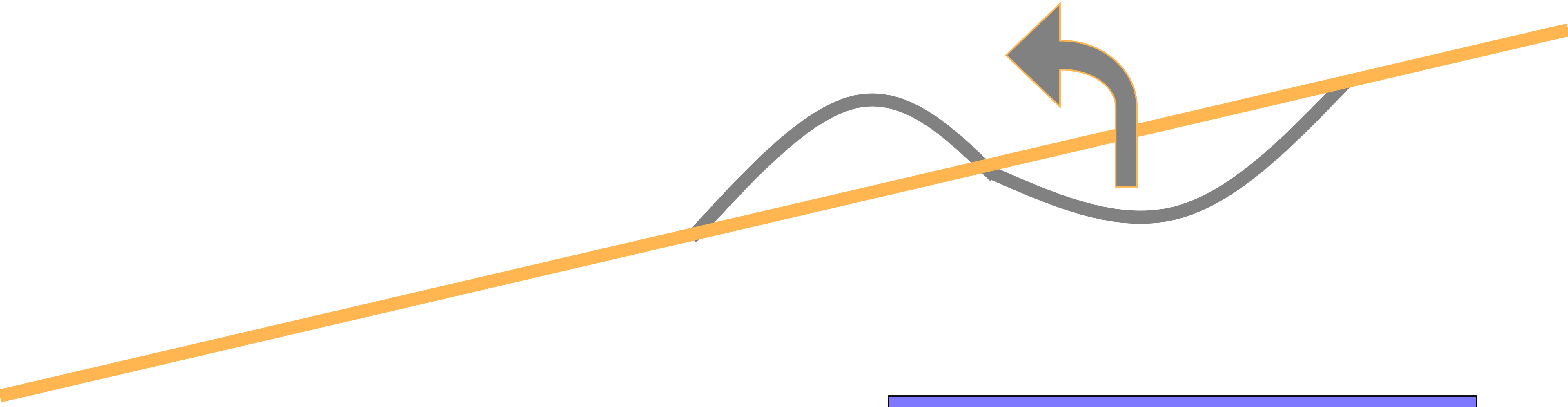

10,000 sq m/hect x 1,600mm/year = 16,000,000 liters/hect/year
Water Harvesting
Vetiver erosion control


Swale 3
Water harvesting


Swale 3
Water harvesting

The Swale

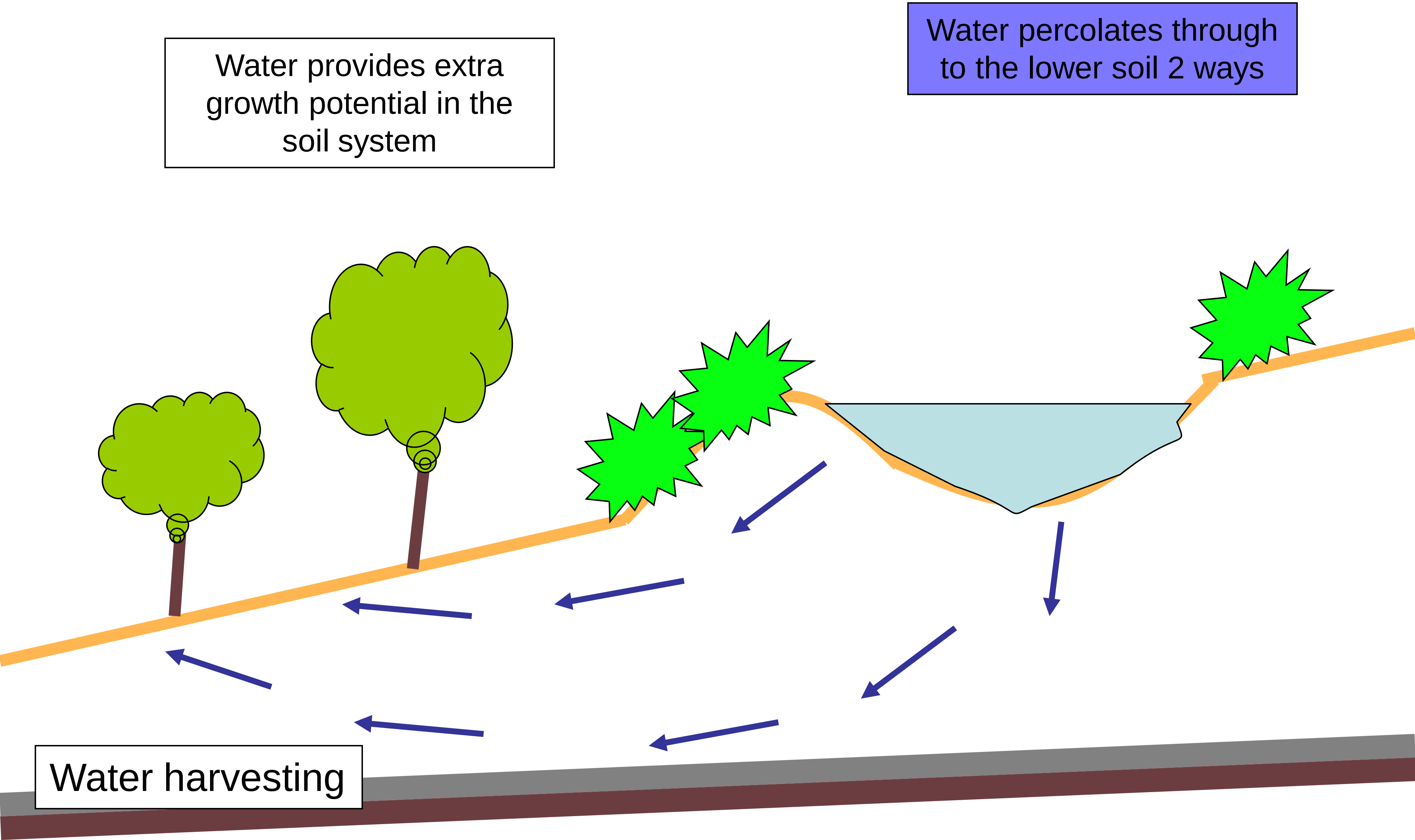
The best way to maximize rain water is by slowing it down so that it can soak into the ground. Give it the longest path on the slowest course.



Water harvesting technique on contour with the land

Water harvesting

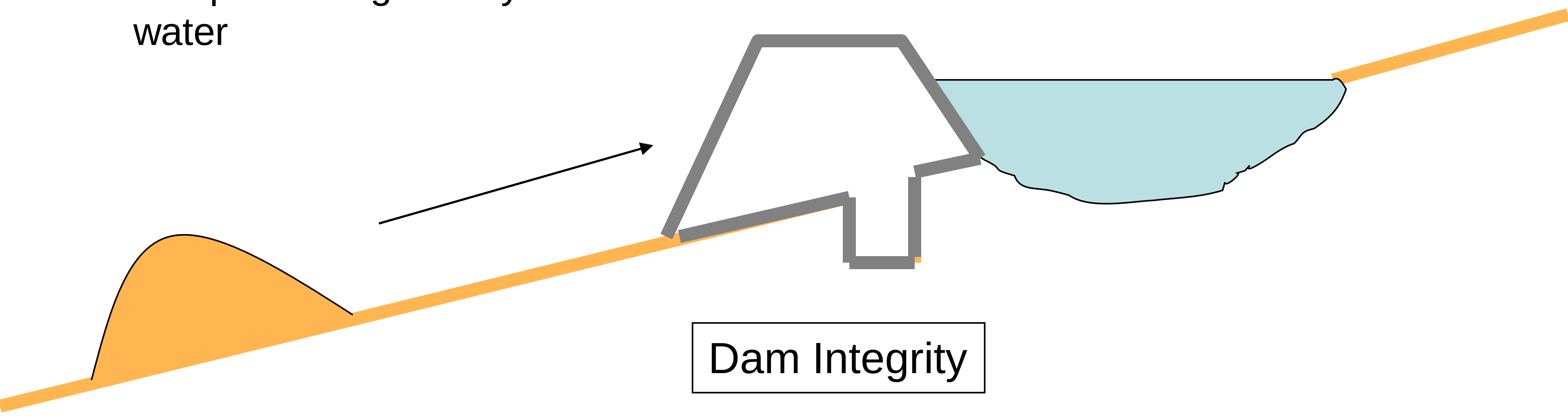
The Swale


Water provides extra growth potential in the soil system
Water percolates through to the lower soil 2 ways
Water harvesting


swale
Water harvesting

Dam Construction

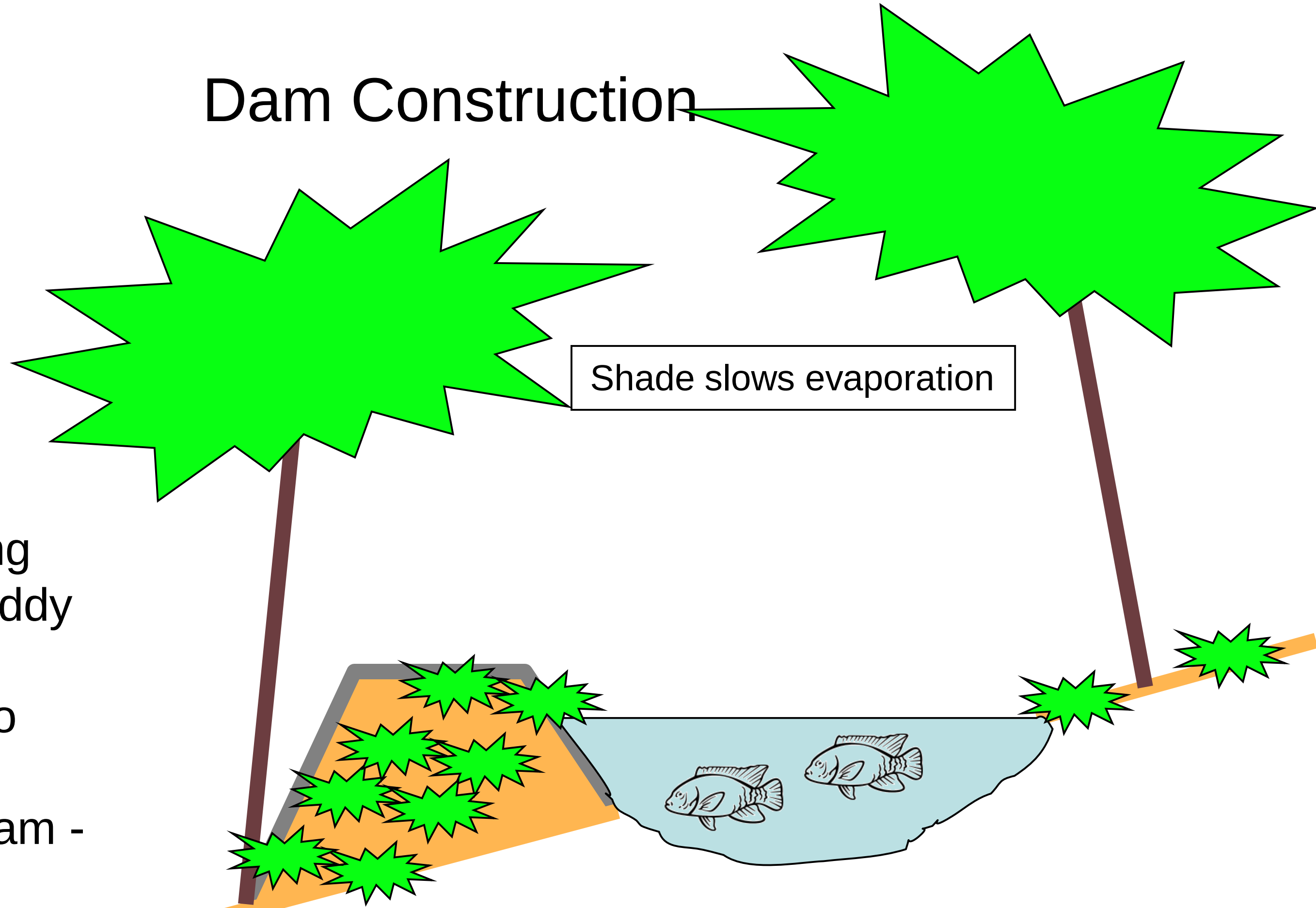
•Replace valuable topsoil for replanting and preventing muddy water



Dam Integrity

Water harvesting

Dam Construction



- Replace valuable topsoil for replanting and preventing muddy water
- Plant cover crop to prevent silt
- Trees are not in dam -- to prevent leaks/weakness

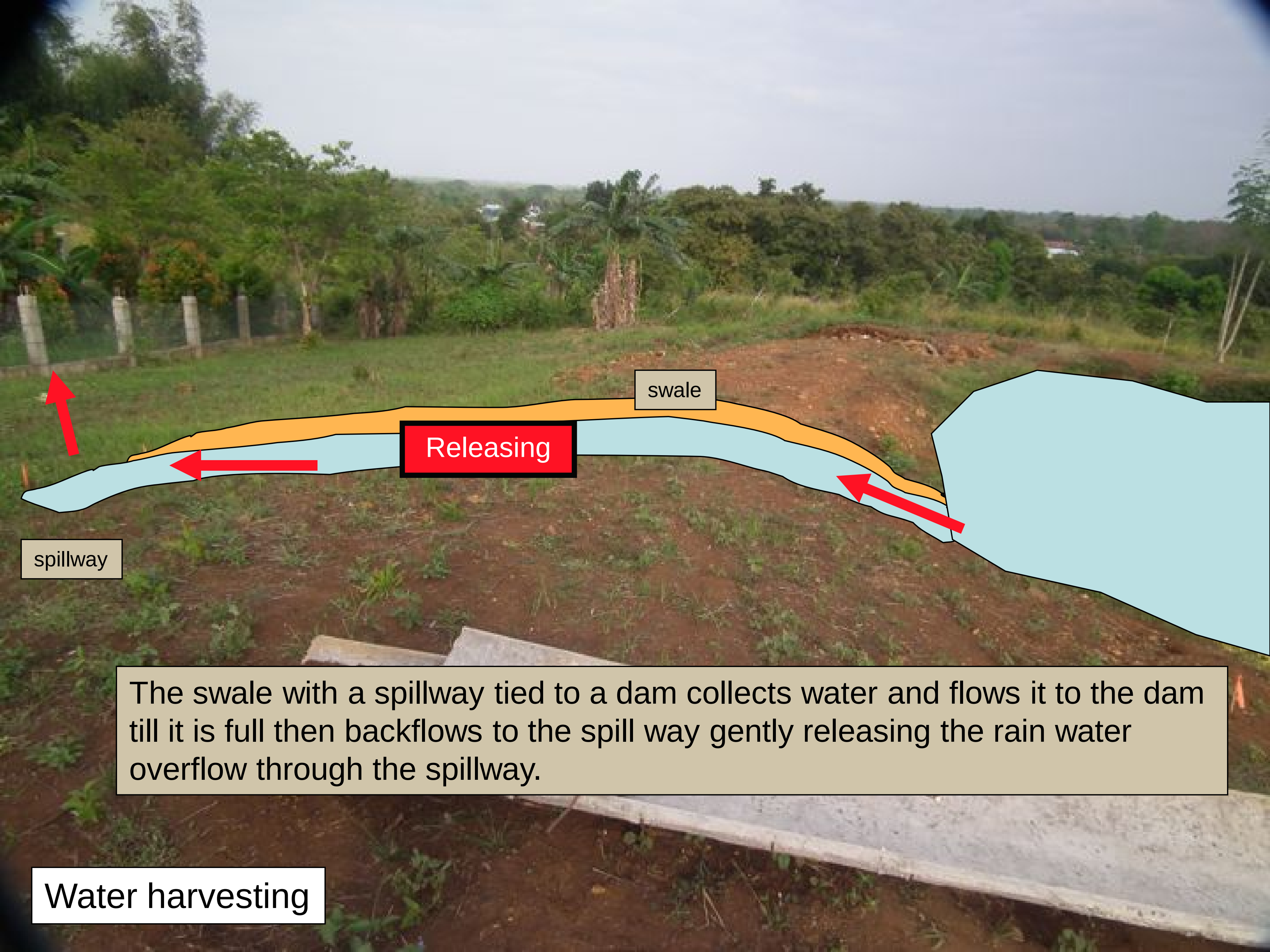
Dam longevity

Water harvesting


1. Deepen pond
2. Fill old spillway
3. Add swale w/ spillway
Pond 1
old spillway
swale
spillway
Water harvesting

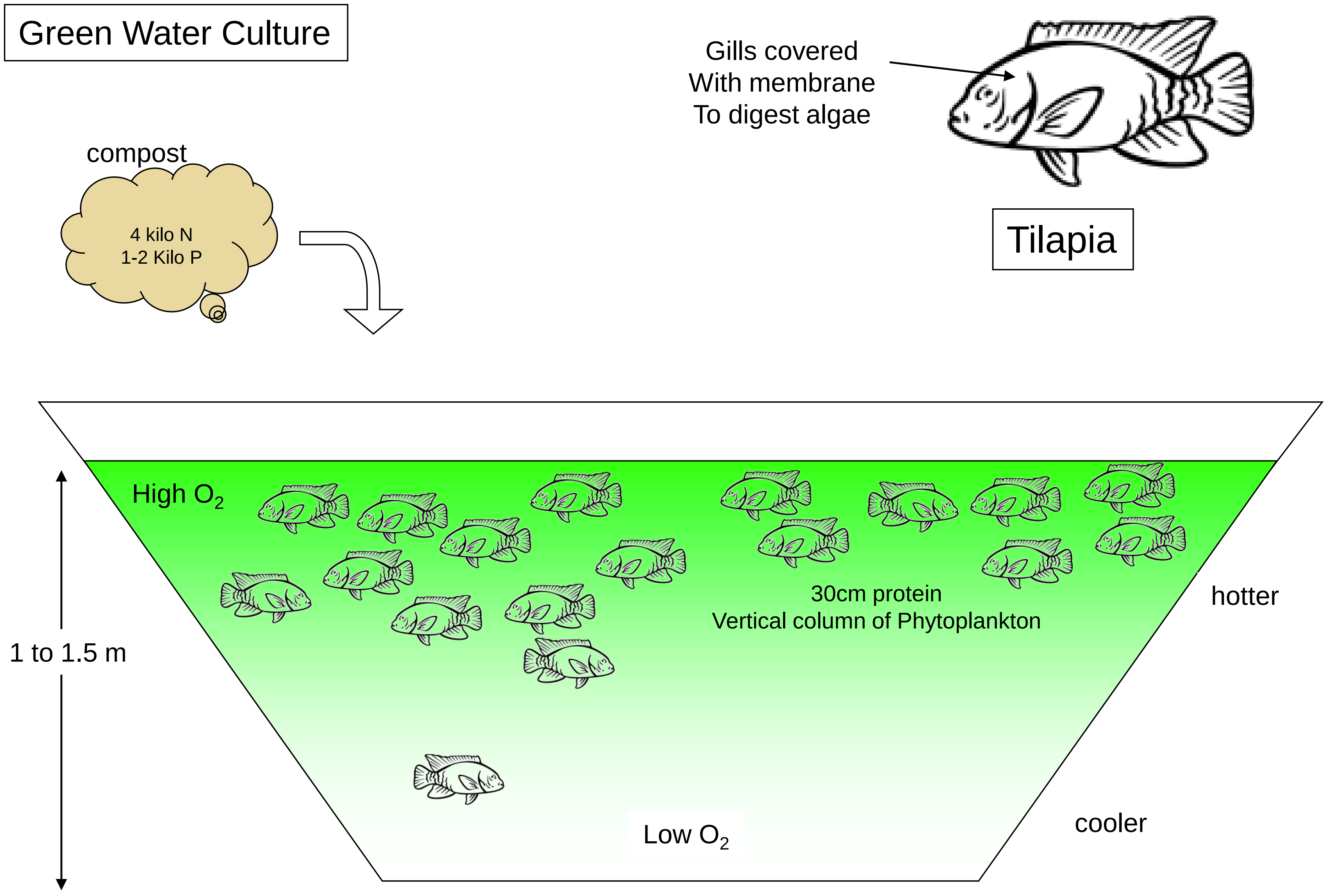
The swale with a spillway tied to a dam collects water and flows it to the dam till it is full then backflows to the spill way gently releasing the rain water overflow through the spillway.

Water harvesting



The swale with a spillway tied to a dam collects water and flows it to the dam till it is full then backflows to the spill way gently releasing the rain water overflow through the spillway.

Water harvesting

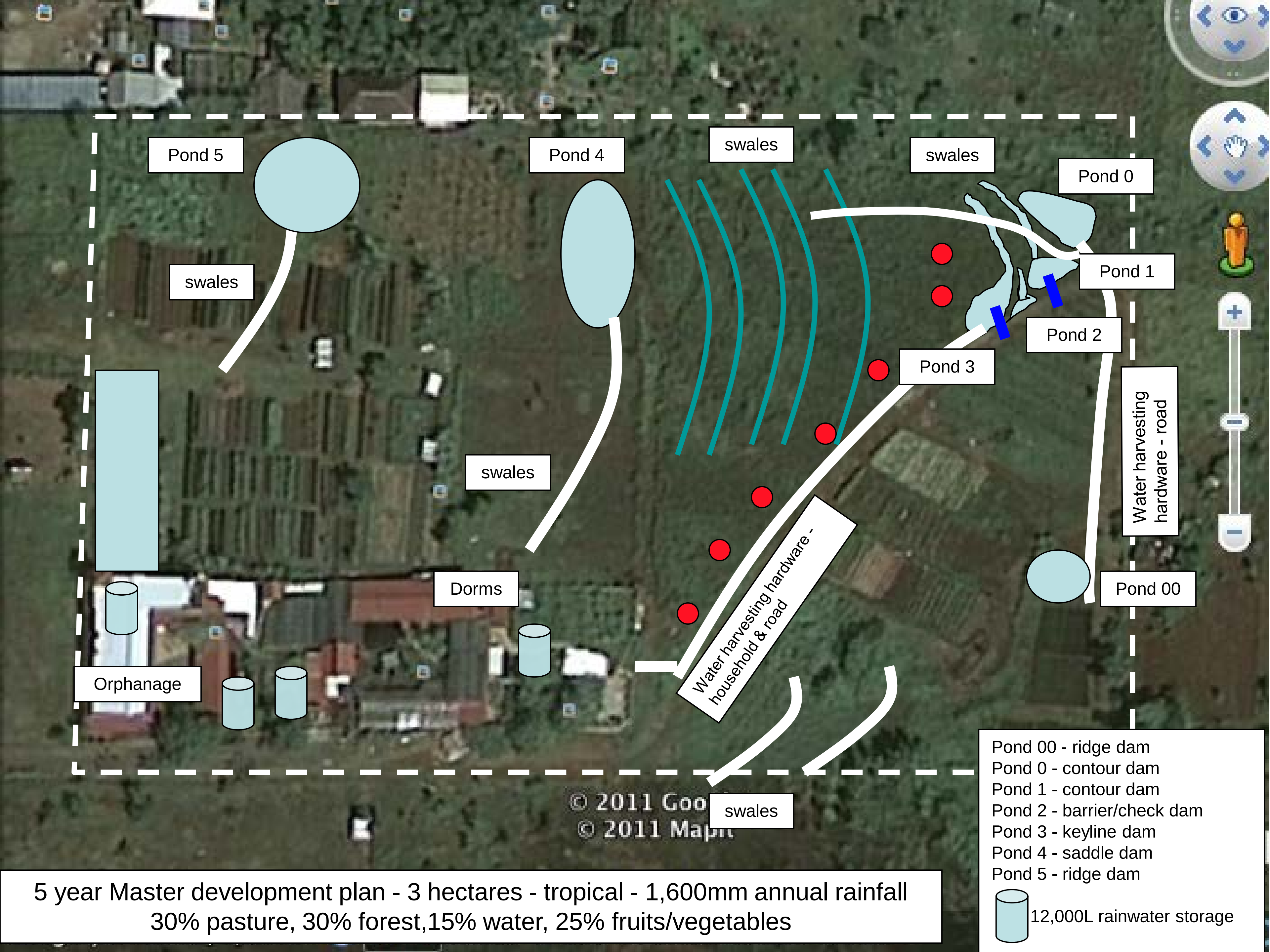


Green Water Culture
Gills covered
With membrane
To digest algae
Tilapia
compost
4 kilo N
1-2 Kilo P
High O_2
30cm protein
Vertical column of Phytoplankton
hotter
1 to 1.5 m
cooler
Low O_2


Green Water Culture
Tilapia
Vertical column of Phytoplankton
30cm protein
Water harvesting

Common fertilization rates used to establish a phytoplankton bloom in fish ponds.

	Low hardness	Moderate hardness	High hardness
Granular 18-46-0	4-8 kilo/hectare	8-16 kilo/hectare	16-32 kilo/hectare



Pond 5
Pond 4
swales
swales
Pond 0
swales
Pond 1
Pond 2
Pond 3
Water harvesting hardware - road
swales
Dorms
Pond 00
Orphanage
Water harvesting hardware - household & road
swales
© 2011 Goo
© 2011 Mapit
Pond 00 - ridge dam
Pond 0 - contour dam
Pond 1 - contour dam
Pond 2 - barrier/check dam
Pond 3 - keyline dam
Pond 4 - saddle dam
Pond 5 - ridge dam
12,000L rainwater storage
5 year Master development plan - 3 hectares - tropical - 1,600mm annual rainfall
30% pasture, 30% forest,15% water, 25% fruits/vegetables


Vetiver erosion control


Vetiver erosion control
12 months
Established vetiver for erosion control

Why aquaponics?

Why aquaponics?

Why aquaponics?

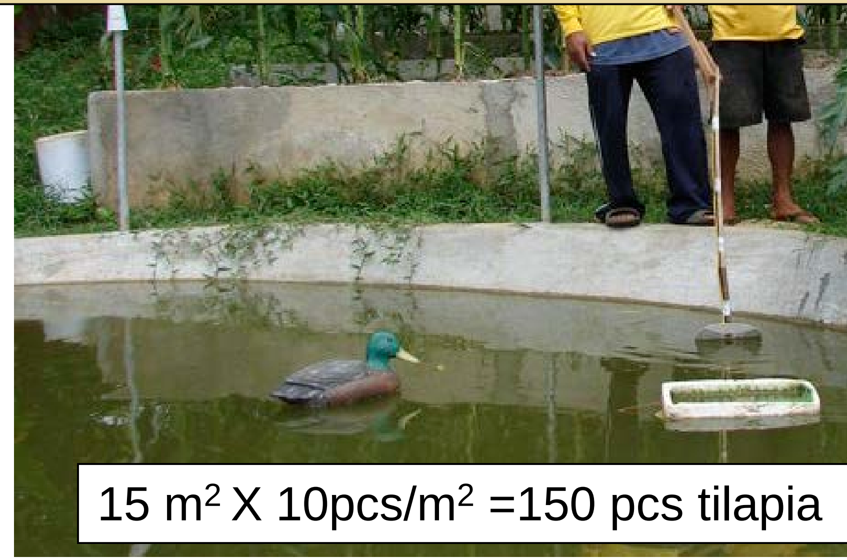

Intensive Nursery 15 years ago
Natural,chemical free, organic

Intensive Nursery 15 years ago

Natural, chemical free, organic

\+

Semi-intensive Fish Pond 12 years ago



15 m^2 X 10pcs/m^2 =150 pcs tilapia

=

Intensive Recirculating Aquaponic System **5 years ago**

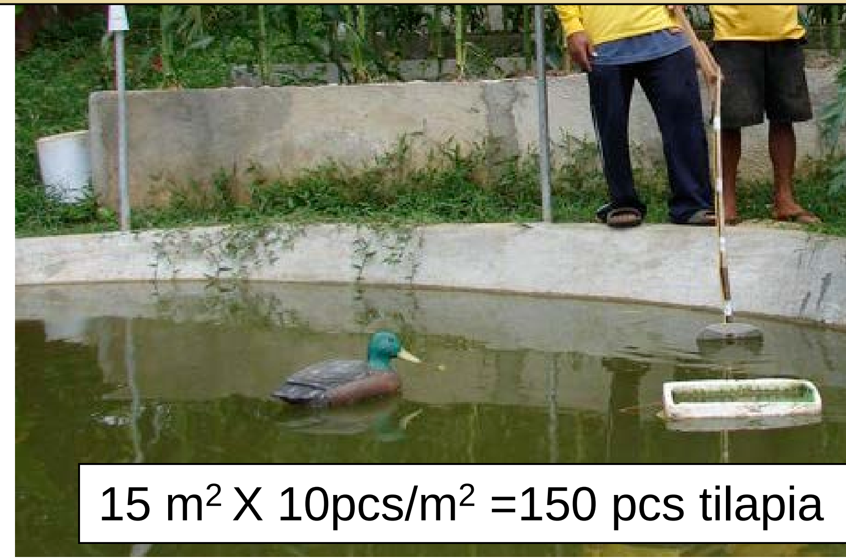
15 m^3 X 250pcs/m^3 =3,000 pcs tilapia

Intensive Nursery 15 years ago

Natural, chemical free, organic

+

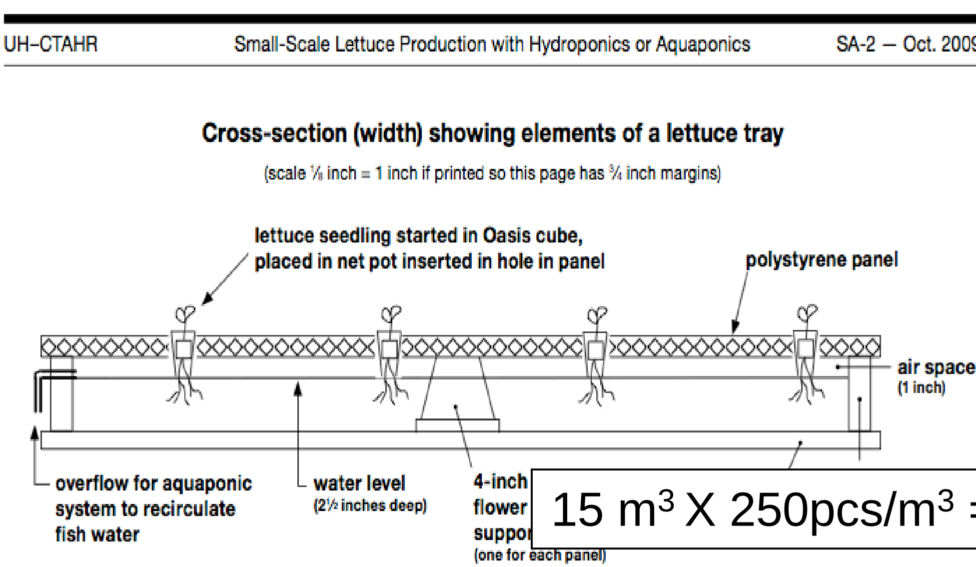
Semi-intensive Fish Pond 12 years ago



15 m^2 X 10pcs/m^2 =150 pcs tilapia

=

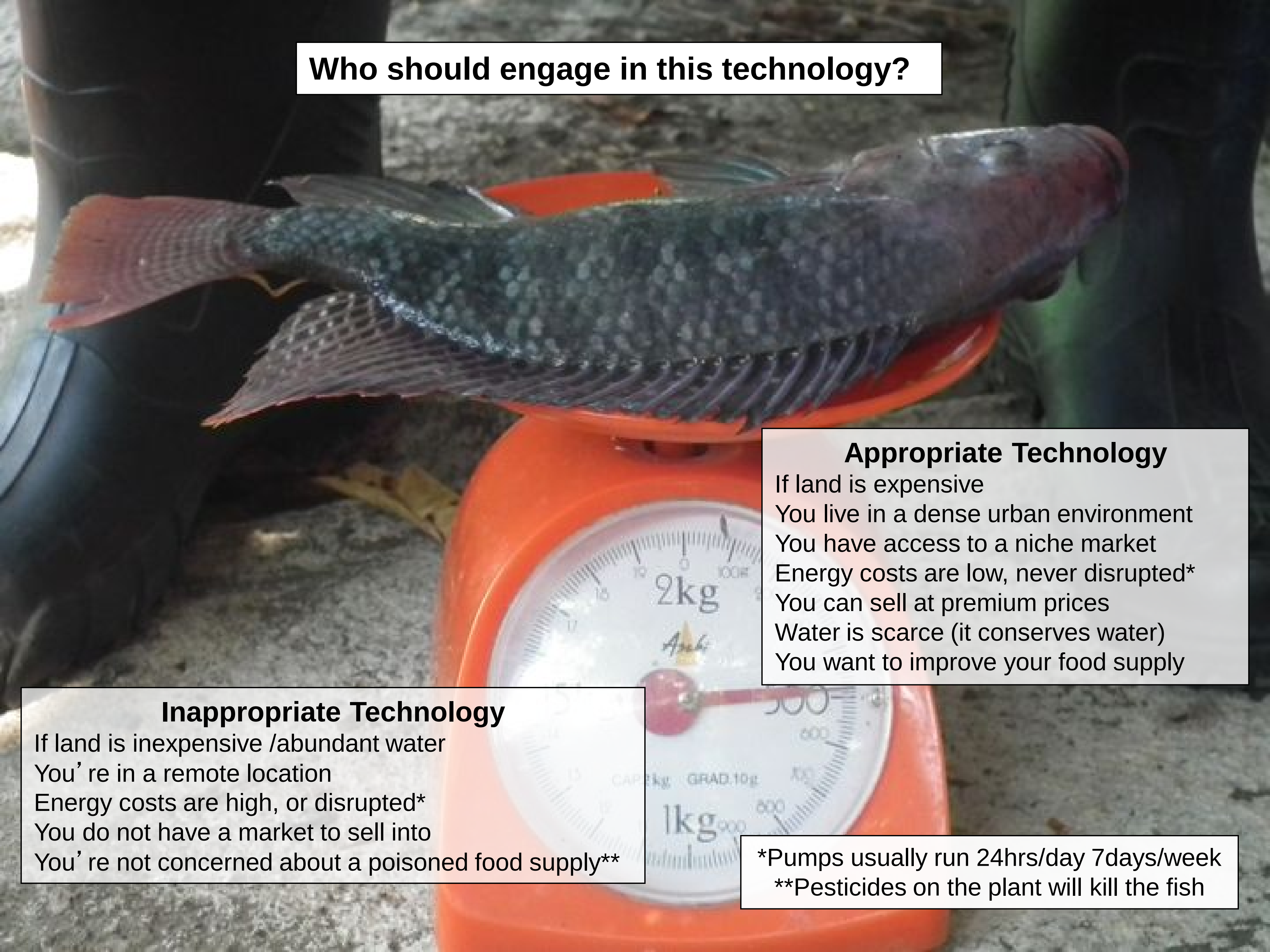
Intensive Recirculating Aquaponic System **5 years ago**


UH–CTAHR Small-Scale Lettuce Production with Hydroponics or Aquaponics SA-2 — Oct. 2009

Cross-section (width) showing elements of a lettuce tray

(scale ⅛ inch = 1 inch if printed so this page has ¾ inch margins)

15 m^3 X 250pcs/m^3 =3,000 pcs tilapia



Who should engage in this technology?

Appropriate Technology

If land is expensive
You live in a dense urban environment
You have access to a niche market
Energy costs are low, never disrupted*
You can sell at premium prices
Water is scarce (it conserves water)
You want to improve your food supply

Inappropriate Technology

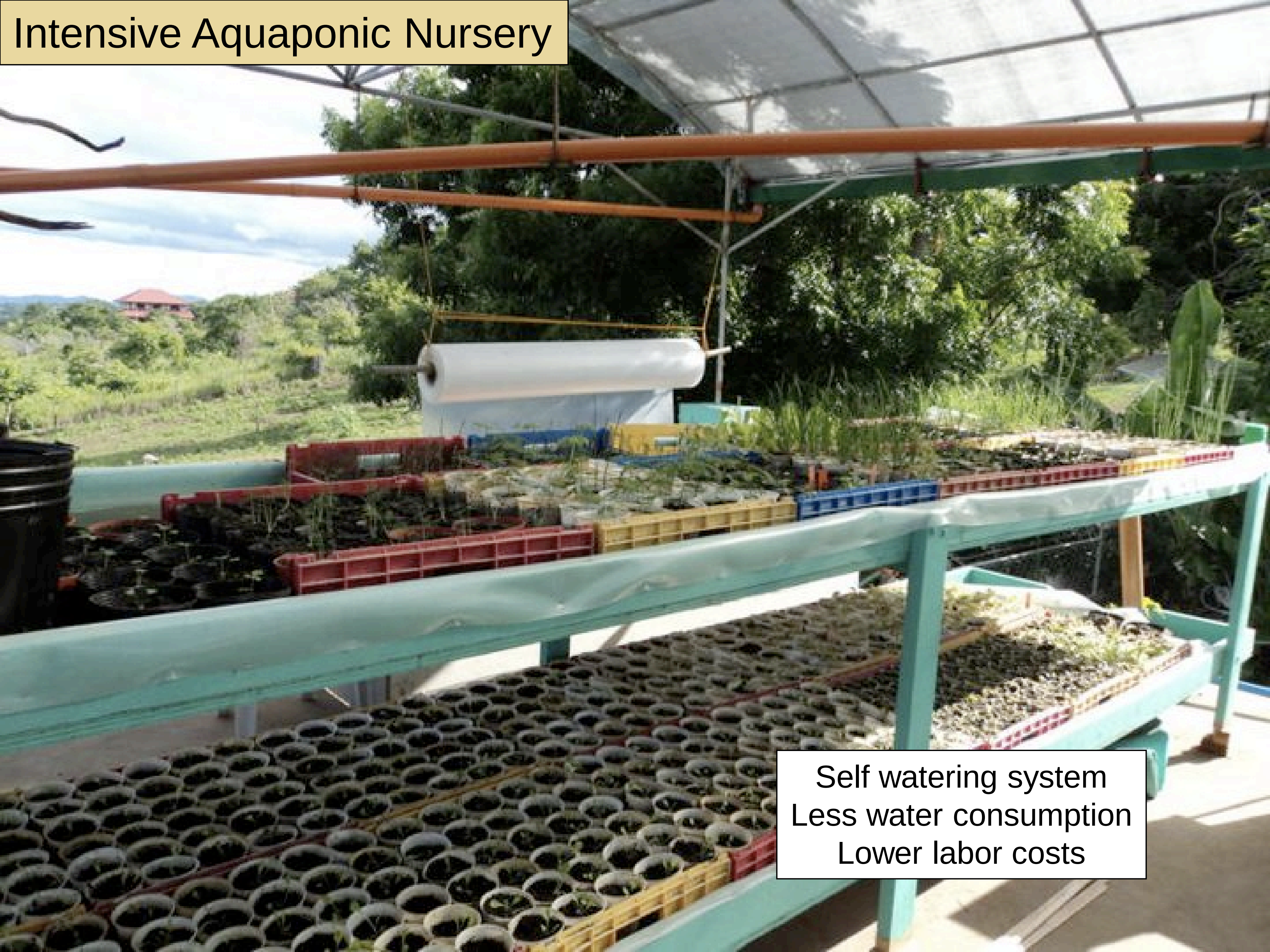
If land is inexpensive /abundant water
You're in a remote location
Energy costs are high, or disrupted*
You do not have a market to sell into
You're not concerned about a poisoned food supply**

*Pumps usually run 24hrs/day 7days/week
**Pesticides on the plant will kill the fish

Gentle flow of 10% or less

Fine filter a fraction of system water for raft method

Intensive Aquaponic Nursery



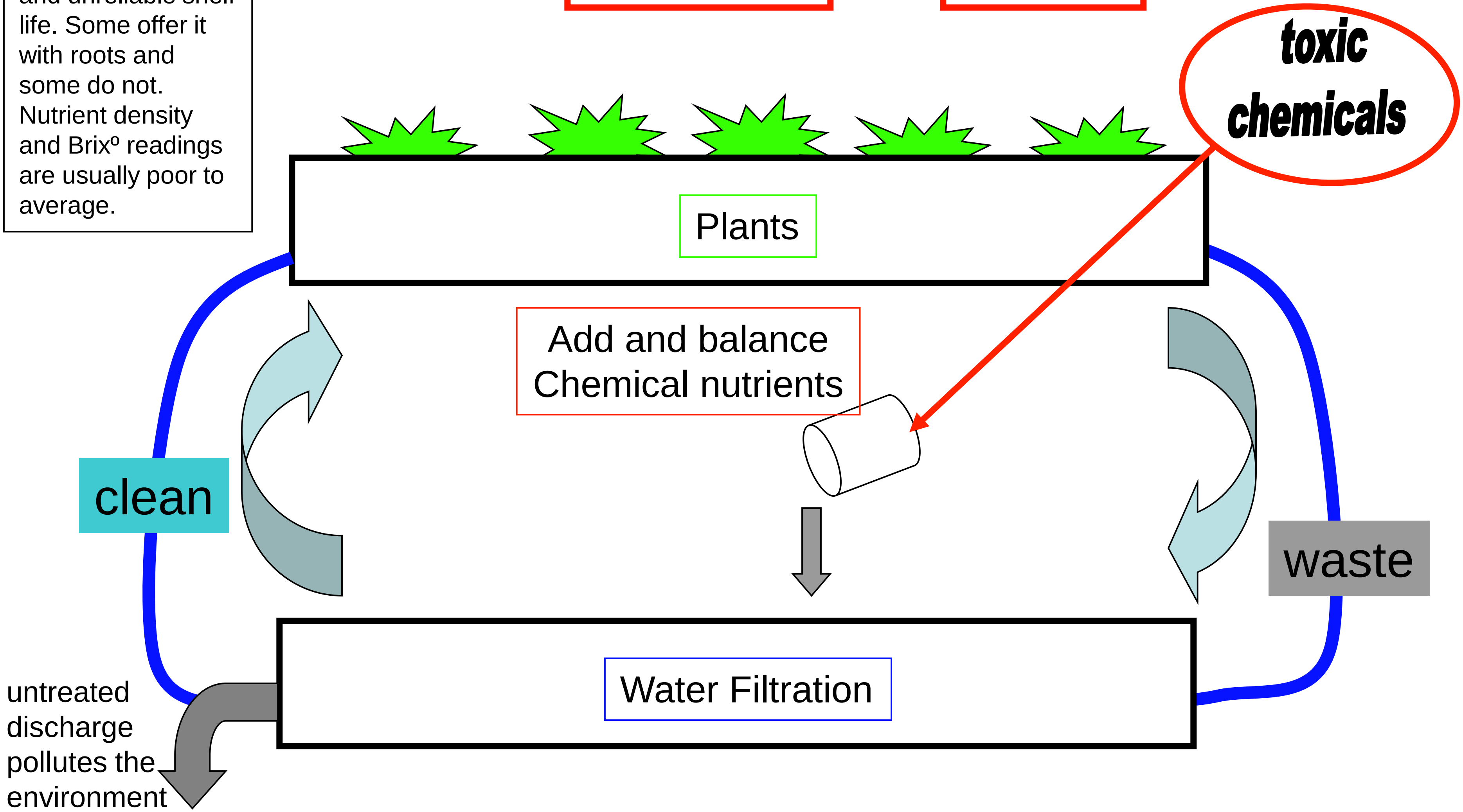

Manila Price
170.00

There are currently hydroponic growers from California to Montreal, Hong Kong to Dubai, but few produce high volume and tests show fairly short and unreliable shelf life. Some offer it with roots and some do not. Nutrient density and Brixº readings are usually poor to average.

Hydroponics

Plants are grown in a soil-less medium

ORIGIN: 1930s from hydro- [of water] + Greek ponos ‘labor’ + -ics .

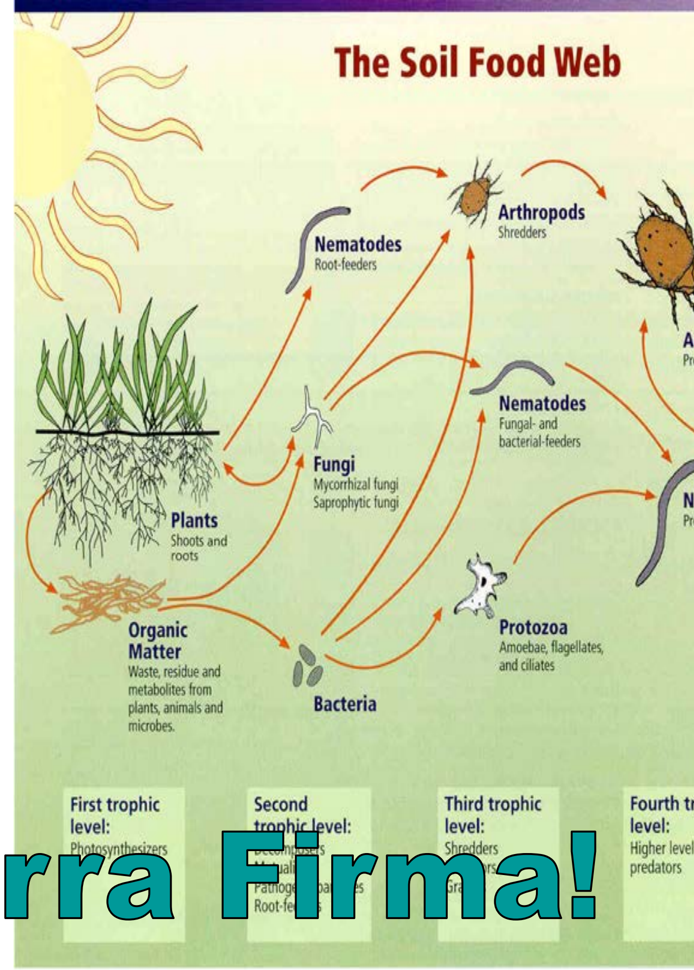


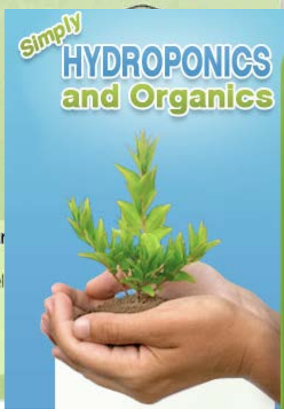
Criticism of Hydroponics

1. Technologically Advanced
2. Management Intensive
3. Can you find a system in operation over 1 year?
4. How about 5 years old?
5. Often Exotic Imported Mediums
6. Nutritionally lacking…

Nutritional proof lacking: Claims only

With intensive use:
Water gets worse not better…
Soil gets better, not worse



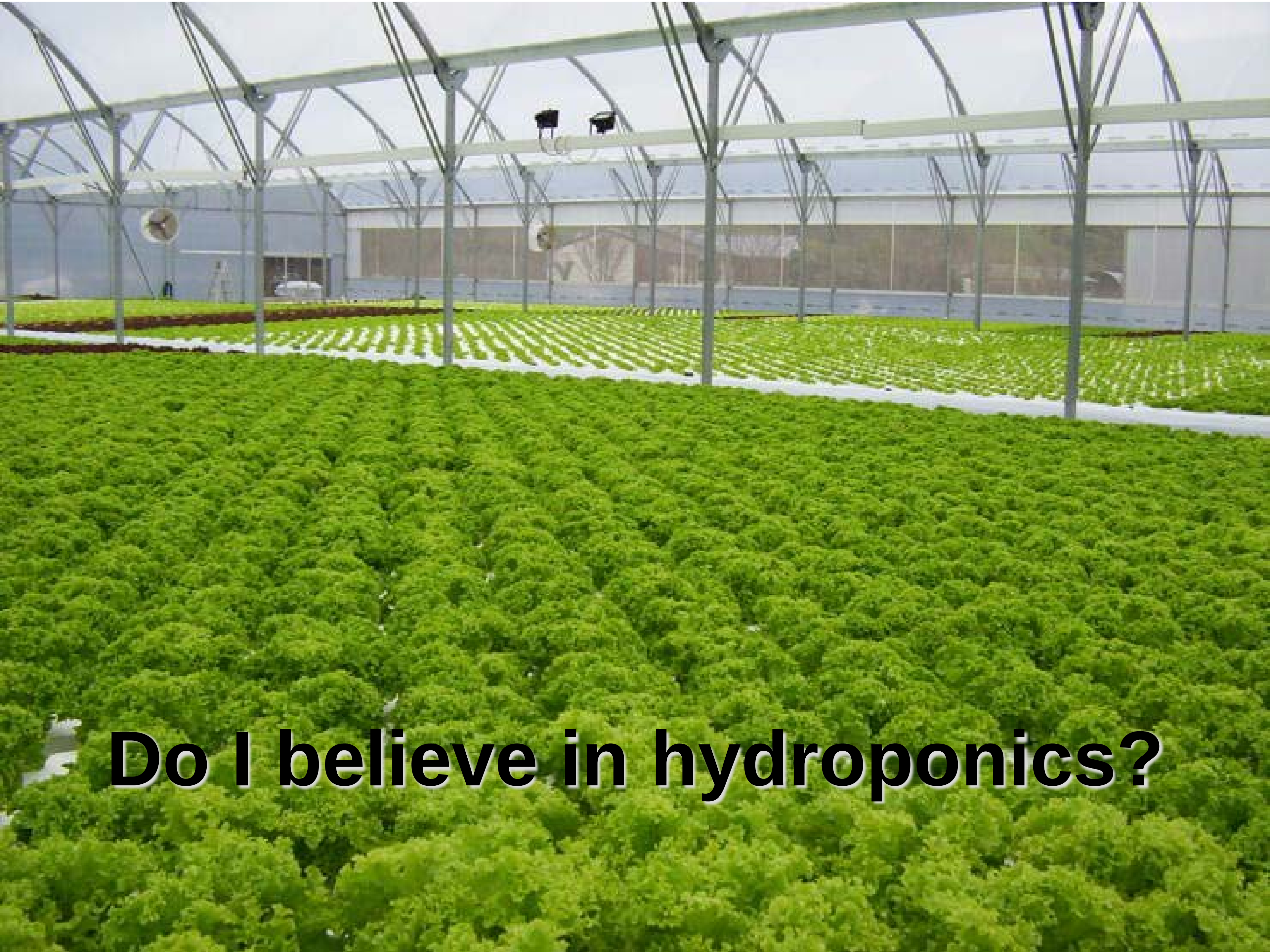


Terra Firma!

Hydroponic Farming Eliminates The Soil

	Traditional Farming	Emirates Hydroponics Farms	Water saving / kg yield
Lettuces	320 Gallons	10 Gallons	310 Gallons
Tomatoes	360 Gallons	12 gallons	348 Gallons
Strawberries	370 Gallons	54 Gallons	316 Gallons

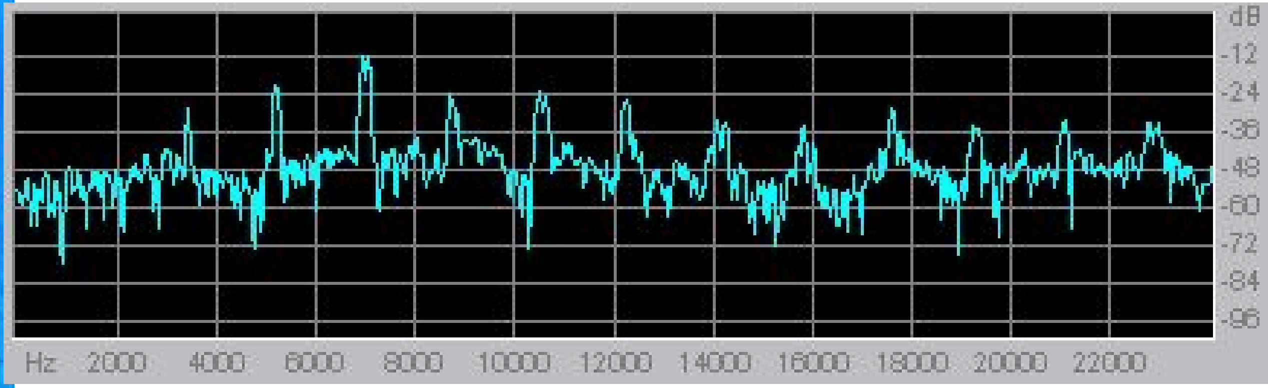
Then God said, **"Let the land produce vegetation:** seed-bearing **plants and trees on the land** that bear fruit with seed in it, according to their various kinds." And it was so. **12 The land produced vegetation**: plants bearing seed according to their kinds and trees bearing fruit with seed in it according to their kinds. **And God saw that it was good. 13** And there was evening, and there was morning, the third day.

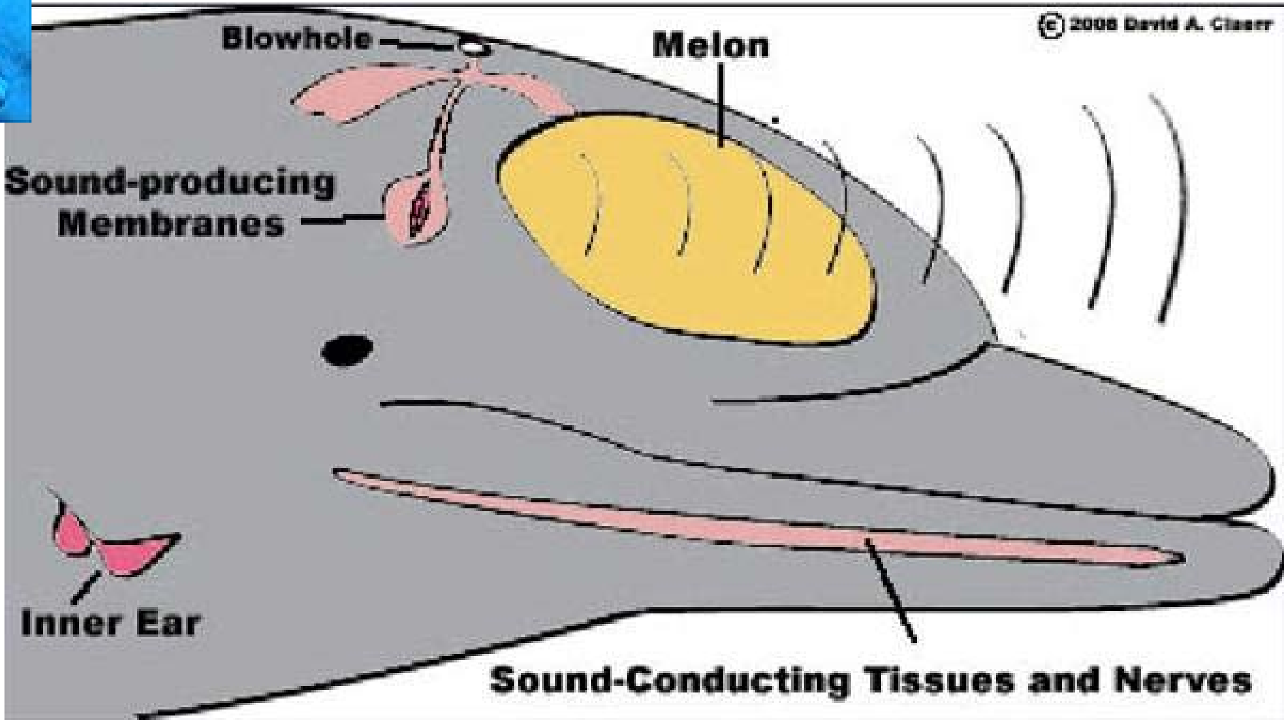

Do I believe in hydroponics?


Do I believe in hydroponics?
Why not?
God invented it...
...it's called seaweed, kelp and algae!

Hydrophonics

ORIGIN: 2010s from hydro- [of water] + Greek phono [sound] + -ics



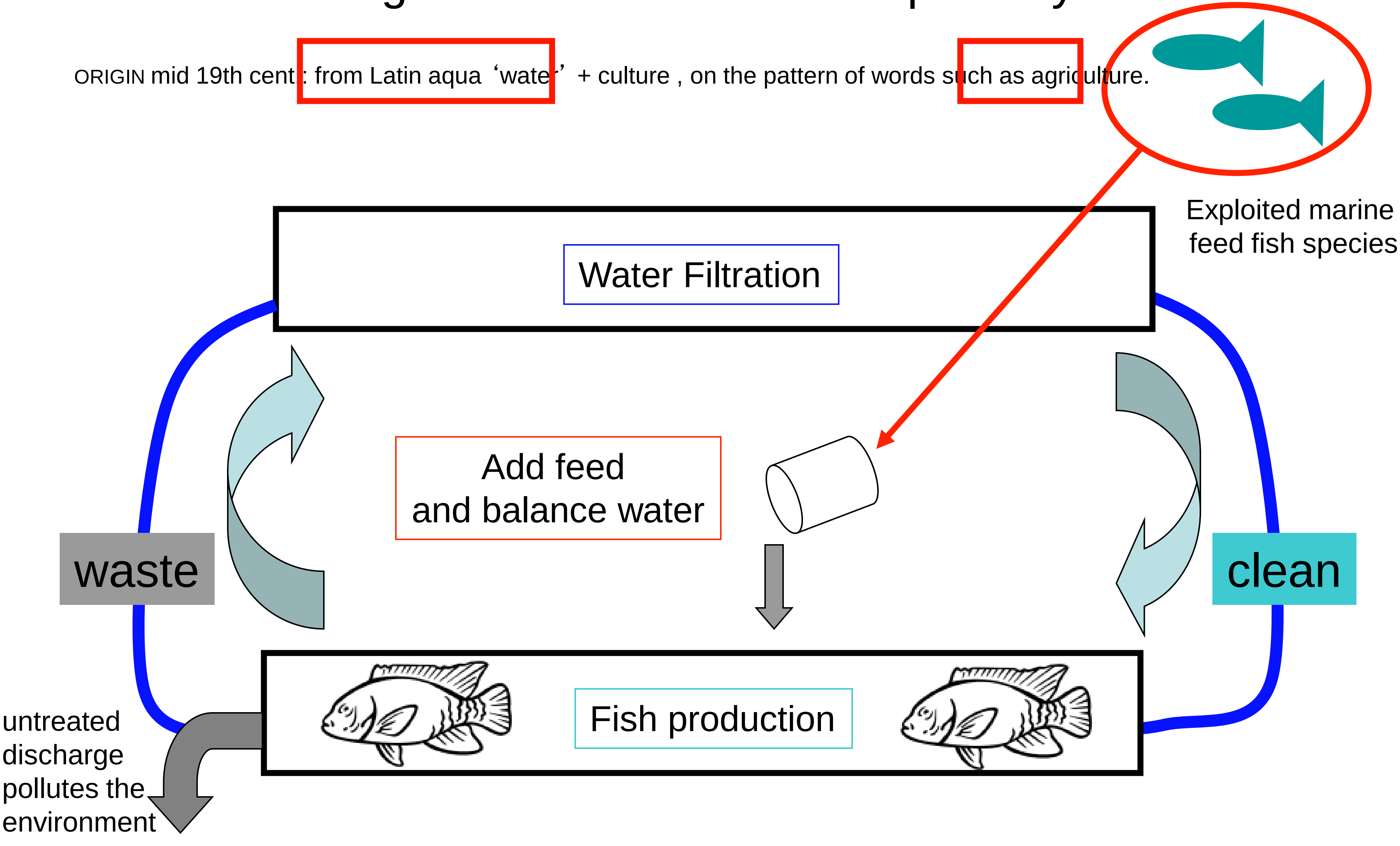


Many people coming to our farm inquire about hydrophonics. Hydrophonics is not **Hydroponics**. Hydrophonics does not exist and appears in no modern or ancient dictionary. I suppose if the word did exist then the Greek would mean ***sound in water***, like a dolphin perhaps communicating to it's pod. Please make sure you pronounce the words for agricultural study as accurately as possible.

Recirculating Aquaculture

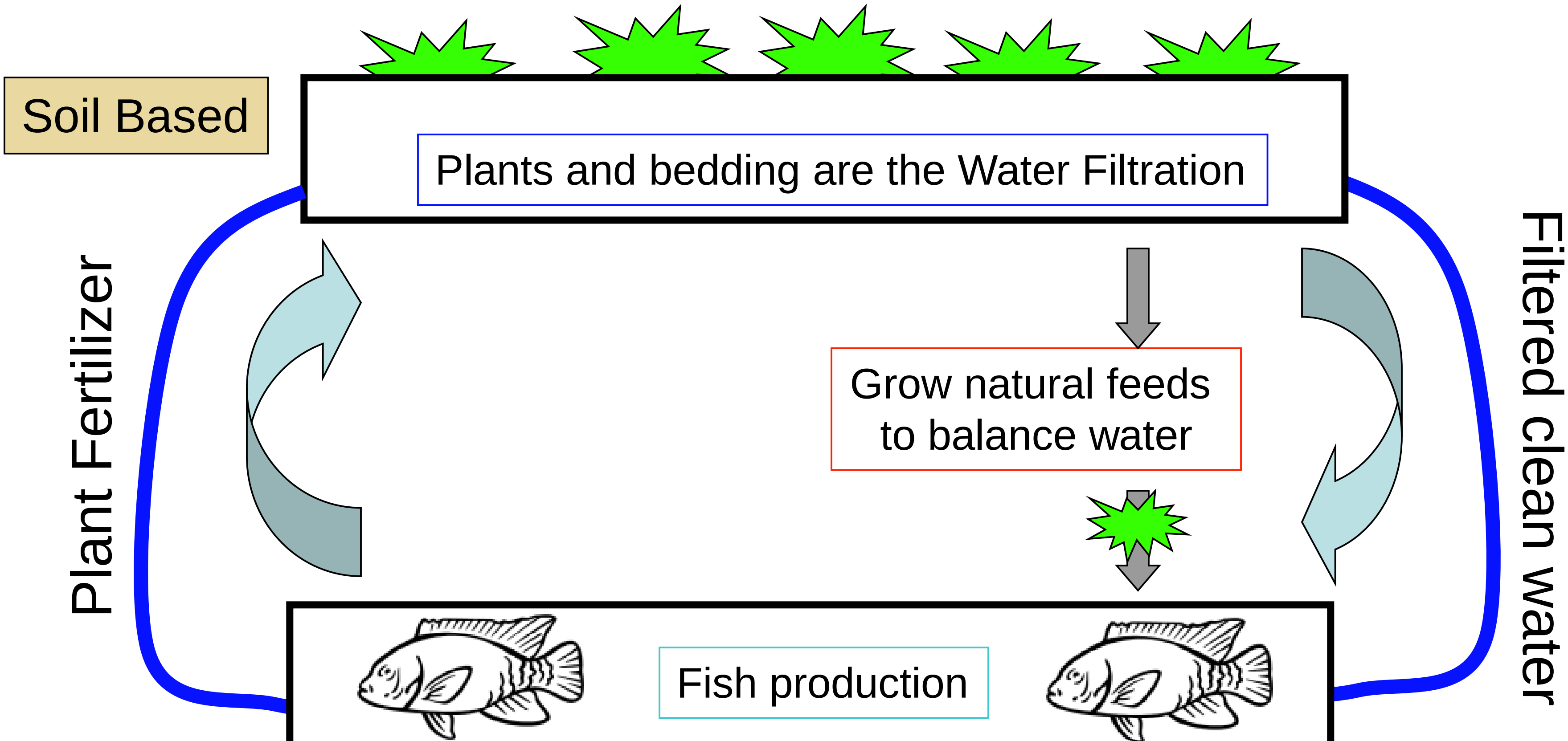
Fish are grown in a water tank or pond system

ORIGIN mid 19th cent.: from Latin aqua ‘water’ + culture , on the pattern of words such as agriculture.



Aquaponics = Aquaculture + Hydroponics

ORIGIN: 1960s from Aqua- [implying fish] + Greek **ponos** ‘labor’ + -ics .



vAquaponics = Integrated Vermiculture

Fish and plants living in a balanced self limiting ecosystem

In Thailand, Malasia and China fish and aquatic plants have been kept together in decorative vases and pots for thousands of years. The fish prevent mosquito eggs and larvae from growing into pests and serve as feed for the fish.

Static aquaponics


Static aquaponics
Algae is seen growing in the water, utilizing any available sunlight and also nutrients from the fish waste. Many fish in turn feed on the high protein phytoplankton, string algae and blanket algae. The balance between fish and algae needs periodic monitoring and intervention depending on the breeding rate of your fish, waste production, sunlight and the algae growth rate.
Fish and plants living in a balanced self limiting ecosystem

Static aquaponics

Phytoplankton, unicellular algae, is seen growing in the water, utilizing any available sunlight and also nutrients from the fish waste. The catfish were fed commercial feed and vegetable scraps. Water hyacinth utilize the nutrient load from the fish and grow rapidly.

Catfish and Water Hyacinth

Static aquaponics

Water hyacinth utilize the nutrient load from the fish and grow rapidly. The catfish do not consume the plant or it’s root, proving to be an appropriate companion system.

Catfish and Water Hyacinth


Water hyacinth are systematically culled and fed to the chicken. They will consume the insects that a resident in the host plant and the the plant itself, proving to be a well integrated food source from the static aquaponic unit that rears catfish.
Static aquaponics
Chaquaponics

Water hyacinth utilize the nutrient load from the turtles and grow rapidly. The turtles will consume the plant so growth rate and quantity of plants need to be balanced. This is an appropriate companion system if quantities of water hyacinth out grow the consumption rate of the turtles.

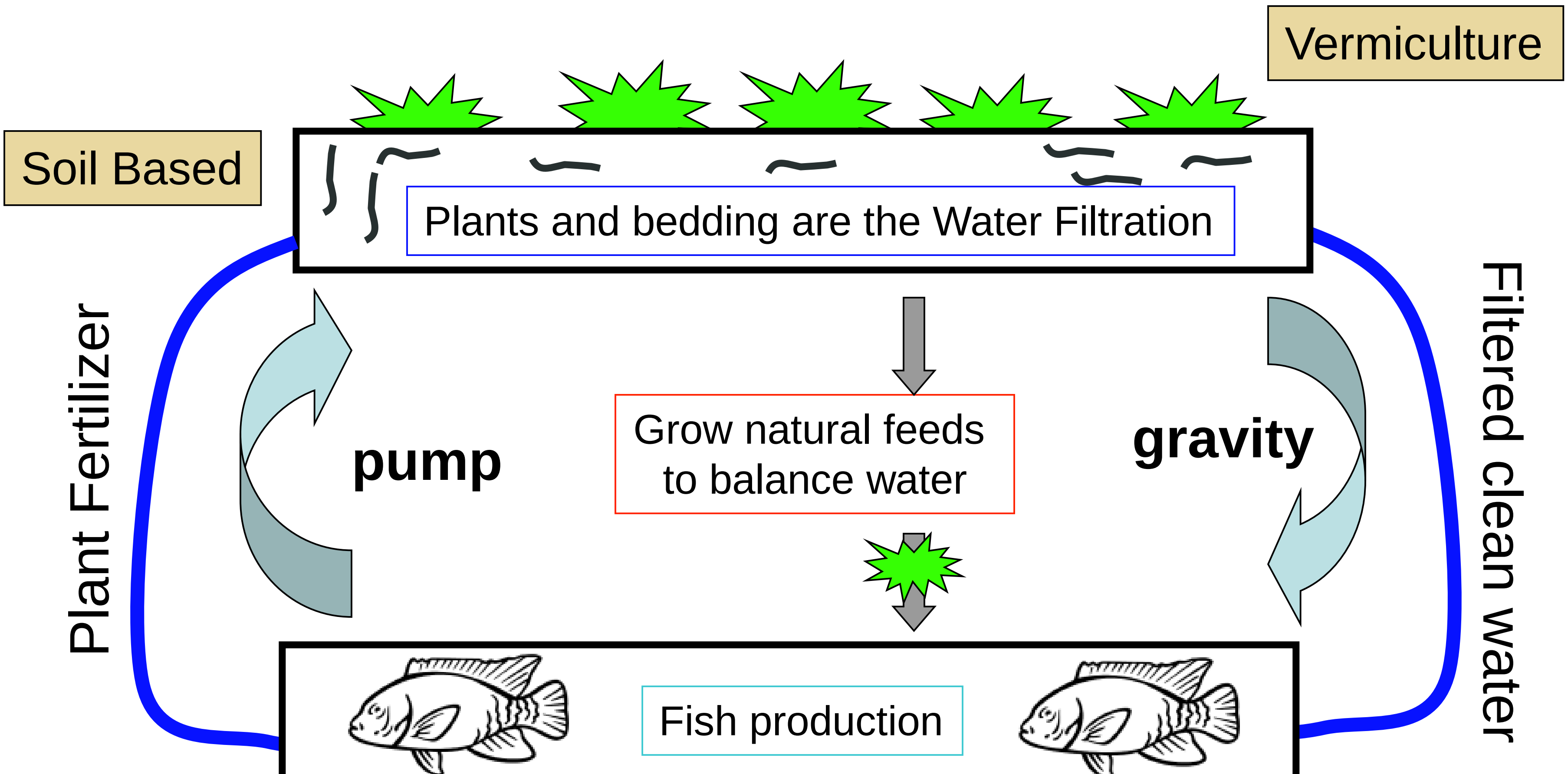
Turtleponics

Duckweed utilizse the nutrient load from the fish and ducks and grow rapidly. The tilapia and ducks consume the plant, proving to be an appropriate companion system if addition grow ponds are available as duck stocks grow larger and consume more.

Duckponics

vAquaponics = Aquaculture + Hydroponics

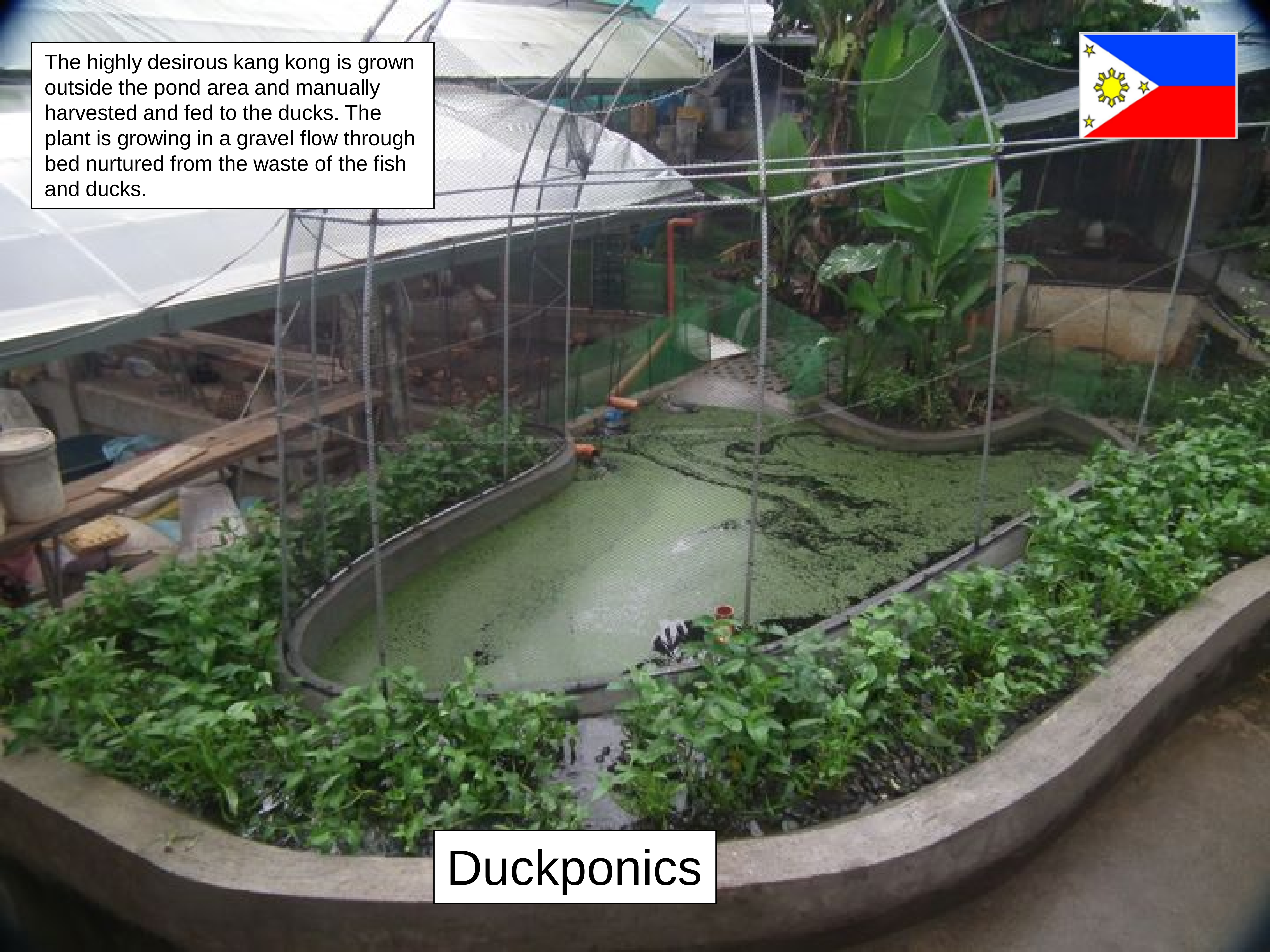
ORIGIN: 1960s from Aqua - [implying fish] + Greek **ponos** ‘labor’ + -ics .

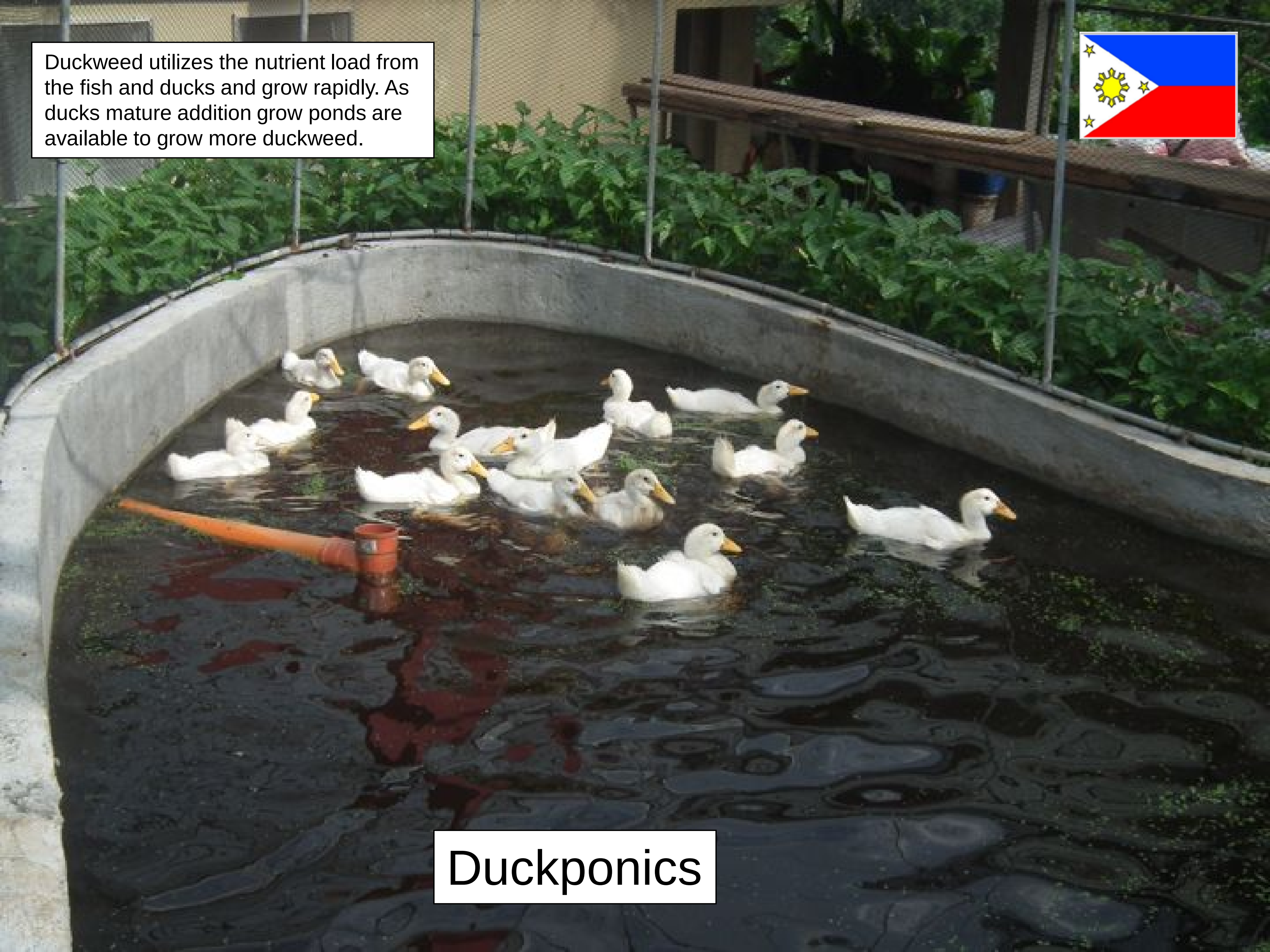


vAquaponics = Integrated Vermiculture

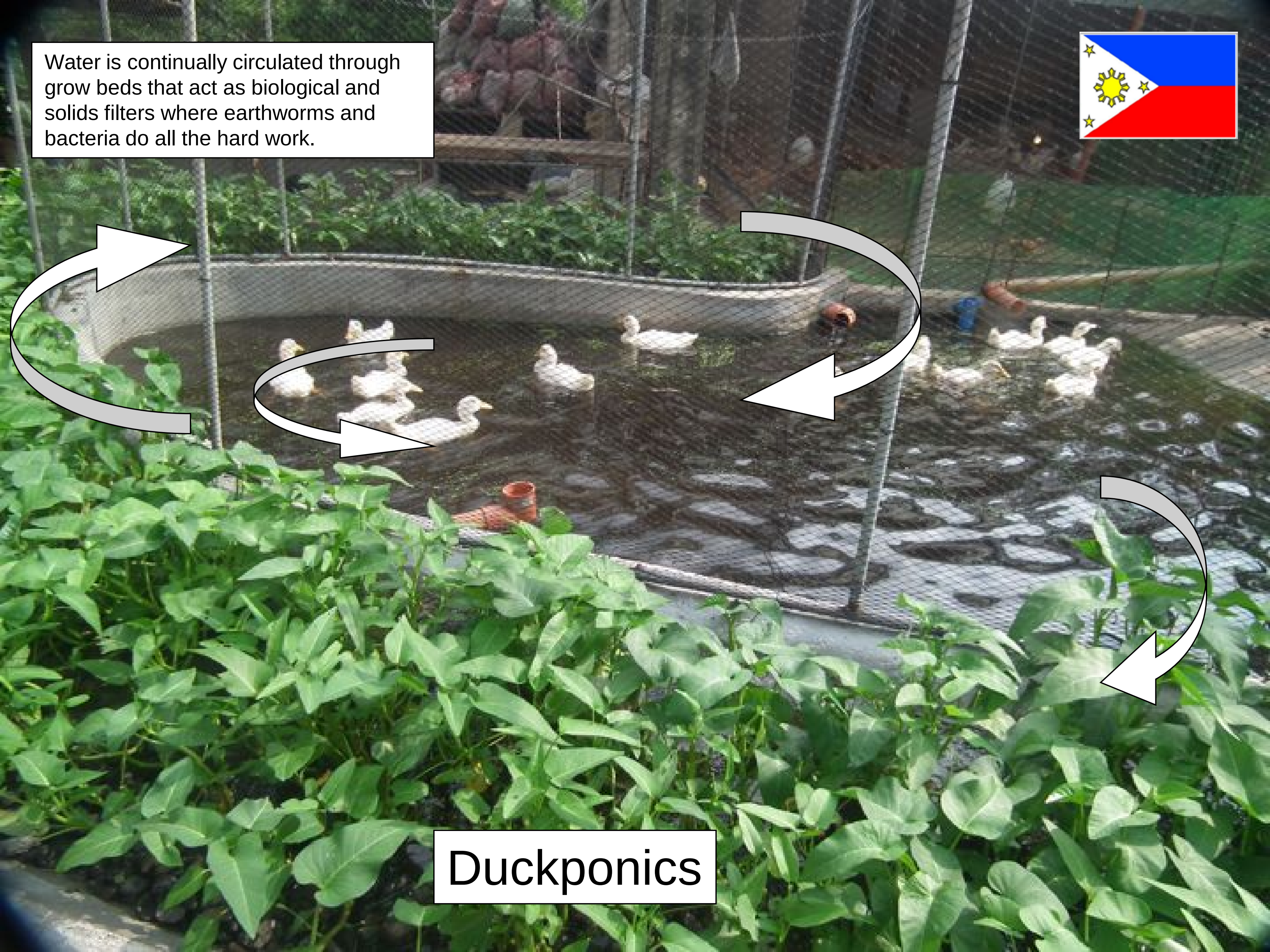
Duckponics

The highly desirous kang kong is grown outside the pond area and manually harvested and fed to the ducks. The plant is growing in a gravel flow through bed nurtured from the waste of the fish and ducks.




Duckweed utilizes the nutrient load from the fish and ducks and grow rapidly. As ducks mature addition grow ponds are available to grow more duckweed.
Duckponics

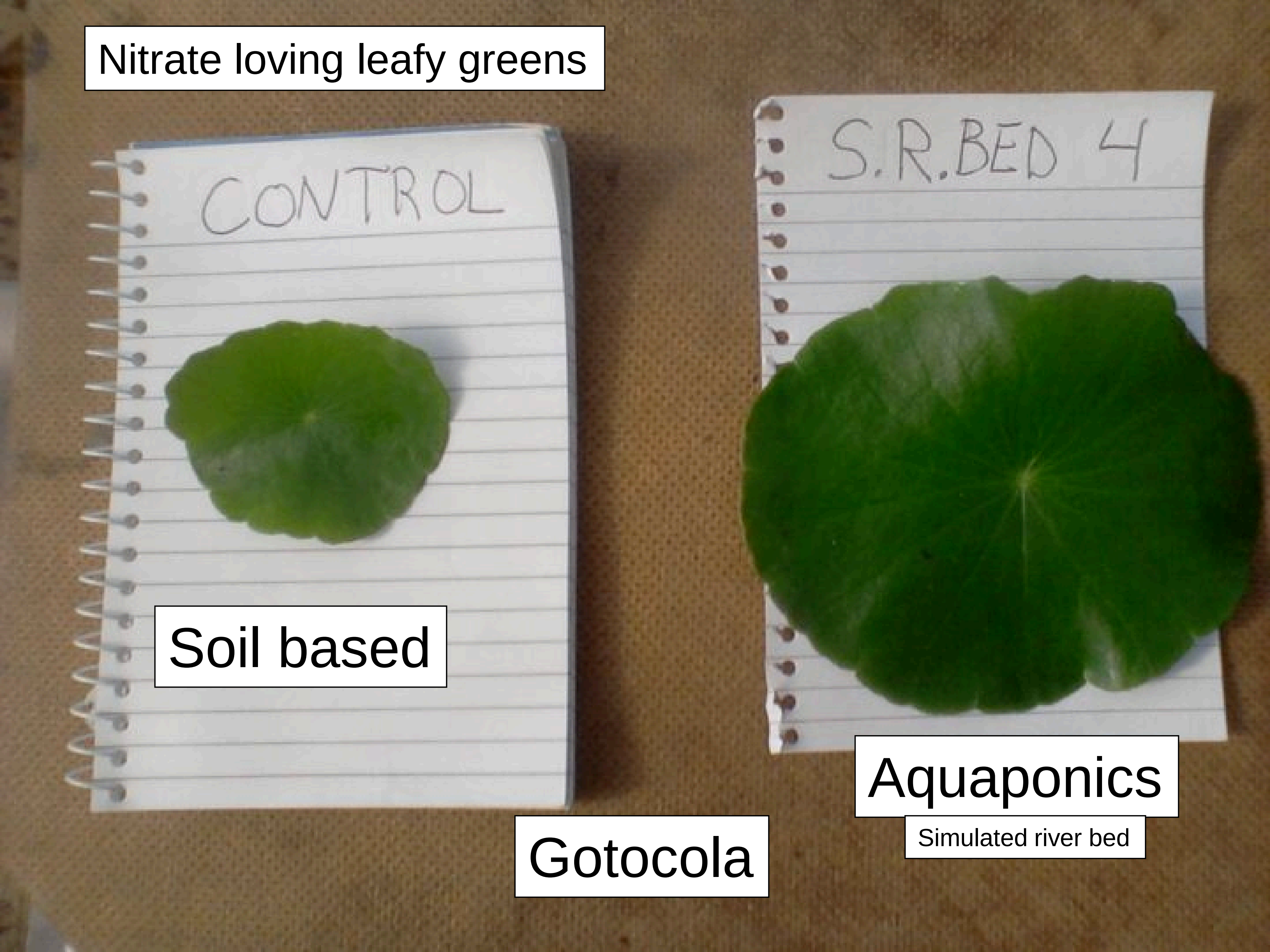
Conventional confinement systems deprive ducks of their natural development and produce lower nutrition than sun drenched, naturally fed aquatic ducks.

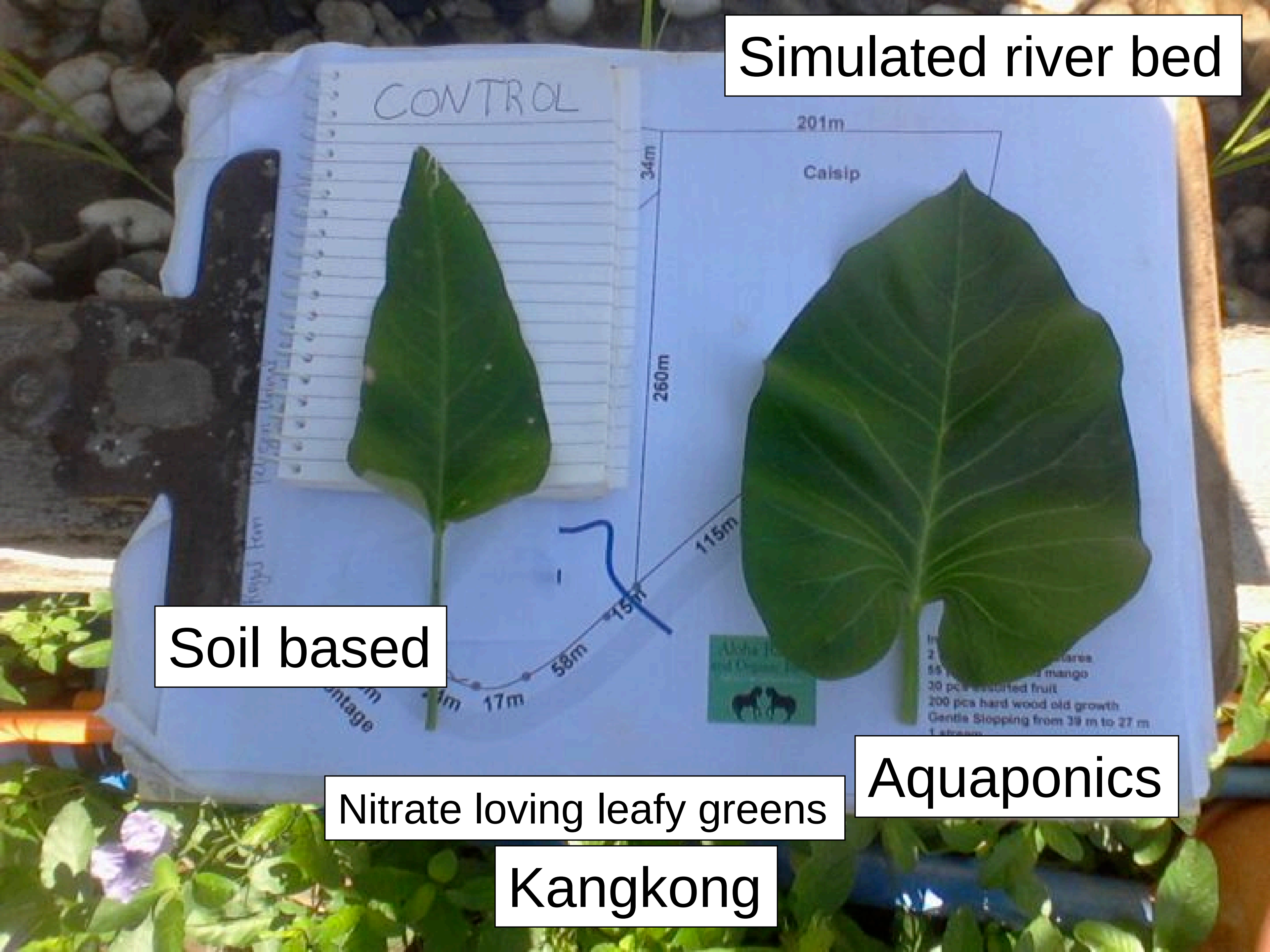

Water is continually circulated through grow beds that act as biological and solids filters where earthworms and bacteria do all the hard work.
Duckponics

Tigerponics

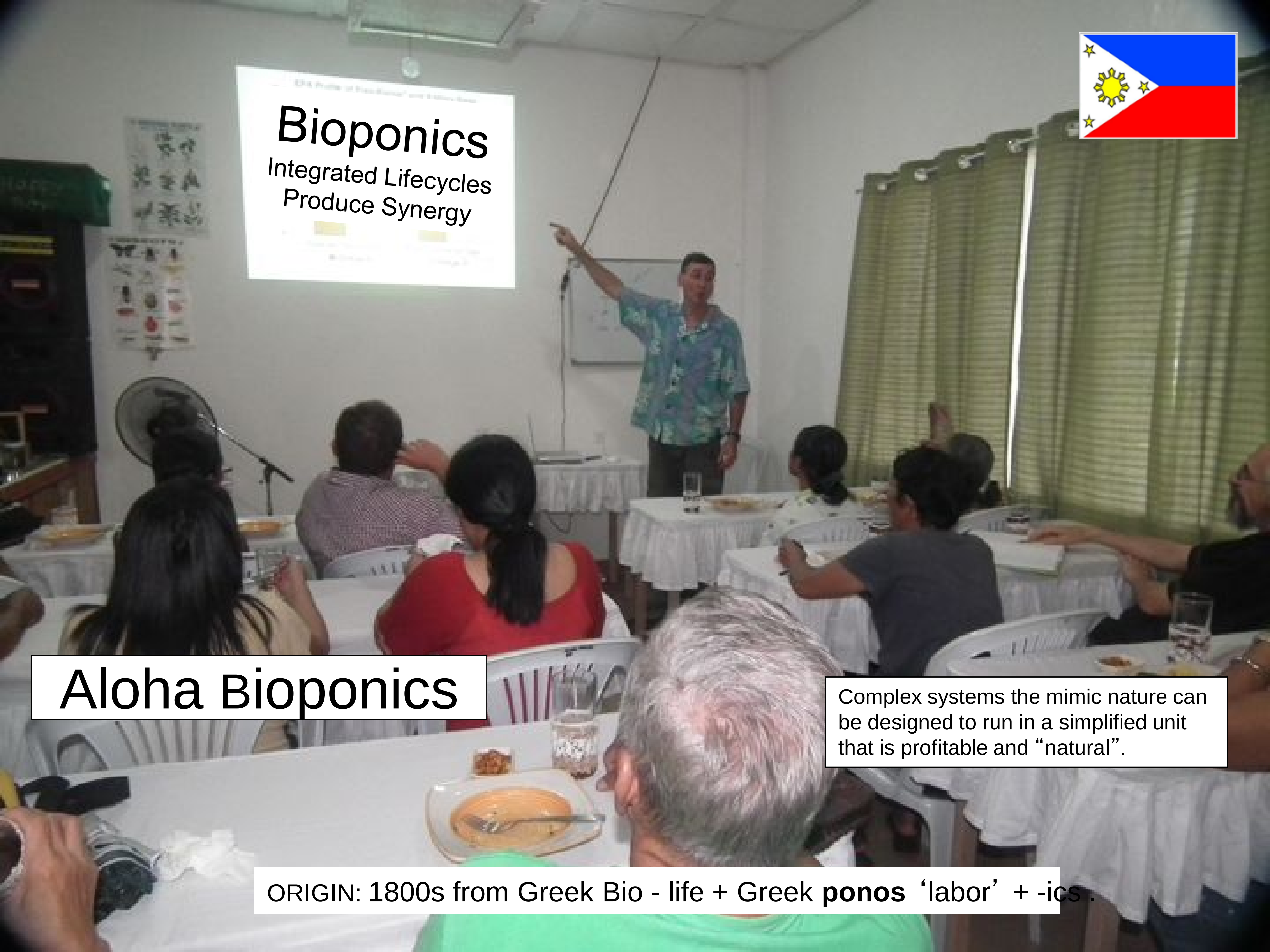
Algae in nutrient rich tiger bath water could circulate through simple grow beds with feed species for other animals in the zoo. The water would not need to be flushed into the wild waterways, thus keeping Thailand clean and green.


Fact is you can integrate unlimited combinations of nutrient sources to produce more food for people and livestock any where in the world.
Bootponics


Nitrate loving leafy greens
CONTROL
S.R.BED 4
Soil based
Aquaponics
Simulated river bed
Gotocola



Simulated river bed
CONTROL
201m
Calsip
34m
260m
115m
58m
17m
Soil based
Aquaponics
Nitrate loving leafy greens
Kangkong



Bioponics

Integrated Lifecycles
Produce Synergy

Aloha Bioponics

Complex systems the mimic nature can be designed to run in a simplified unit that is profitable and “natural”.

ORIGIN: 1800s from Greek Bio - life + Greek **ponos** ‘labor’ + -ics .

Educational opportunities connecting people with their food supply

Goal: Learn what it takes to build a profitable system that is sustainable.

'finally got it to cycle"

Submitted on: June 09, 2010, 09:22:44 pm

After days of experimenting and trying to figure out the ins and outs (no pun intended) of AP, I finally got the water to cycle from my 55 g blue barrel FT to my grow bed and back. Below is the parts list for my mini-system. I have yet to get my fishies and start the seeds but as soon as I do, I'll post pictures.

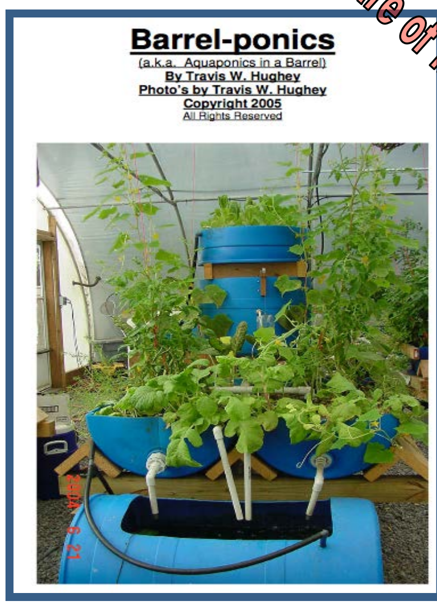
FT: 55 gallon blue barrel
Grow bed: 1 bag of Niu black cinder
Pump: Maxi Jet 400 (110 gpf)
Tube: 1/2" ID clear vinyl tubing

Aquaponics in Paradise .com

Popular starting point

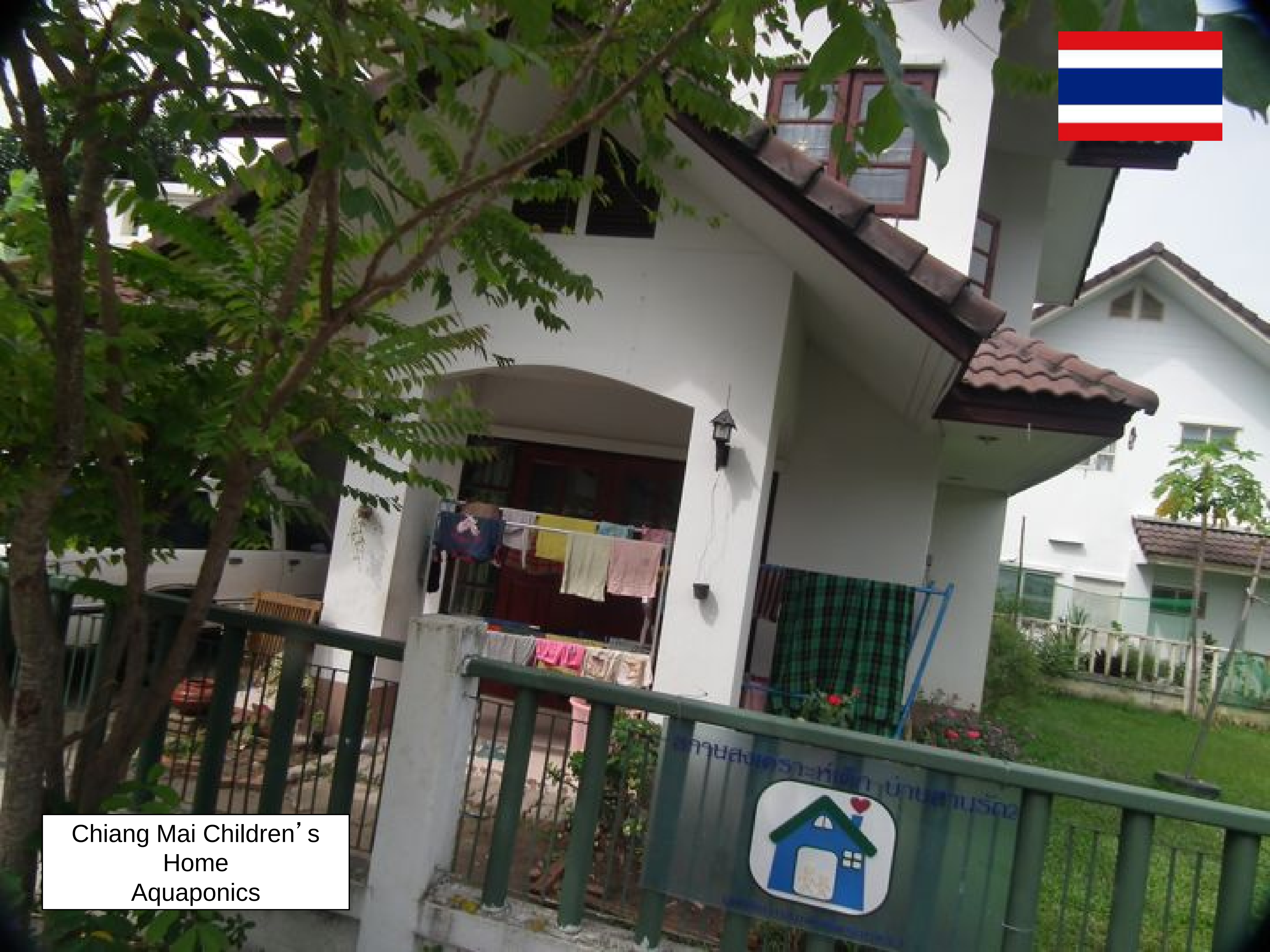
Be aware of limitaions

Too Small to be Stable


Barrel-ponics
(a.k.a. Aquaponics in a Barrel)
By Travis W. Hughey
Photo's by Travis W. Hughey
Copyright 2005
All Rights Reserved

There are many helpful resources online, but few are commercially viable despite the claims of the proponents. A high degree of the internet bandwidth for aquaponics consists of amateur tinkerers, dabblers and hobbyists who spend a disproportionate amount of resources (time and money) compared to the actual yield in their aquaponic unit. Much can be learned what to do (or not do) from these sites. Often the size of the system is to small to be stable. Size limitations will be discussed later in this first part.


2,000 liters Aquaponics
A professional aquaculturist skeptically builds his first aquaponic unit for evaluation. A gravel bed ebb and flow bell siphon system is a good starting point due to ease of operation and minimal filtration needs. Note the low head for pump efficiency to minimize energy costs. He admitted he has the advantage of his many years of fish rearing and needs to expand his horticultural knowledge.
Concrete mixing containers



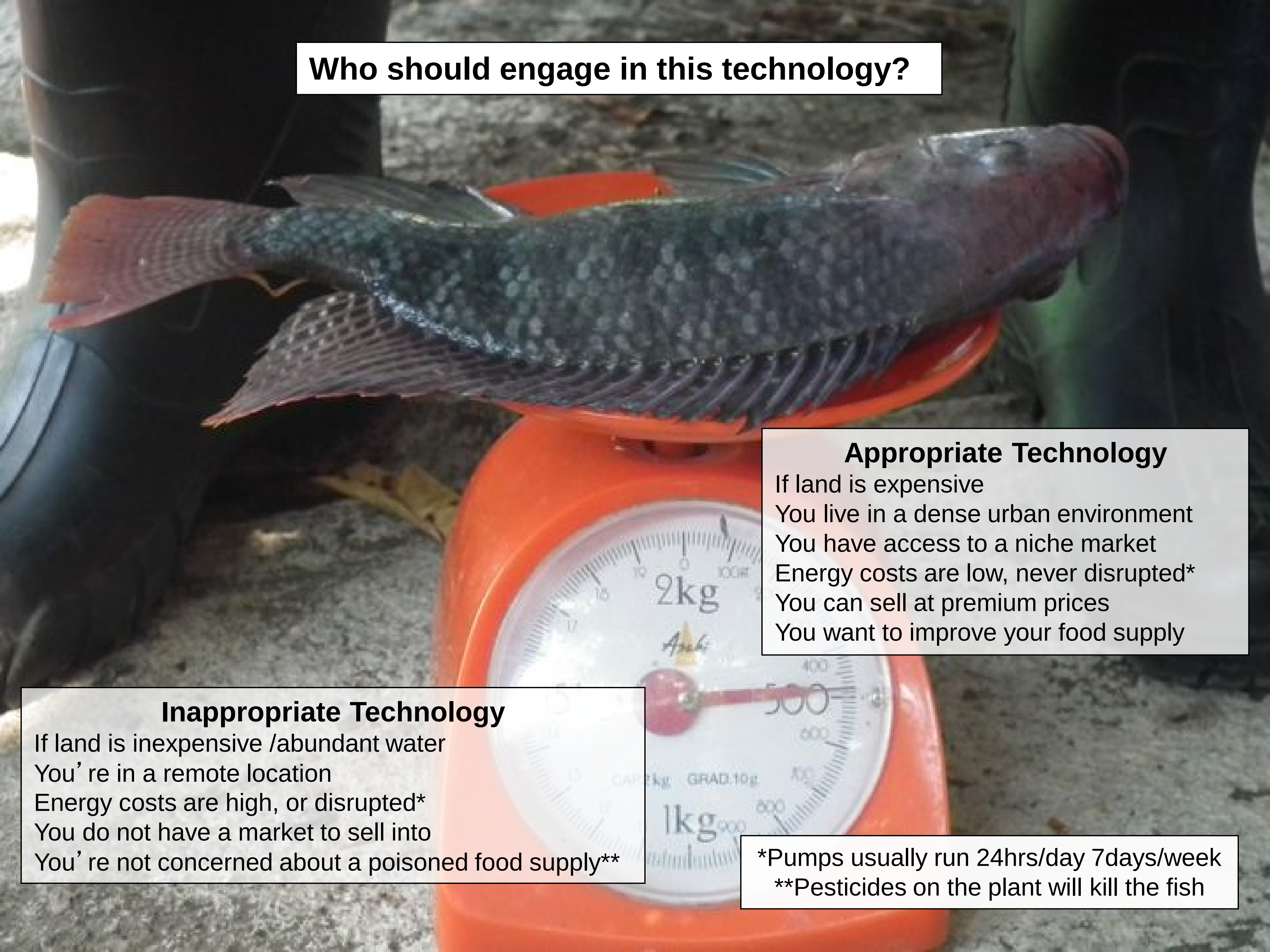
Chiang Mai Children's Home
Aquaponics


Red tilapia
A professional aquaculturist has the advantage of many years of fish rearing and the red tilapia were robust in this raft method aquaponic system.
Chiang Mai Children's Home
Aquaponics


A professional aquaculturist builds his second aquaponic unit for evaluation. A raft method is selected due to it’s higher yield potential. This system requires an extensive filtration unit. Note the low head for pump efficiency to minimize energy costs.
Filter
Chiang Mai Children’s Home Aquaponics


Raft Method vegetable production
Biofouling is noted often in raft method. Without extensive filtering of settled and suspended solids the roots of this basil will limit nutrient uptake. It requires a more complete filtration unit.
Chiang Mai Children's Home Aquaponics


REPUBLIC OF THE PHILIPPINES
CITY OF PUERTO PRINCESA



Who should engage in this technology?

Appropriate Technology

If land is expensive
You live in a dense urban environment
You have access to a niche market
Energy costs are low, never disrupted*
You can sell at premium prices
You want to improve your food supply

Inappropriate Technology

If land is inexpensive /abundant water
You’re in a remote location
Energy costs are high, or disrupted*
You do not have a market to sell into
You’re not concerned about a poisoned food supply**

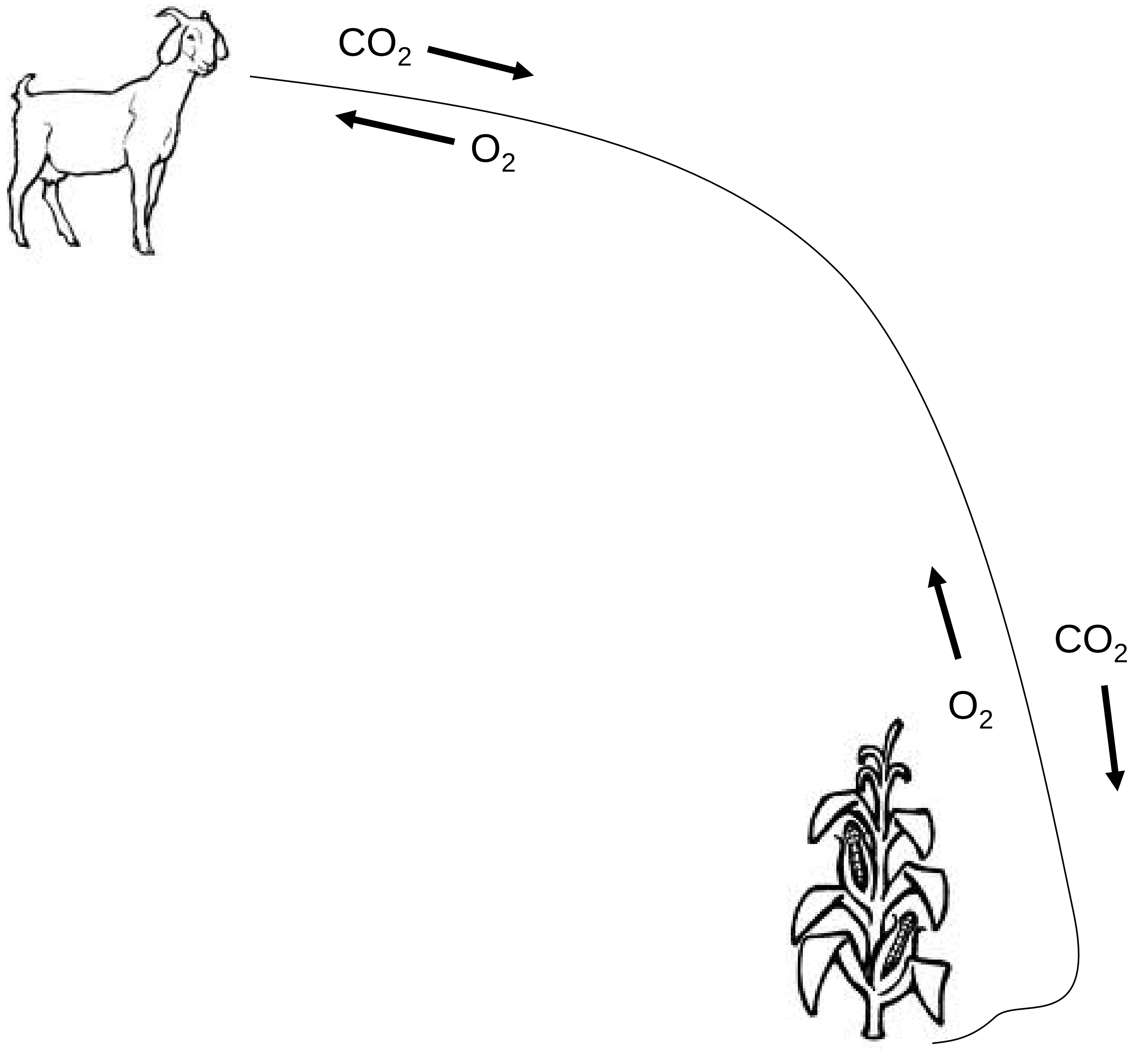
*Pumps usually run 24hrs/day 7days/week
**Pesticides on the plant will kill the fish

Best plant growth is soil based

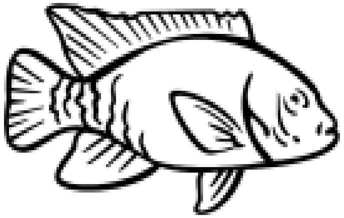
Through capillary action soil wicks water up into the root zone of the plants. This gives the plant the advantage of the soil food web and it’s microbial helpers. The pH can be easily controlled by the right ingredients, assuring full availability of nutrients.

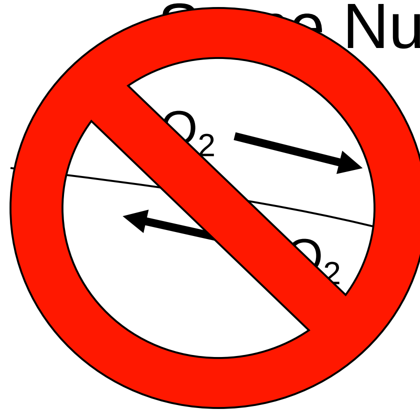

Ease of management
Bed types for plant types
1. Soil based Plants get soil
2. Water based plants get gravel
3. Floating Plants get to Float
Best Biofiltration is gravel based

Some Nutrient Exchanges in Nature

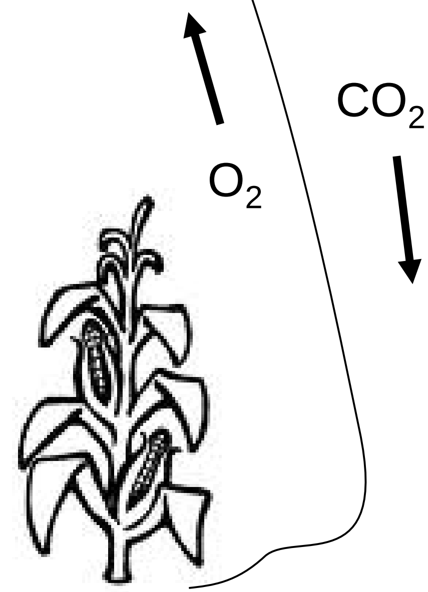


Some Nutrient Exchanges in Nature

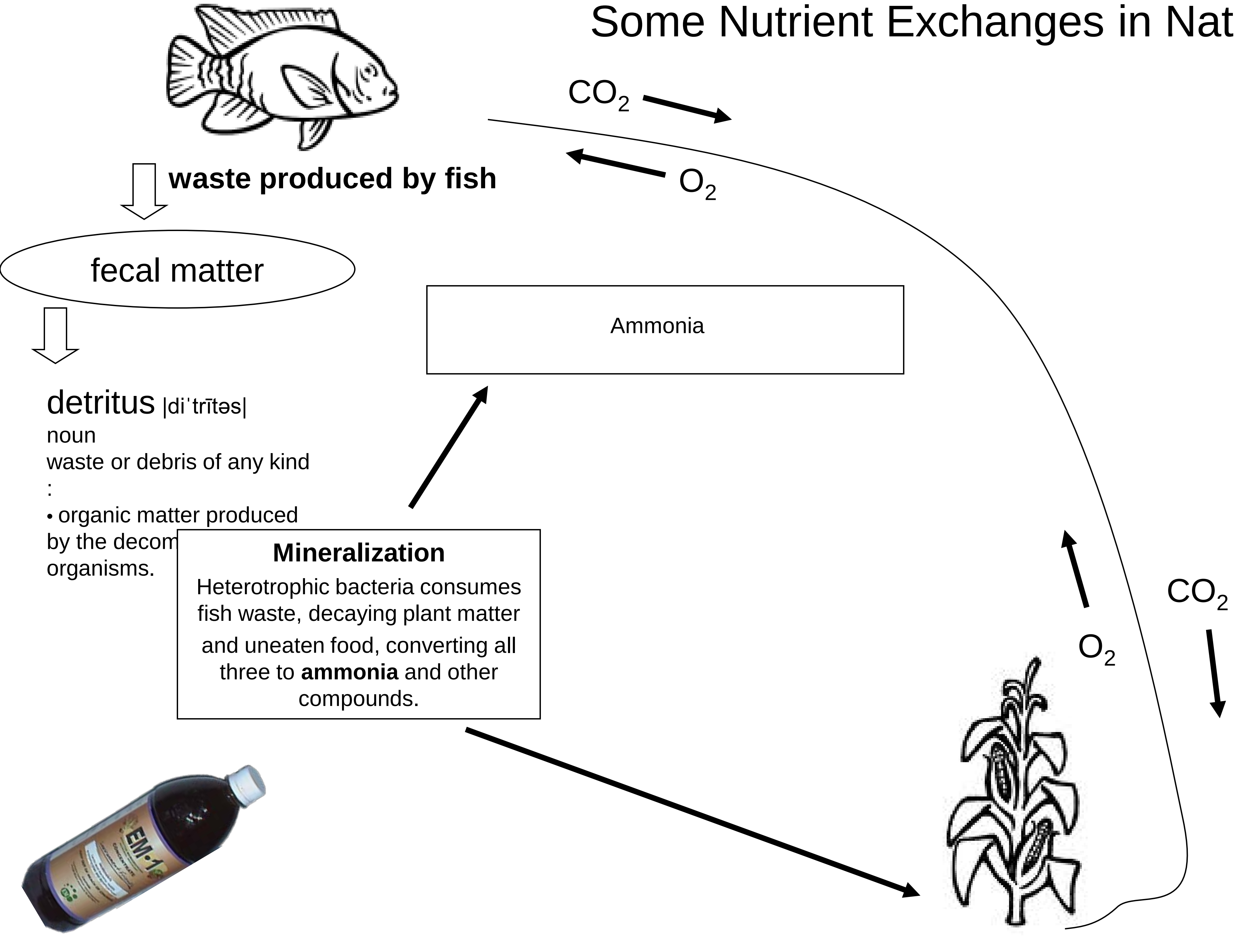


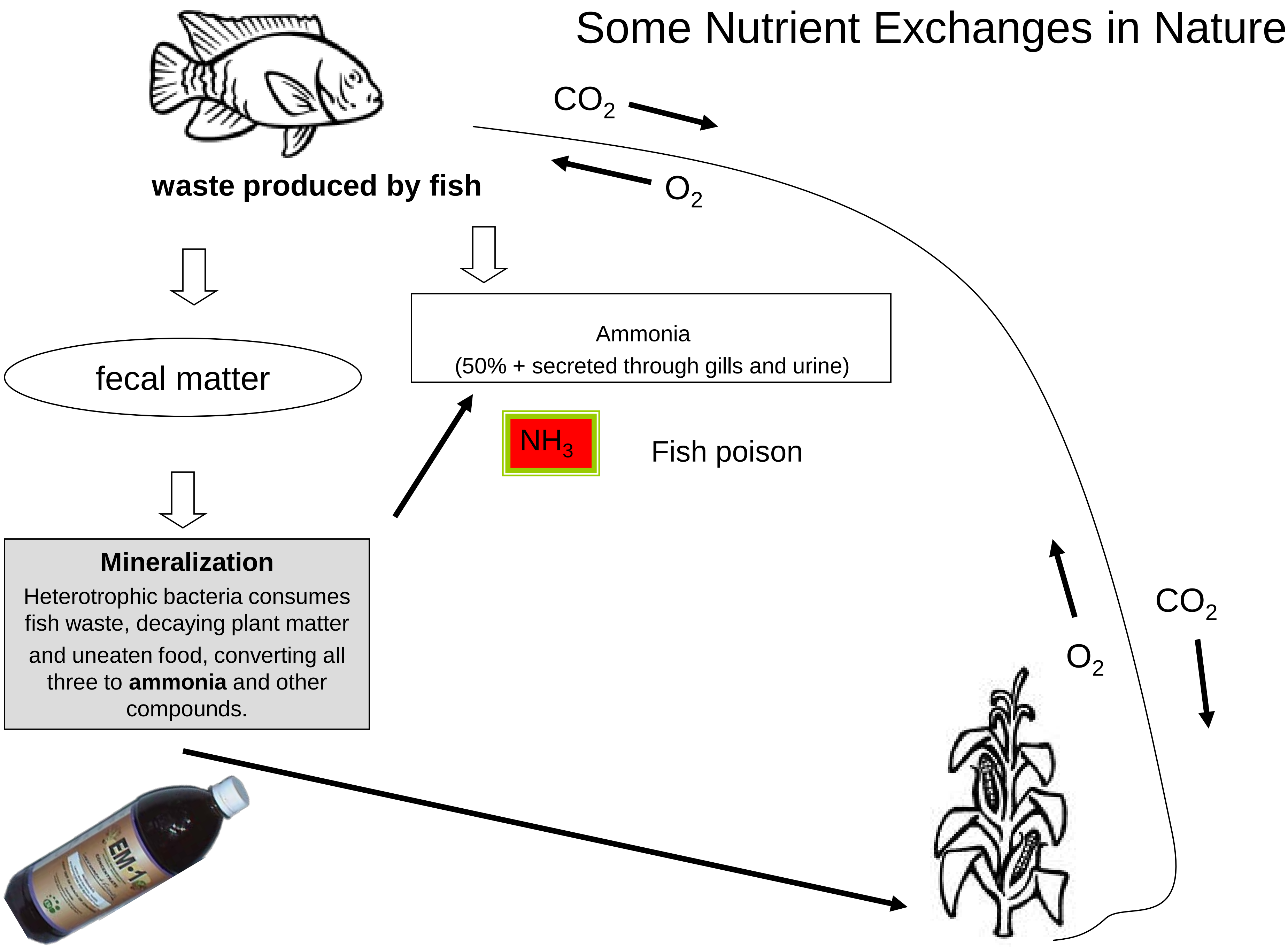


At night phytoplankton do not produce oxygen, the biological oxygen demand must be met for all components of the system

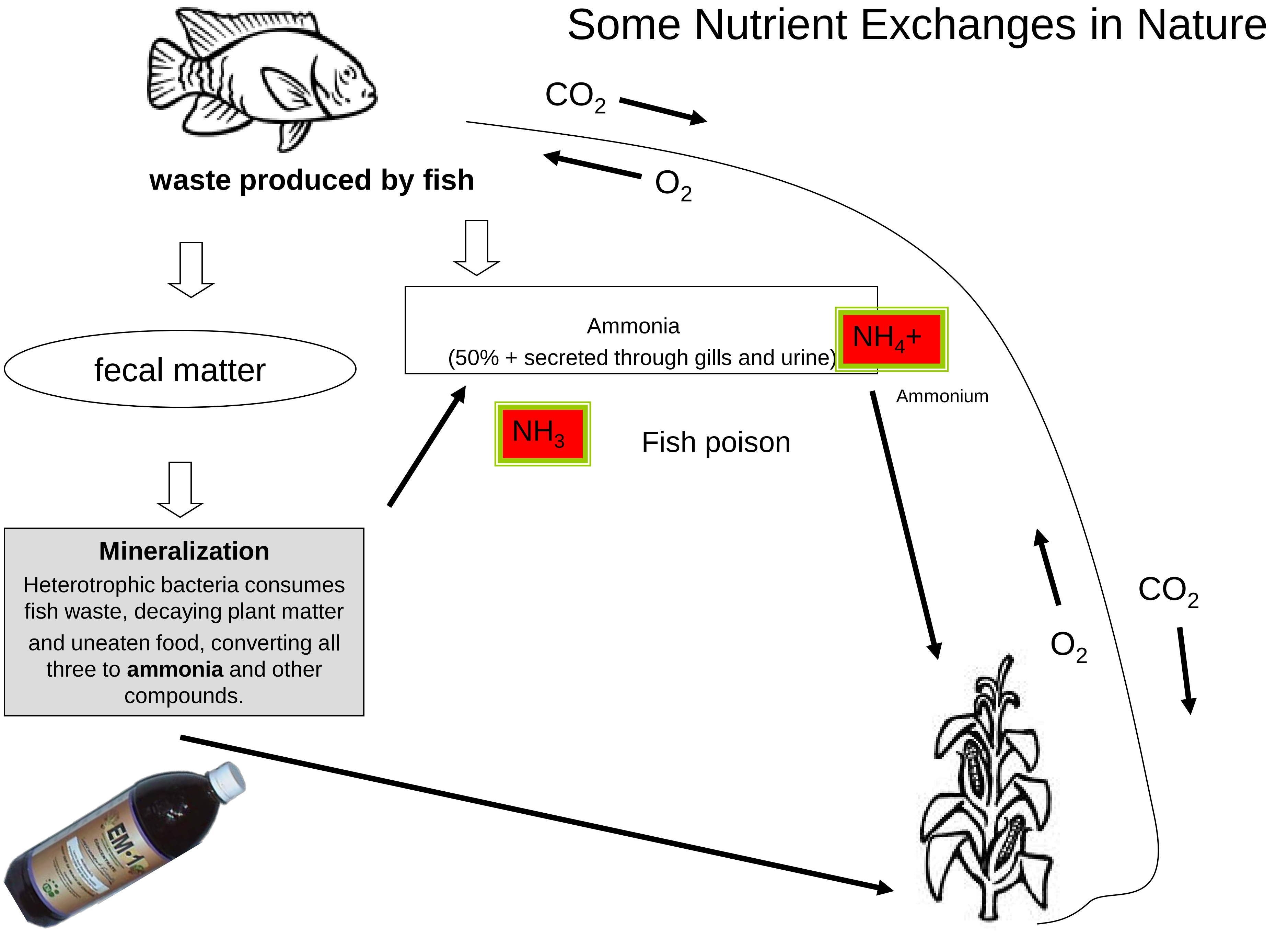


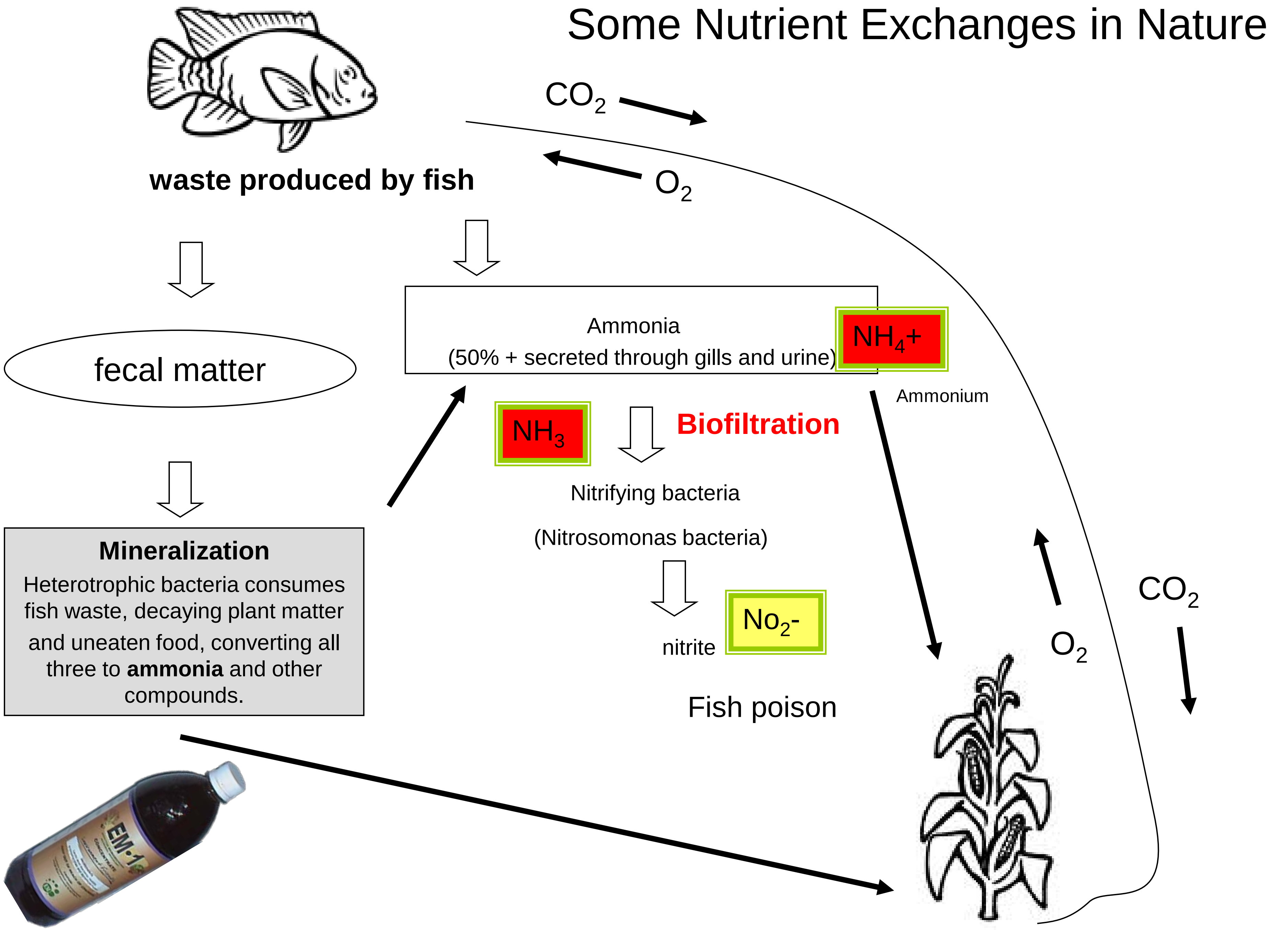
Some Nutrient Exchanges in Nature



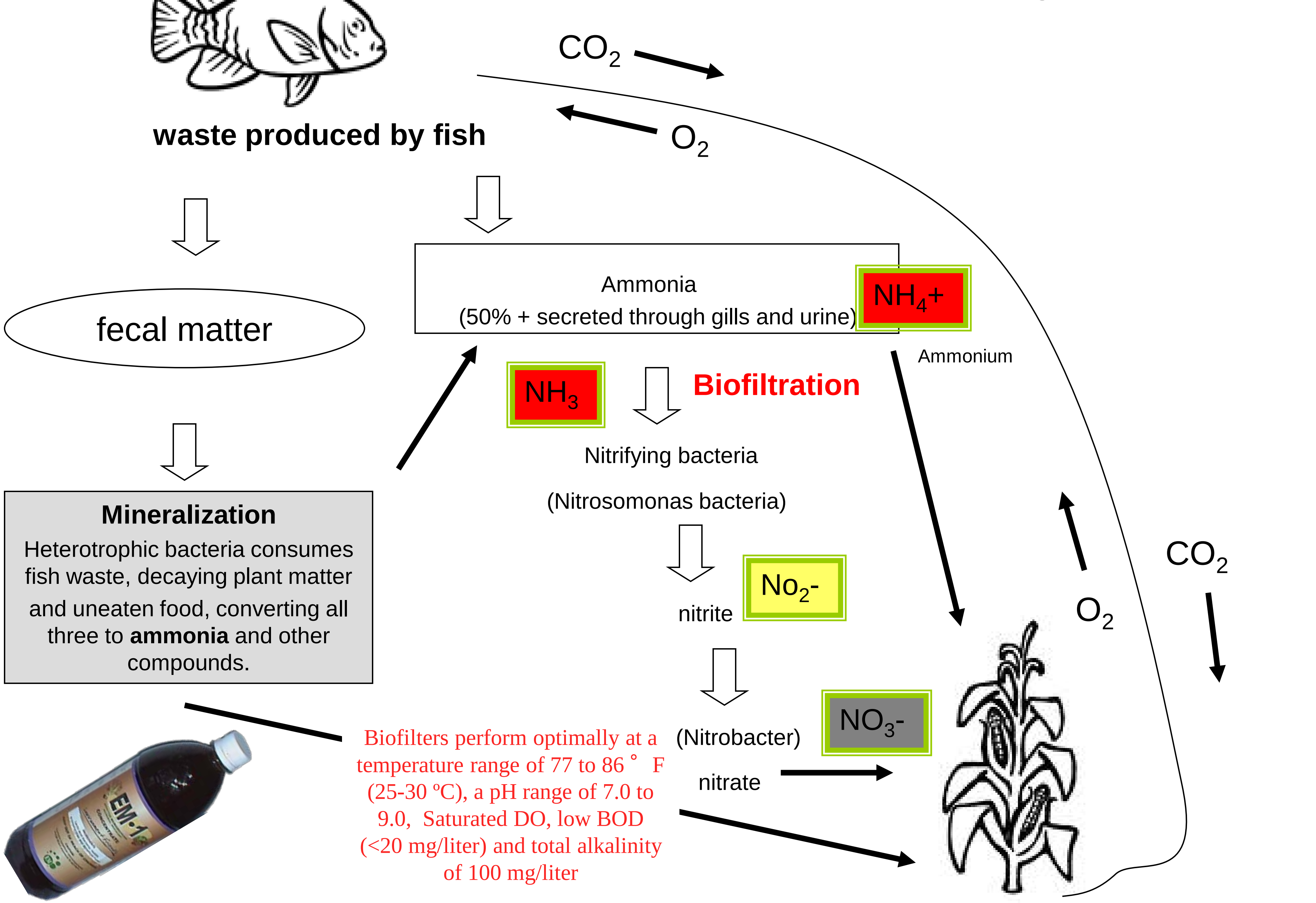


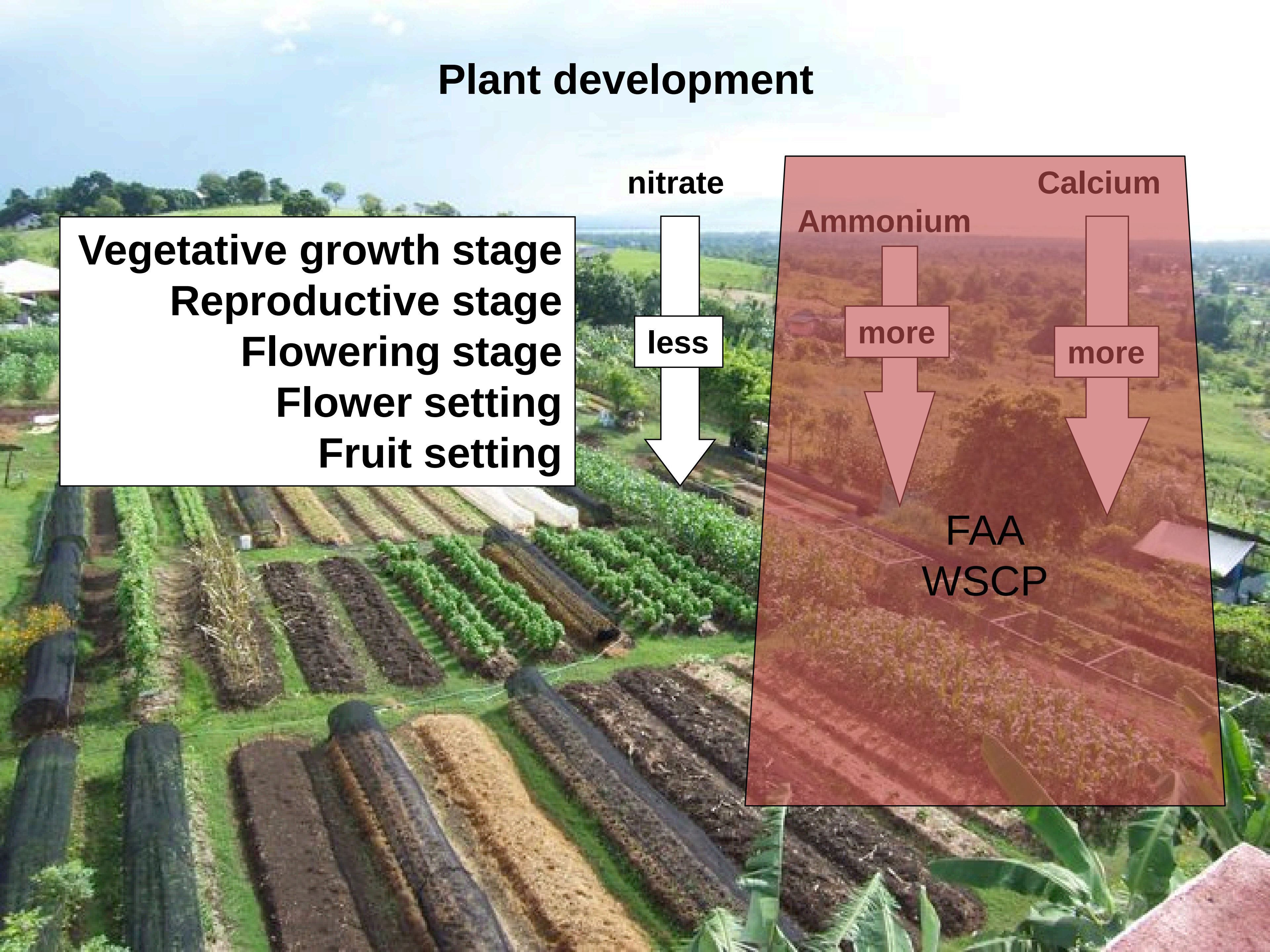
Some Nutrient Exchanges in Nature
waste produced by fish
CO_2
O_2
fecal matter
Ammonia
(50% + secreted through gills and urine)
NH_3
Fish poison
Mineralization
Heterotrophic bacteria consumes fish waste, decaying plant matter and uneaten food, converting all three to **ammonia** and other compounds.
EM-1
O_2
CO_2

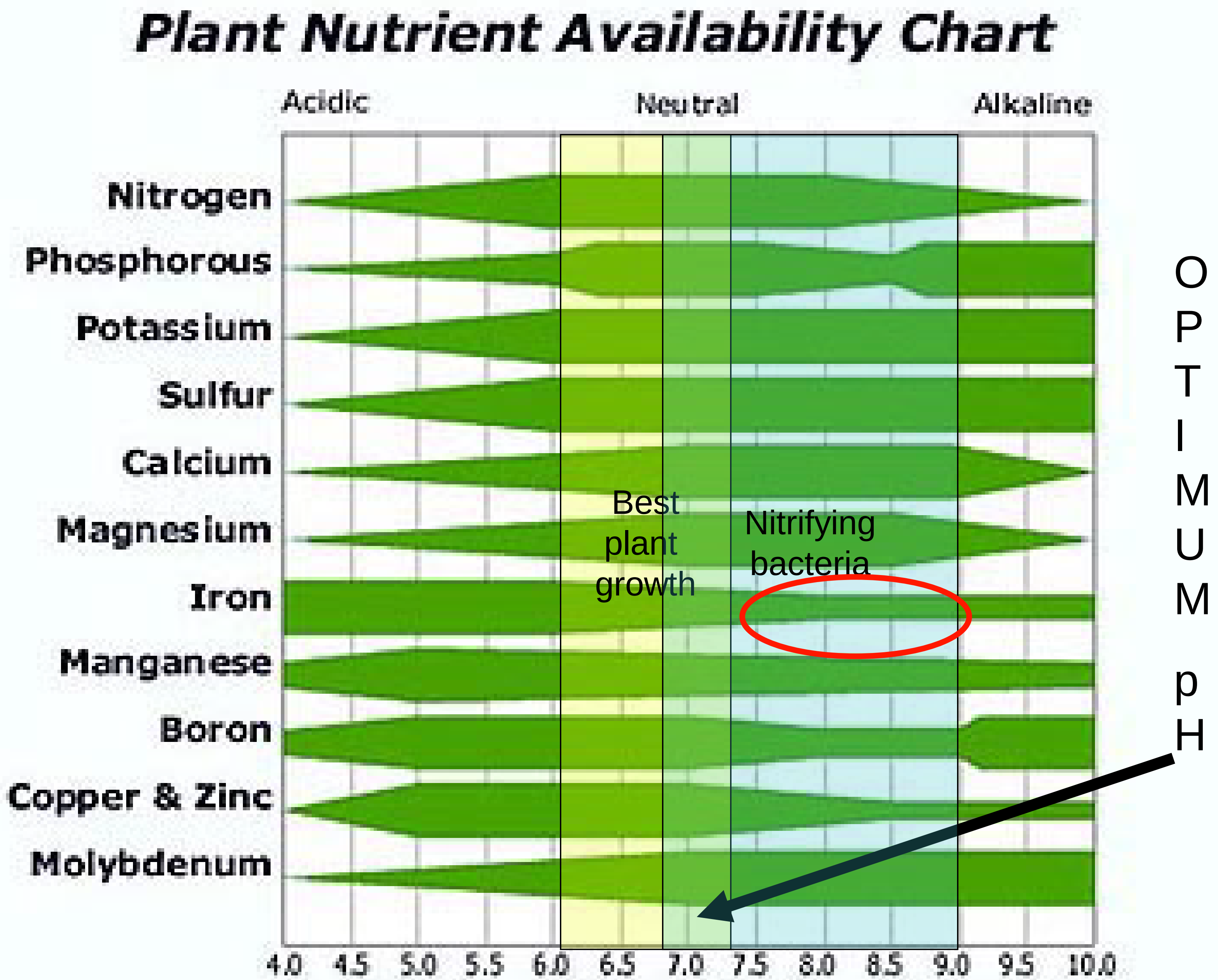

Some Nutrient Exchanges in Nature
waste produced by fish
CO_2
O_2
fecal matter
Ammonia
(50% + secreted through gills and urine)
NH_4+
Ammonium
NH_3
Fish poison
Mineralization
Heterotrophic bacteria consumes fish waste, decaying plant matter and uneaten food, converting all three to ammonia and other compounds.
EM-1
O_2
CO_2


Some Nutrient Exchanges in Nature
waste produced by fish
CO2
O2
fecal matter
Ammonia
(50% + secreted through gills and urine)
NH4+
Ammonium
NH3
Biofiltration
Nitrifying bacteria
(Nitrosomonas bacteria)
nitrite
No2-
Fish poison
Mineralization
Heterotrophic bacteria consumes fish waste, decaying plant matter and uneaten food, converting all three to ammonia and other compounds.
EM-1
O2
CO2

Some Nutrient Exchanges in Nature

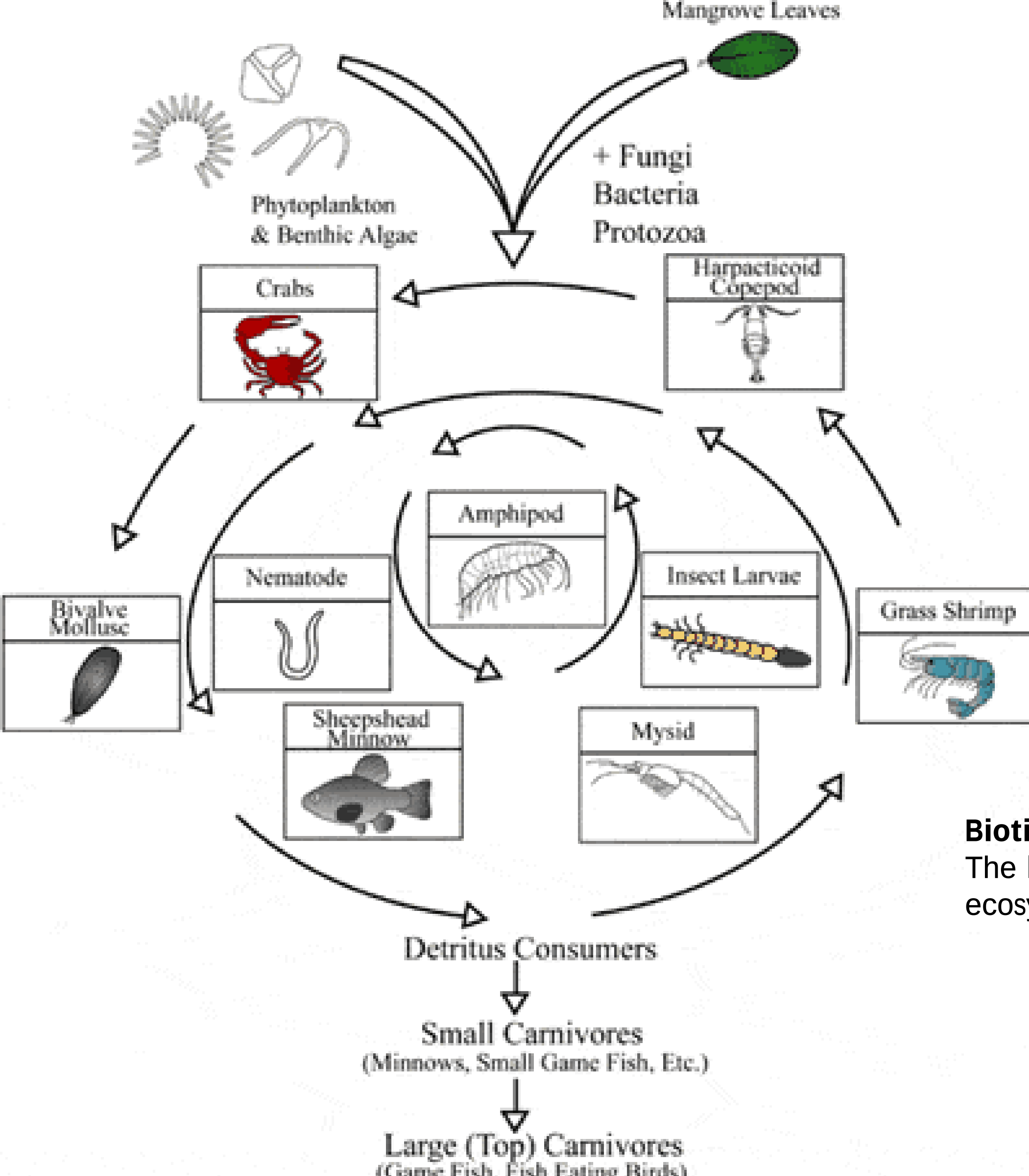



Plant development
Vegetative growth stage
Reproductive stage
Flowering stage
Flower setting
Fruit setting
nitrate
less
Ammonium
more
Calcium
more
FAA
WSCP


Plant Nutrient Availability Chart
Acidic
Neutral
Alkaline
Nitrogen
Phosphorous
Potassium
Sulfur
Calcium
Magnesium
Iron
Manganese
Boron
Copper & Zinc
Molybdenum
Best plant growth
Nitrifying bacteria
OPTIMUM pH
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0

Iron deficiency due to low pH requires supplementation

ethylenediaminetetraacetate

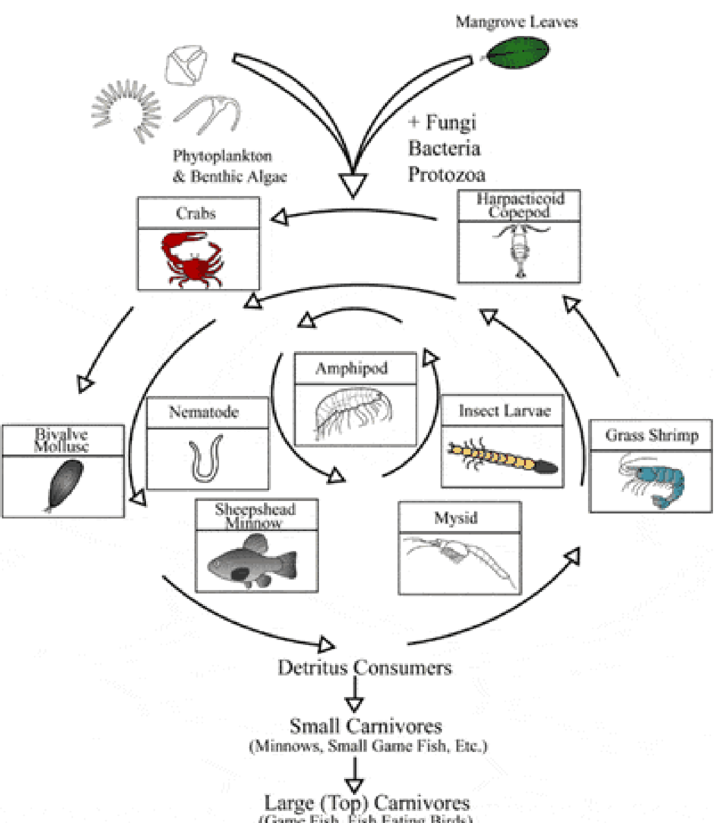


Abiotic components are such physical and chemical factors of an ecosystem as light, temperature, atmosphere gases(nitrogen, oxygen, carbon dioxide are the most important), water, wind, soil.

Detrital Food Web

Biotic Components
The living organisms that are in an ecosystem.

Abiotic components are such physical and chemical factors of an ecosystem as light, temperature, atmosphere gases (nitrogen, oxygen, carbon dioxide are the most important), water, wind, soil.



Biotic Components

The living organisms that are in an ecosystem.

Autotrophs produce their own organic nutrients for themselves and other members of the community; called the **producers**. two kinds of autotrophs, Chemautotrophs are bacteria that obtain energy by oxidizing inorganic compounds such as ammonia, nitrites, and sulfides , and they use this energy to synthesize carbohydrates.

Photoautotrophs are photosynthesizers such as algae and green plants that produce most of the organic nutrients for the biosphere.

Heterotrophs, **consumers** unable to produce, are constantly looking for source of organic nutrients from elsewhere. Herbivores like grass carp graze directly on plants or algae. Carnivores like trout feed on other animals; Omnivores like tilapia feed on plants and animals. **Detritivores** are organisms that rely on detritus, the decomposing particles of organic matter, for food. Earthworms, beetles, termites, and maggots are all terrestrial detritivores.

Nonphotosynthetic bacteria and fungi, including mushrooms, are **decomposers** that carry out decomposition, the breakdown of dead organic matter, including animal waste. Decomposers perform a very valuable service by releasing inorganic substances that are taken up by plants

IRON COMPLEXING

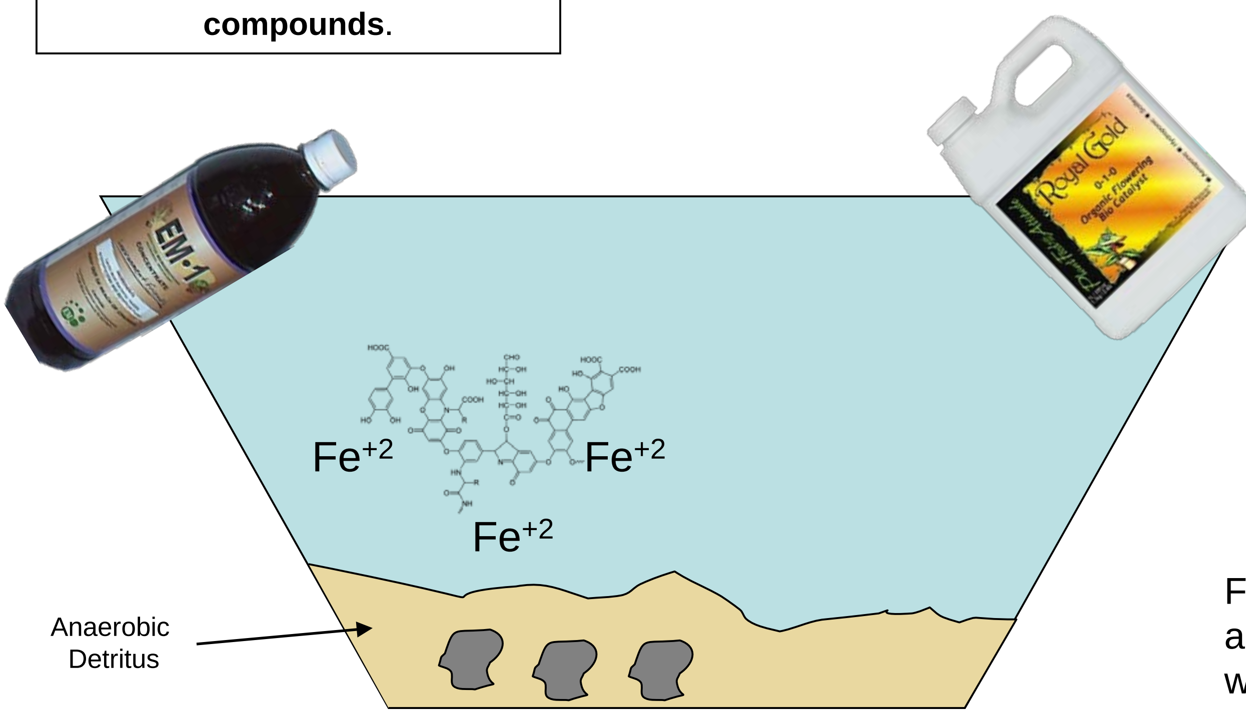
Ferrous iron (Fe^{+2}) is soluble as a cation, ferric iron (Fe^{+3}) is not. However, ferric iron can form soluble complexes with many inorganic and organic ligands

Humic acid, fulvic acid and tannic acid are examples on non-contaminant organic complexes. Phosphate also serves as a very effective complexing agent for iron.

In water systems iron occurs in one of two oxidation states: reduced soluble divalent ferrous iron (Fe^{+2}) or oxidized insoluble trivalent ferric iron (Fe^{+3}). The atmosphere has 21% oxygen, causing most of the iron in shallow water and subsurface soils to be in the oxidized ferric state.

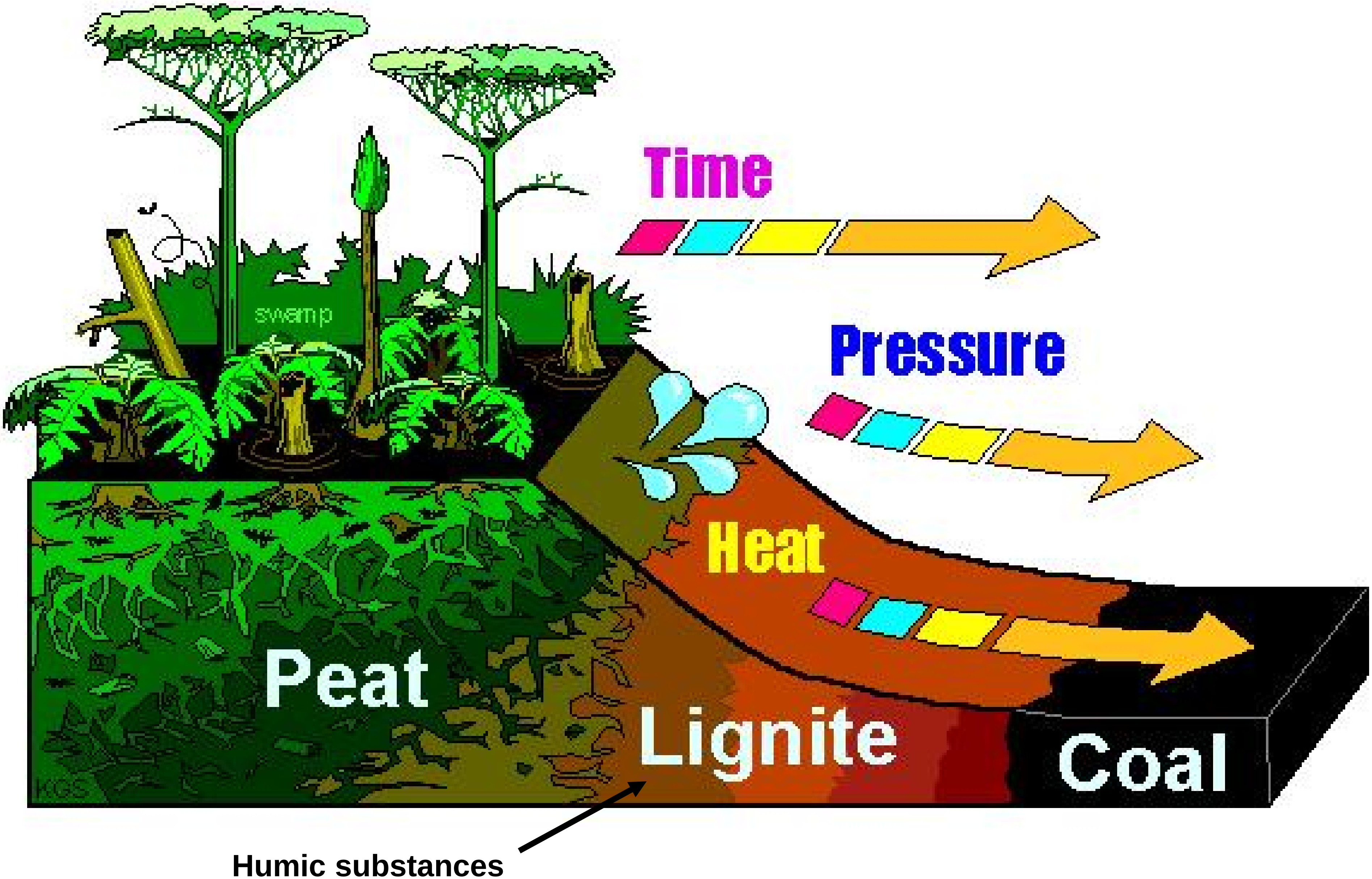
Mineralization

Heterotrophic bacteria consumes fish waste, decaying plant matter and uneaten food, converting all three to ammonia and **other compounds**.



<u>Non toxic Sources of Iron</u>
Laterite, oxisol rocks, oxisol clay mudballs, Cast iron

Fe^{+2} will adsorb to humic and fulvic acids formed in worm castings or with added humic substances



Leonardite is the best source for humic and fulvic acids because its biological activity is much greater than other sources of humic acid. Biologically, humic acids increase production of plant enzymes; act as an organic catalyst in biological processes; stimulate the production of micro-organisms; enhance natural resistance against plant disease and pests; aid in the uptake of nutrients through improved permeability of plant cells; provide building blocks for sugars, amino acids, and chlorophyll; stimulate plant growth by increasing cell division; and improve yields by decreasing plant stress

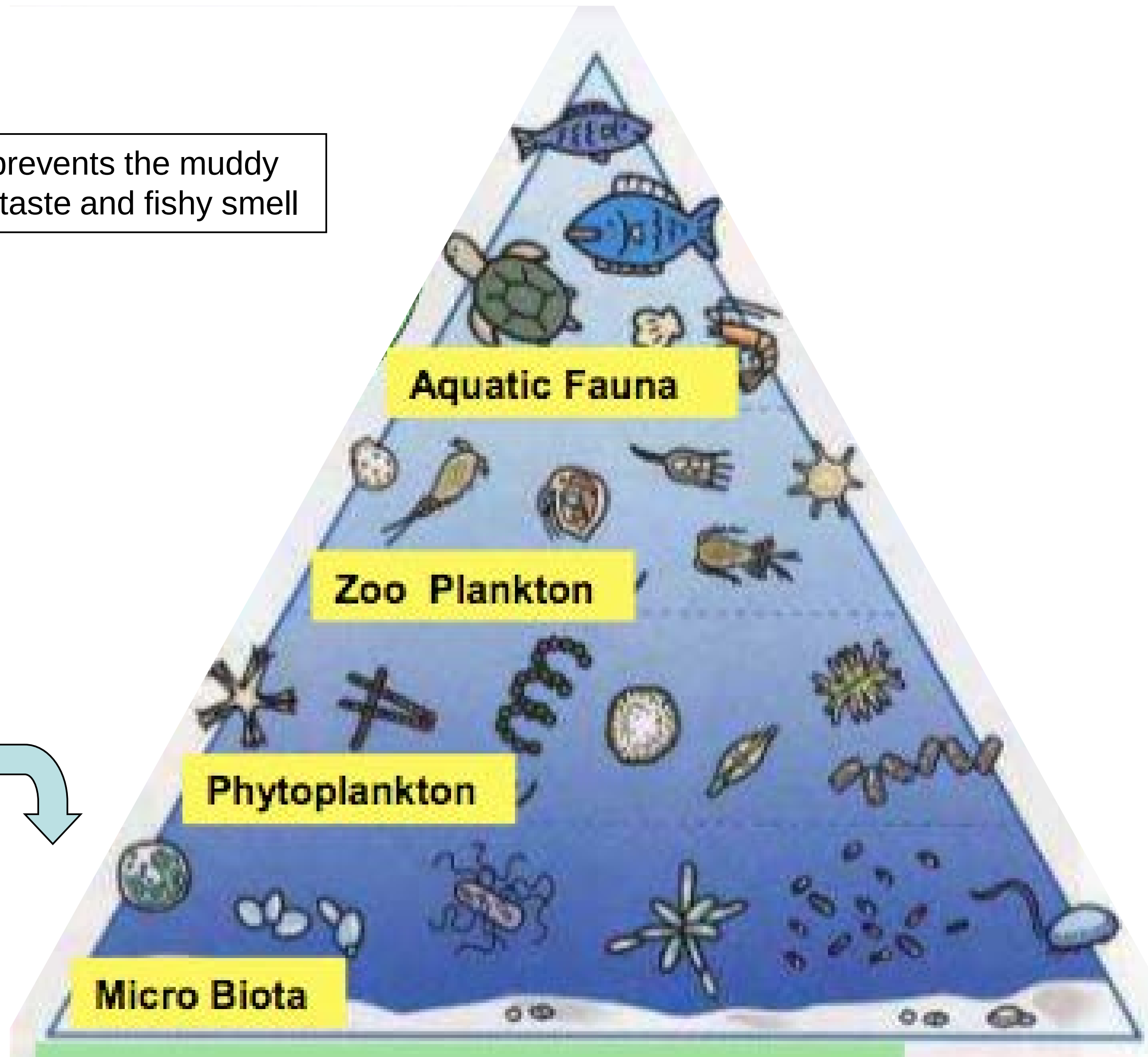
Europonic® FossilFuel® is created from the highest quality humic acids, which provide complex interactions with soils, potting mixes, and organic hydroponic media to promote healthy soils and growing media which in turn helps to produce lush plant growth and expansive root systems.

The humic acids in Europonic® FossilFuel® are derived solely from Leonardite, organic matter that is the result of a long humification process. Research has shown that **Leonardite is the best source for humic and fulvic acids because its biological activity is much greater than other sources of humic acid.**

Biologically, humic acids increase production of plant enzymes; act as an organic catalyst in biological processes; stimulate the production of micro-organisms; enhance natural resistance against plant disease and pests; aid in the uptake of nutrients through improved permeability of plant cells; provide building blocks for sugars, amino acids, and chlorophyll; stimulate plant growth by increasing cell division; and improve yields by decreasing plant stress

The Water Food Web

EM prevents the muddy algae taste and fishy smell



Costing

0.00 3 sacks oxisol or Laterite clay

50.00 1/2 sack Uling (CRH)

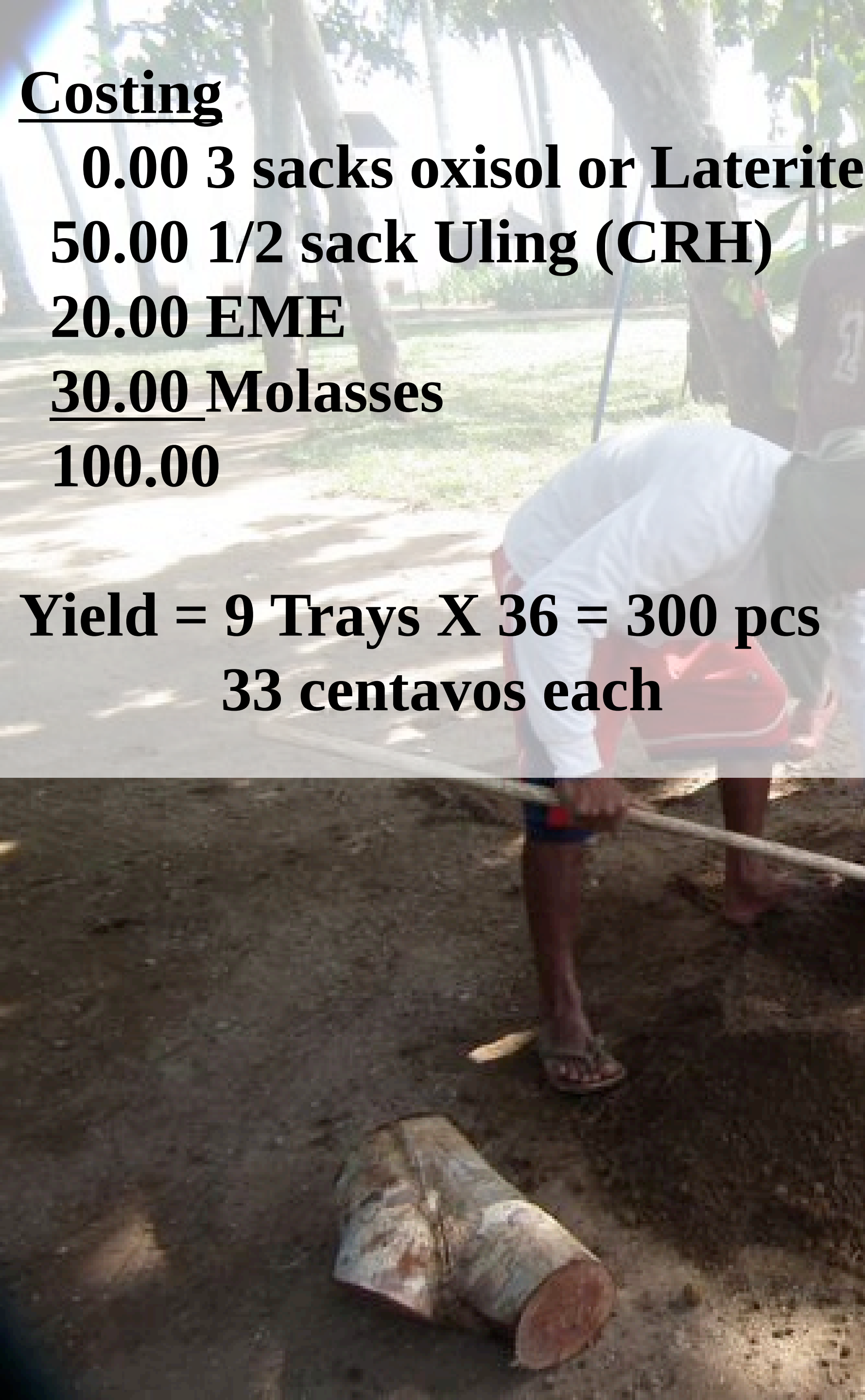
20.00 EME

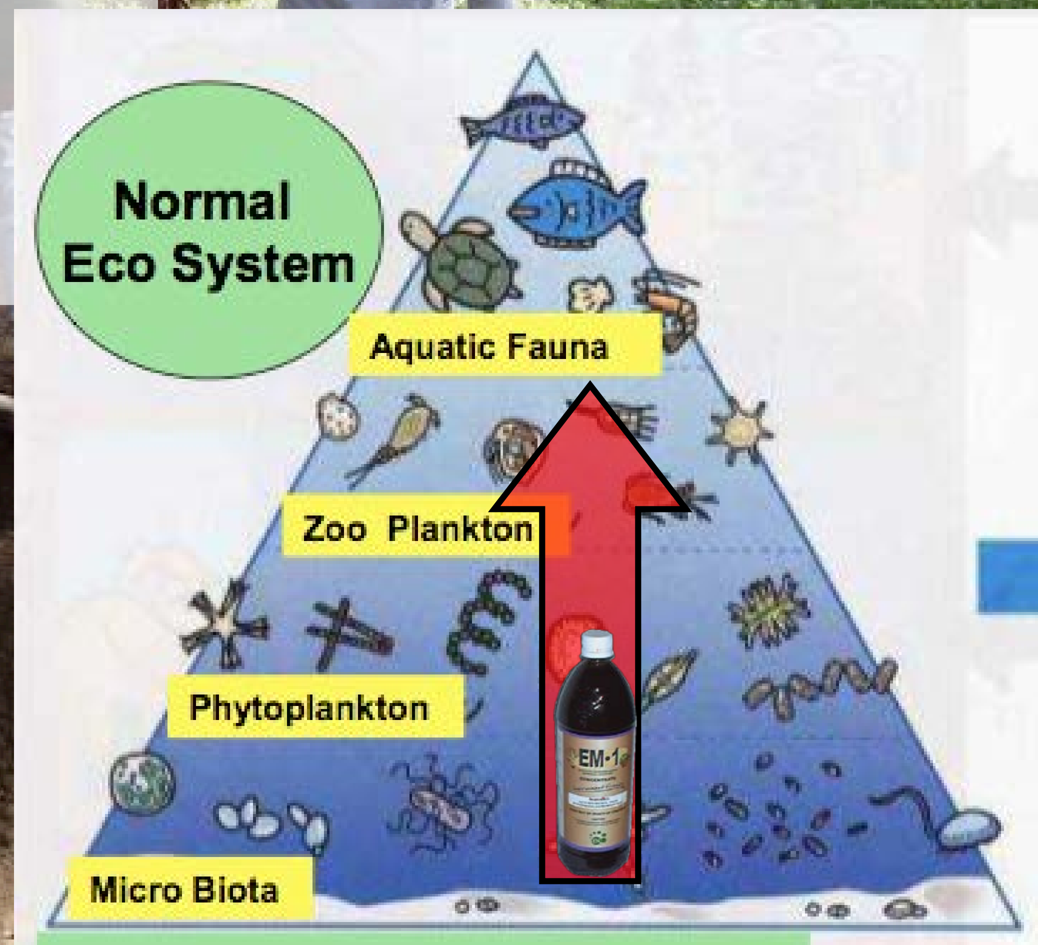
30.00 Molasses

100.00

Yield = 9 Trays X 36 = 300 pcs

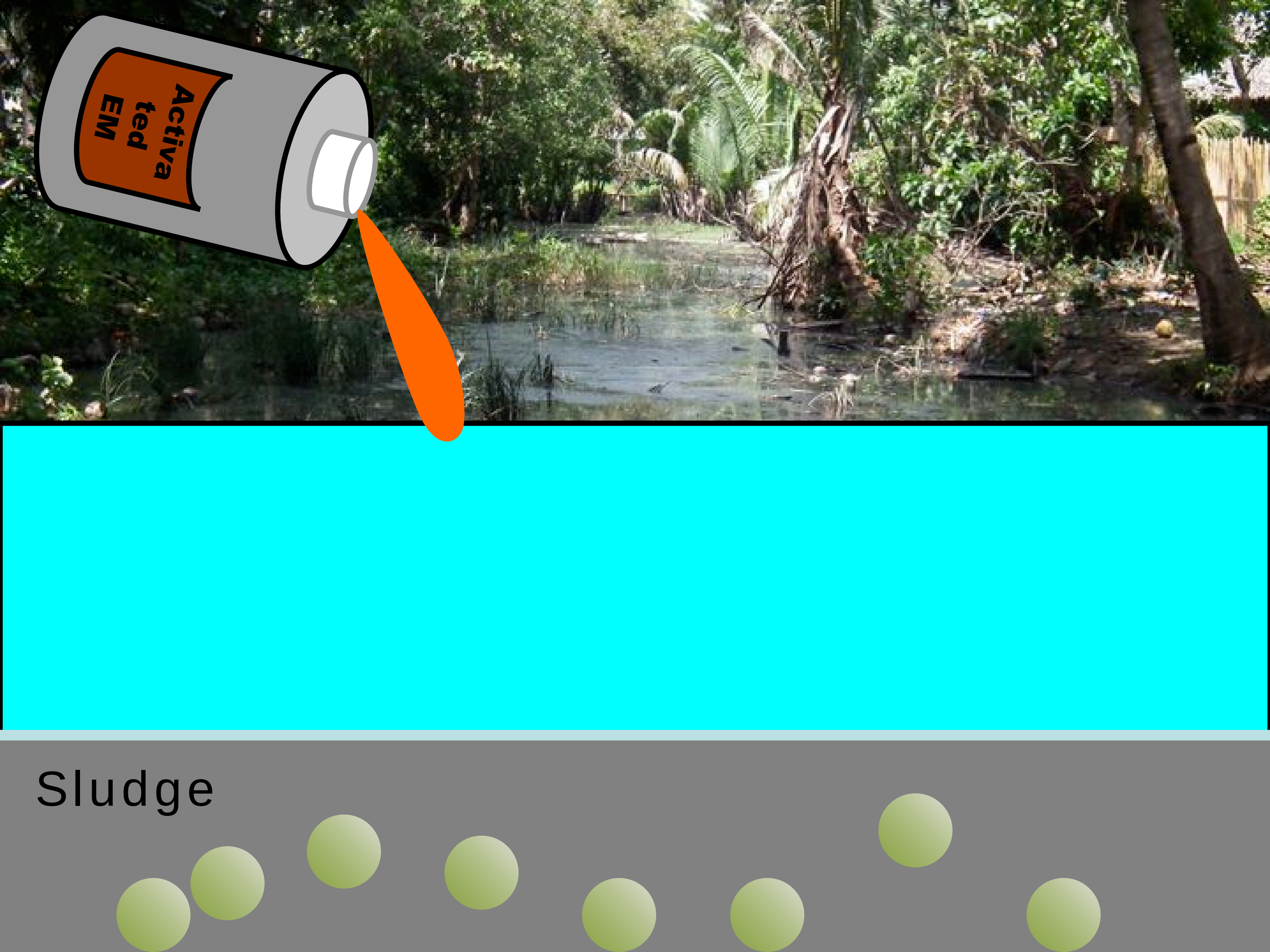
33 centavos each






Water Treatment

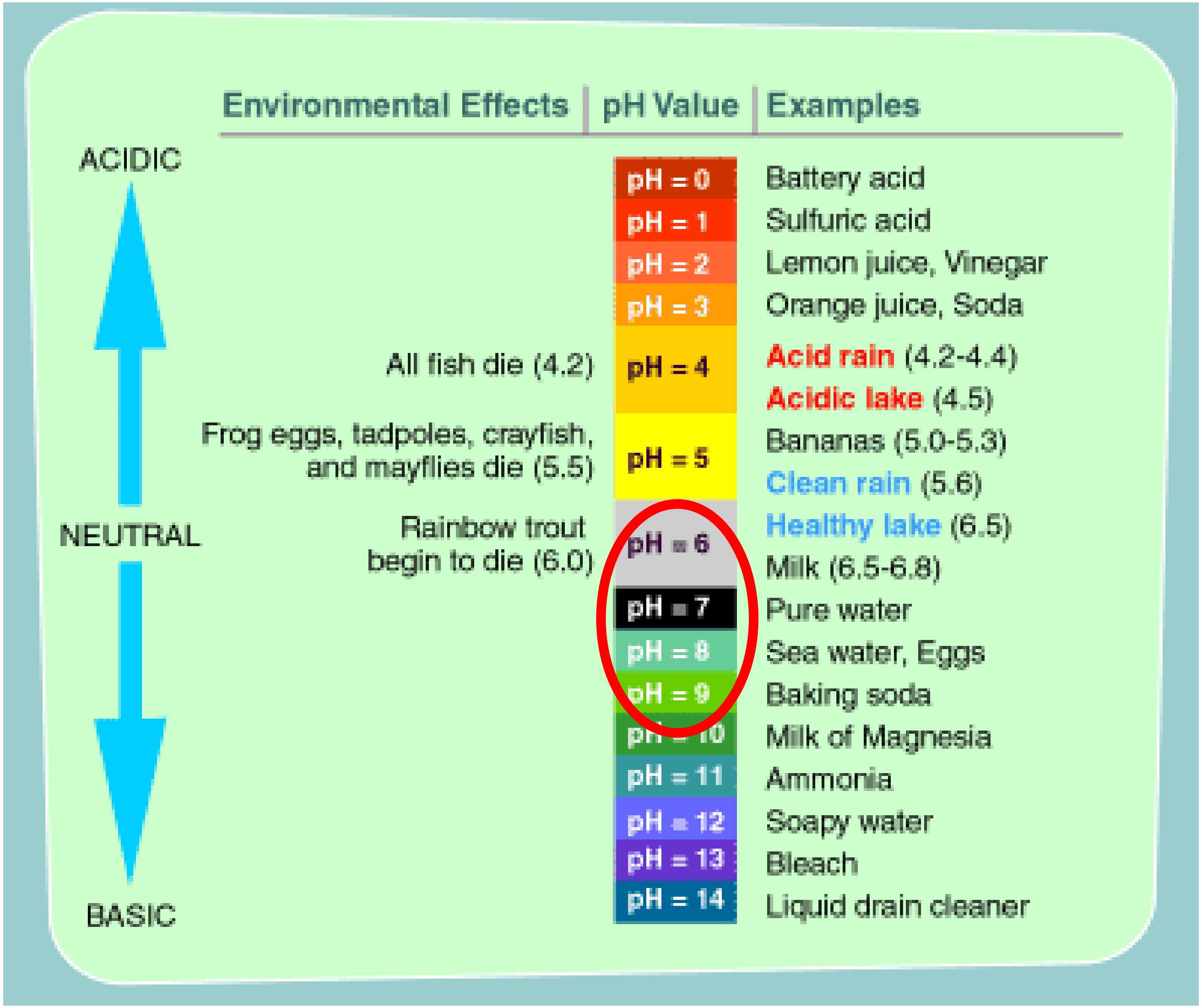

Sludge


Activa
ted
EM
Sludge

Some Water Quality
Monitoring Parameters

Biological Oxygen Demand
Dissolved Oxygen
Turbidity
Ammonia
Nitrate
Nitrite

Properly sized, biodiverse systems are stable and require minimal testing



Environmental Effects
pH Value
Examples
ACIDIC
NEUTRAL
BASIC
pH = 0
Battery acid
pH = 1
Sulfuric acid
pH = 2
Lemon juice, Vinegar
pH = 3
Orange juice, Soda
All fish die (4.2)
pH = 4
Acid rain (4.2-4.4)
Acidic lake (4.5)
Frog eggs, tadpoles, crayfish, and mayflies die (5.5)
pH = 5
Bananas (5.0-5.3)
Clean rain (5.6)
Rainbow trout begin to die (6.0)
pH = 6
Healthy lake (6.5)
Milk (6.5-6.8)
pH = 7
Pure water
pH = 8
Sea water, Eggs
pH = 9
Baking soda
pH = 10
Milk of Magnesia
pH = 11
Ammonia
pH = 12
Soapy water
pH = 13
Bleach
pH = 14
Liquid drain cleaner

The System Overview

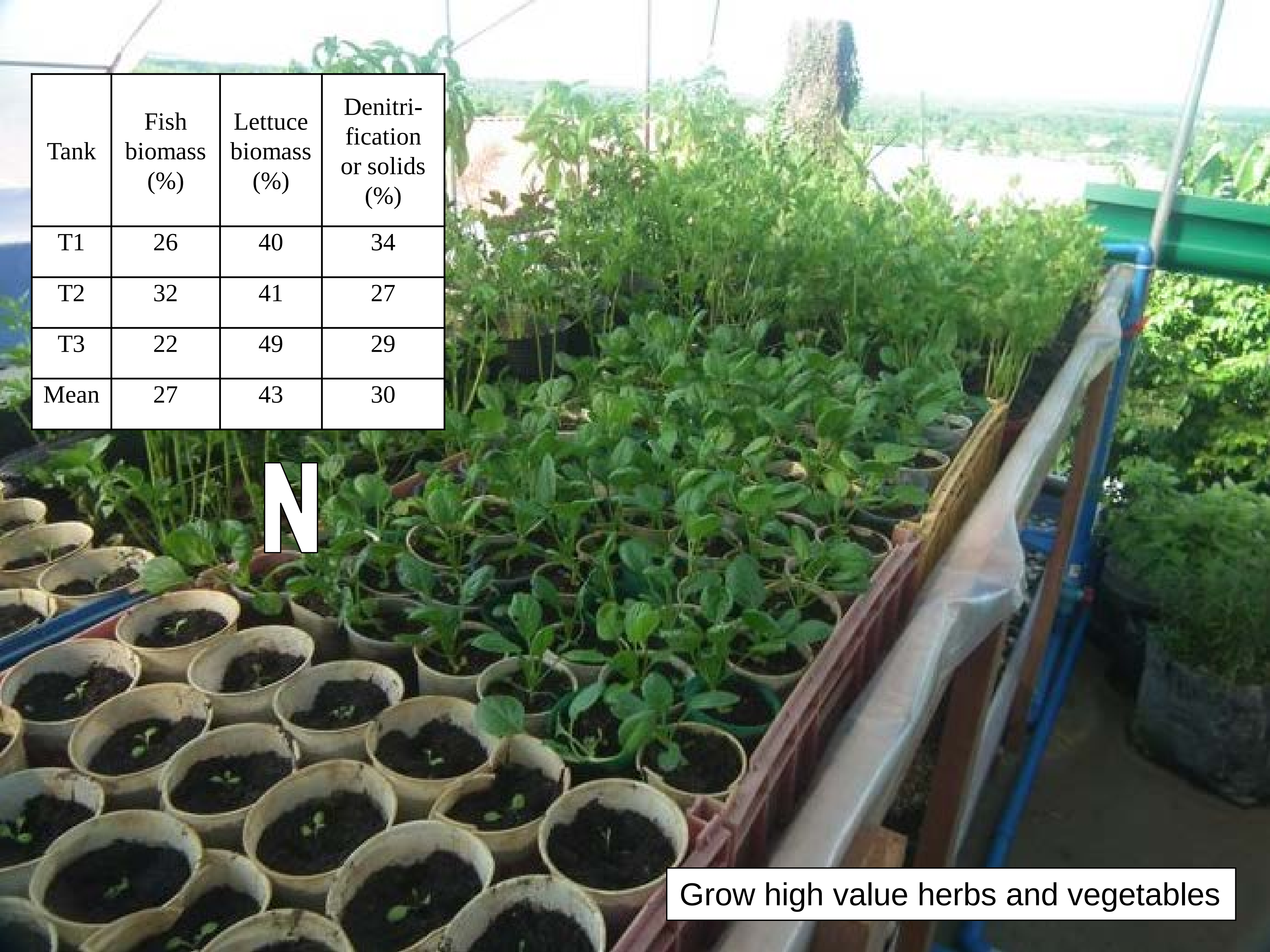
The System Overview
Water Based Plants
(closed loop Recirculating)
Soil Based Plants
(Fish water nutrients)

Red Tilapia

N

Tank	Fish biomass (%)	Lettuce biomass (%)	Denitri-fication or solids (%)
T1	26	40	34
T2	32	41	27
T3	22	49	29
Mean	27	43	30

Tank	Fish biomass (%)	Lettuce biomass (%)	Denitri-fication or solids (%)
T1	26	40	34
T2	32	41	27
T3	22	49	29
Mean	27	43	30



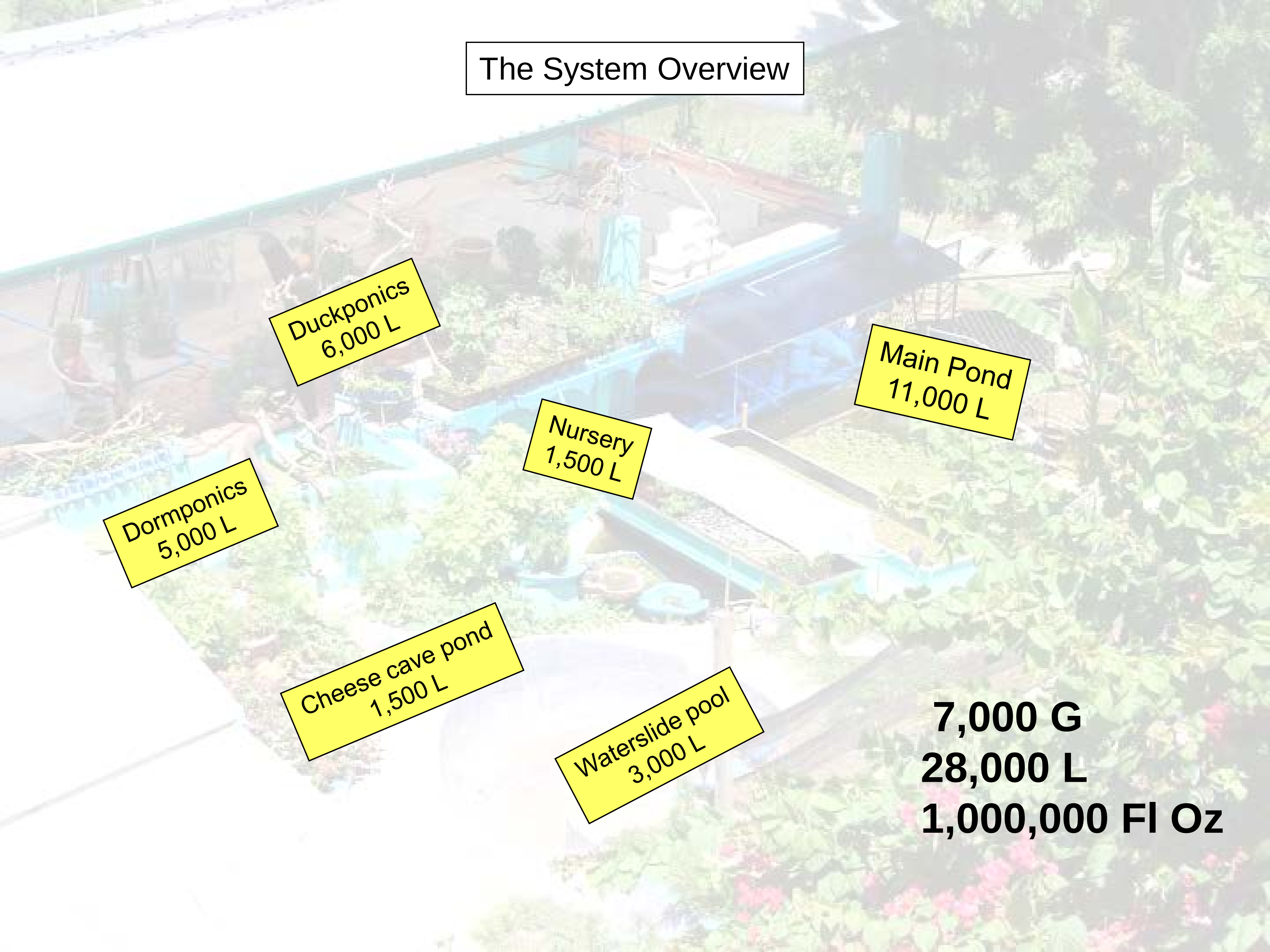
Grow high value herbs and vegetables


Culture profitable fish


Generate your own feed

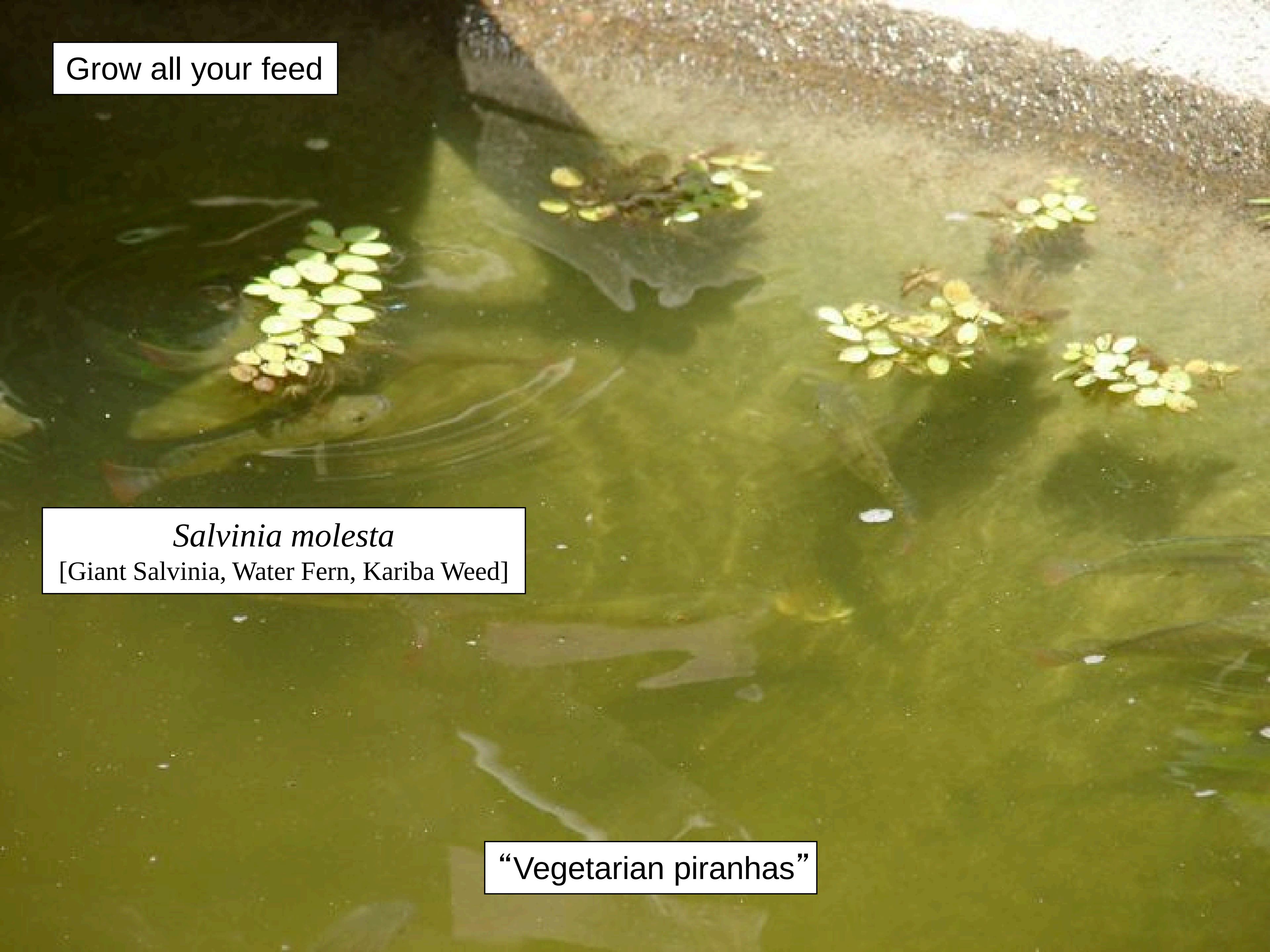

The System Overview
Aquatic Plants
Vetiver grass filter

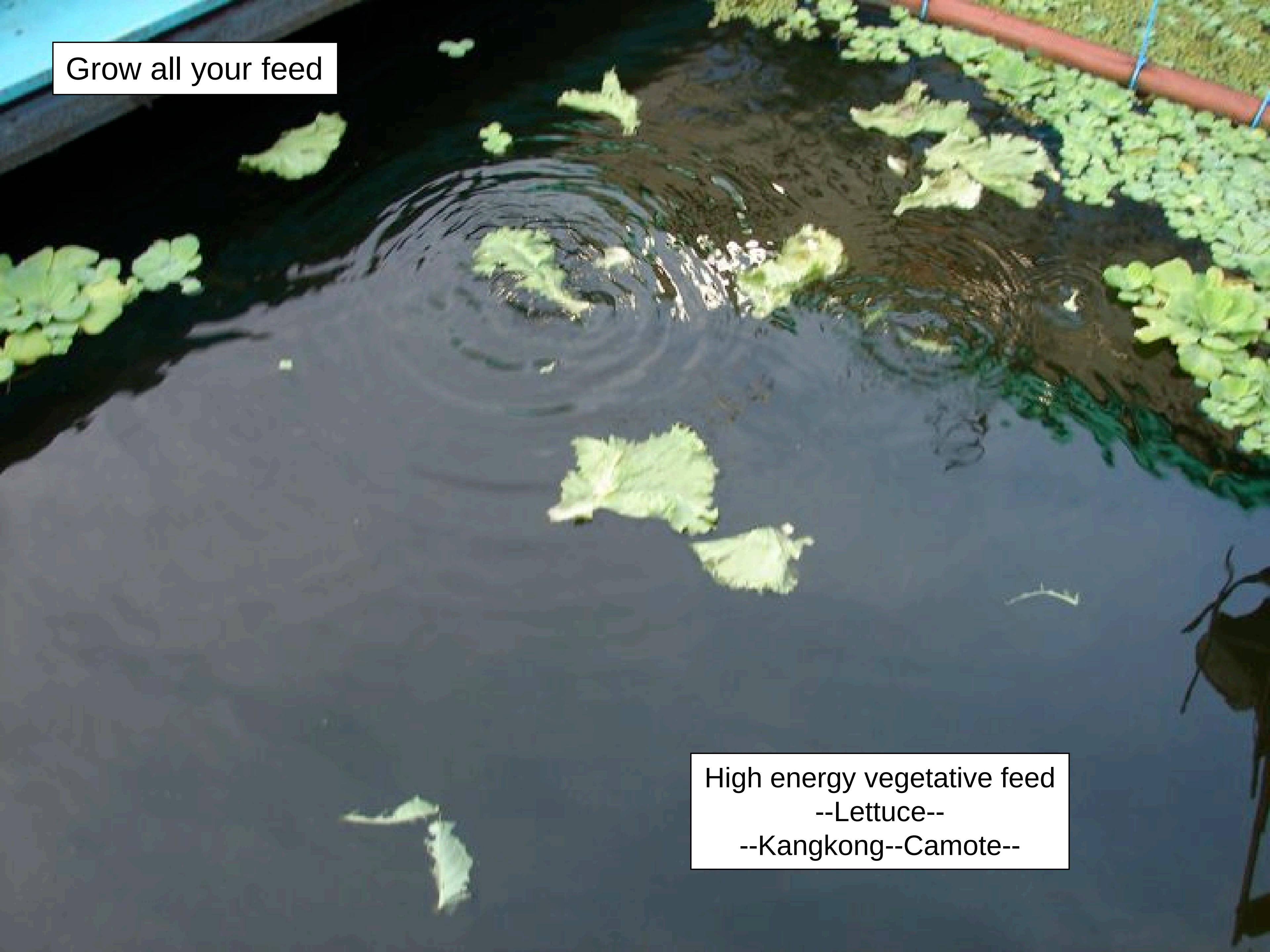
The System Overview



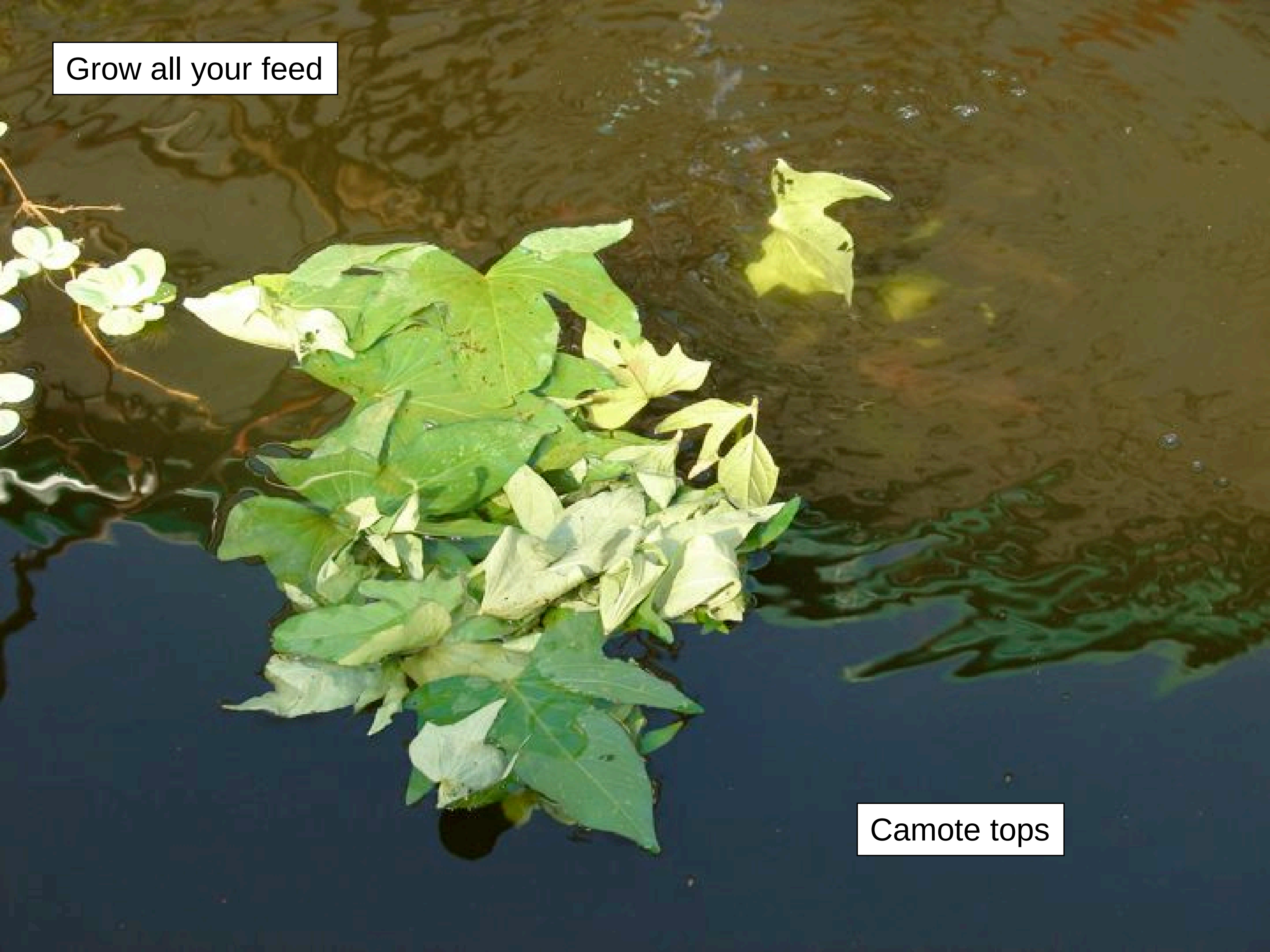
7,000 G
28,000 L
1,000,000 Fl Oz


The System Overview
Safety Rails for children


Grow all your feed
Salvinia molesta
[Giant Salvinia, Water Fern, Kariba Weed]
"Vegetarian piranhas"


Grow all your feed
High energy vegetative feed
--Lettuce--
--Kangkong--Camote--


Grow all your feed
Cosmos


Grow all your feed
Camote tops


The System Overview
Cage culture for ease of harvest


The System Overview
Duck weed for fingerlings


The System Overview
Produce mercury free - soy free - floating feed economically

SOY INFANT FORMULA - BIRTH CONTROL PILLS FOR BABIES

Babies fed soy-based formula have 13,000 to 22,000 times more estrogen compounds in their blood than babies fed milk-based formula. Infants exclusively fed soy formula receive the estrogenic equivalent of at least five birth control pills per day.

Male infants undergo a "testosterone surge" during the first few months of life, when testosterone levels may be as high as those of an adult male. During this period, baby boys are programmed to express male characteristics after puberty, not only in the development of their sexual organs and other masculine physical traits, but also in setting patterns in the brain characteristic of male behavior.

In animals, studies indicate that phytoestrogens in soy are powerful endocrine disrupters. Soy infant feeding—which floods the bloodstream with female hormones that inhibit testosterone—cannot be ignored as a possible cause of disrupted development patterns in boys, including learning disabilities and attention deficit disorder. Male children exposed to DES, a synthetic estrogen, had testes smaller than normal on maturation and infant marmoset monkeys fed soy isoflavones had a reduction in testosterone levels up to 70 percent compared to milk-fed controls.

Almost 15 percent of white girls and 50 percent of African-American girls show signs of puberty, such as breast development and pubic hair, before the age of eight. Some girls are showing sexual development before the age of three. Premature development of girls has been linked to the use of soy formula and exposure to environmental estrogen-mimickers such as PCBs and DDE.

Intake of phytoestrogens even at moderate levels during pregnancy can have adverse affects on the developing fetus and the timing of puberty later in life.

SOY DANGERS SUMMARIZED

High levels of phytic acid in soy reduce assimilation of calcium, magnesium, copper, iron and zinc. Phytic acid in soy is not neutralized by ordinary preparation methods such as soaking, sprouting and long, slow cooking. High phytate diets have caused growth problems in children.

Trypsin inhibitors in soy interfere with protein digestion and may cause pancreatic disorders. In test animals soy containing trypsin inhibitors caused stunted growth.

Soy phytoestrogens disrupt endocrine function and have the potential to cause infertility and to promote breast cancer in adult women.

Soy phytoestrogens are potent antithyroid agents that cause hypothyroidism and may cause thyroid cancer. In infants, consumption of soy formula has been linked to autoimmune thyroid disease.

Vitamin B_{12} analogs in soy are not absorbed and actually increase the body's requirement for B_{12}.

Soy foods increase the body's requirement for vitamin D. Toxic synthetic vitamin D_2 is added to soy milk.

Fragile proteins are over-denatured during high temperature processing to make soy protein isolate and textured vegetable protein.

Processing of soy protein results in the formation of toxic lysinoalanine and highly carcinogenic nitrosamines.

Free glutamic acid or MSG, a potent neurotoxin, is formed during soy food processing and additional amounts are added to many soy foods to mask soy's unpleasant taste.

Soy foods contain high levels of aluminum, which is toxic to the nervous system and the kidneys.

The Weston A. Price Foundation is supported solely by membership contributions and private donations and does not accept funding from the meat or dairy industries.

Soy Alert!

THE WESTON A. PRICE FOUNDATION®

for Wise Traditions

IN FOOD, FARMING AND THE HEALING ARTS

Education • Research • Activism

Soy Alert! is a project of
The Weston A. Price Foundation
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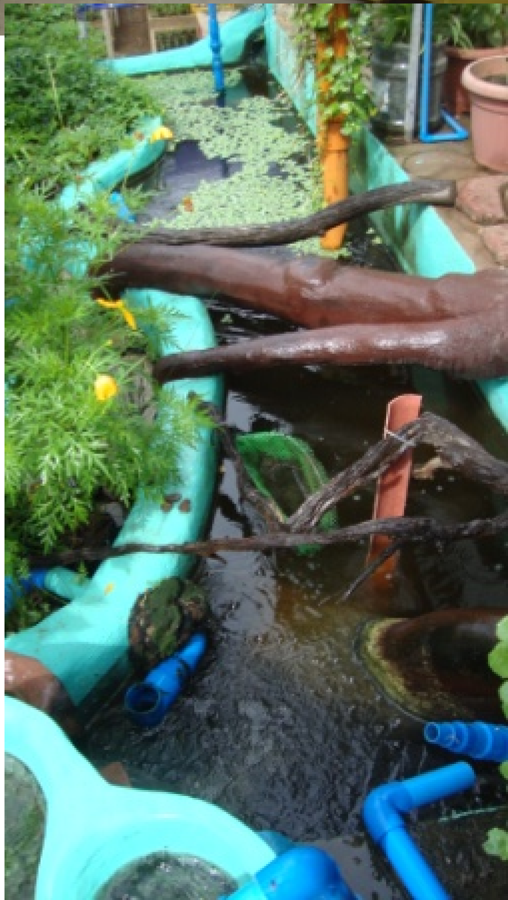
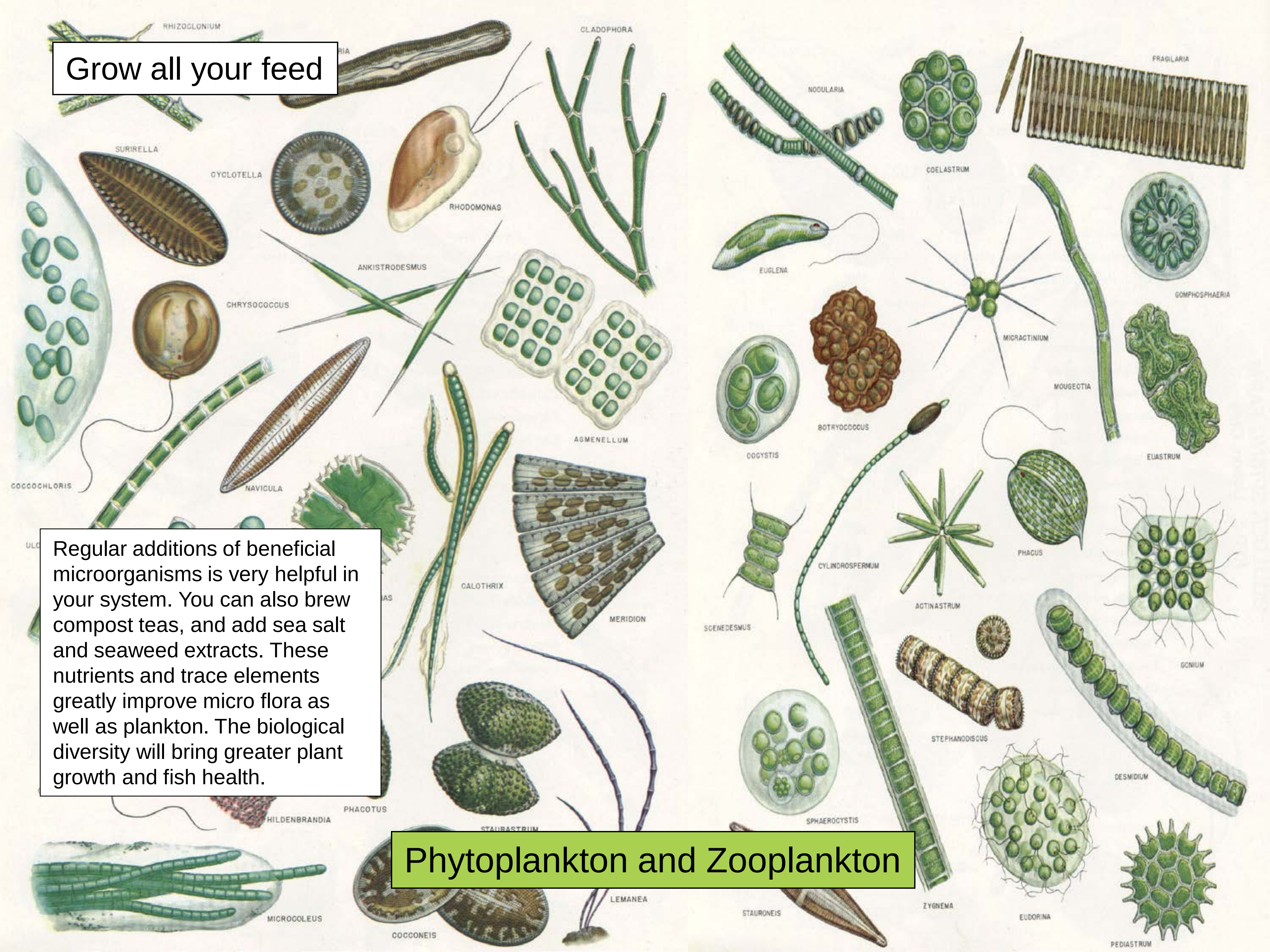
Washington, DC 20016
(202) 363-4394
info@westonaprice.org
www.westonaprice.org

The System Overview



Tank culture for ease of production

Grow all your feed



Regular additions of beneficial microorganisms is very helpful in your system. You can also brew compost teas, and add sea salt and seaweed extracts. These nutrients and trace elements greatly improve micro flora as well as plankton. The biological diversity will bring greater plant growth and fish health.

Phytoplankton and Zooplankton


1/2 kilo Nile Tilapia
25 cm


Settle able solids filtration
Suspended solids filtration


Settle able solids filtration

Suspended solids filtration


Discharge filter

Bottom exit flow- C.H.O.P.s


Raft Method


Raft Method

Raft Method
Duckweed feed

Hanging Raft Method


Hanging Raft Method

Hanging Raft Method


Raft Method
Wick Method
(soil based)

Develop safe reliable system using one pump

- ✓ Utilize gravity
- ✓ Understand head, hp to watts to kwh to cost
- ✓ GFIC required

Understanding dissolved oxygen

- ✓ Venturi
- ✓ Sheeting
- ✓ Use Flow form aeration where ever possible

Understanding filtration

- ✓ Gravel beds for trapping solids and also for additional biofiltration
- ✓ Ebb and flow – Build simple bell siphon prototype
- ✓ Flow through beds
- ✓ NFT- Nutrient film technique
- ✓ Low cost main biofilter

Plants are for

- ✓ Nitrate removal
- ✓ Ammonia removal
- ✓ CO_2 / carbonic acid production

Meet plant fertilizer needs

- ✓ Grow plants in soil if not aquatic
- ✓ Soil based plants - vermicast, cocopeat
- ✓ Dependant on capillary action of potting soil – we have ideal materials

One Pump System Costs

Pump Size to Use at 250V (lph=liters per hour)
750 lph=10.5W
1200lph=14.5W
1500lph=25W
2000lph=48W
3000lph=66W

.1243 kw
125 watts

1/6 hp
3,000 gallons/hr

Convert horsepower to kw
Hp X .746 = kilowatts

Pump Size to Use at 250V (lph=liters per hour)
750 lph=10.5W
1200lph=14.5W
1500lph=25W
2000lph=48W
3000lph=66W

One Pump System Costs

Pump size dictates pond size
Pond size dictates fish carrying capacity
Feed Weight dictates number of filter beds

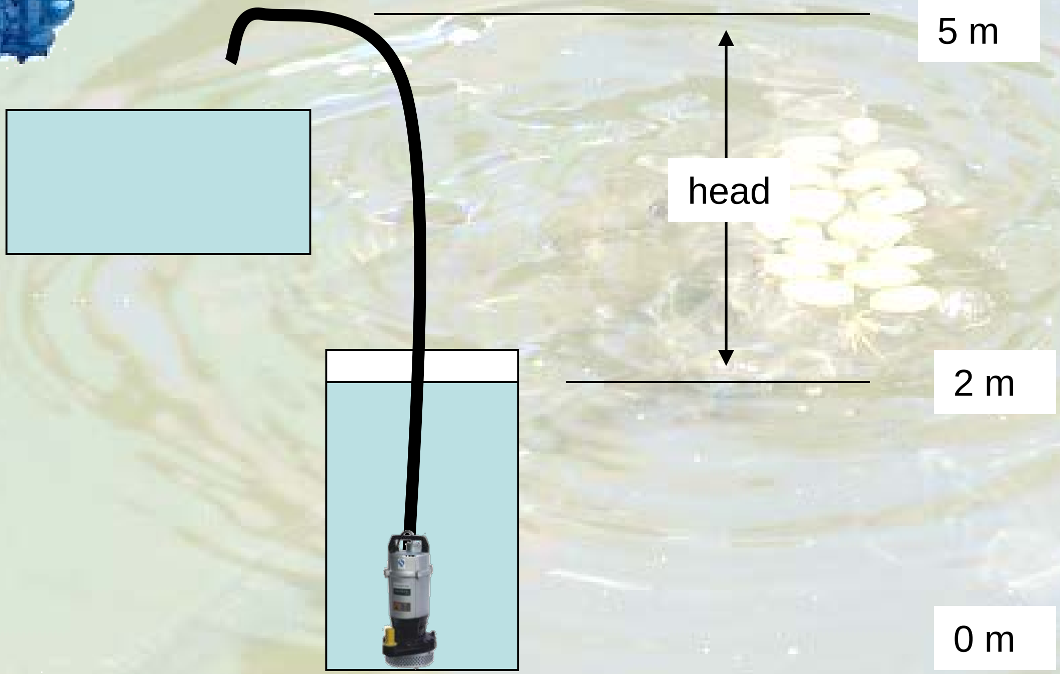
Pump L/hr x 1/2 = pond size x 1 fish/3.8 L (gallon) = critical carrying capacity

Calibrate actual pump flow

1/6 hp
3,000 gallons/hr

One Pump System Costs

Pump Size to Use at 250V (lph=liters per hour)
750 lph=10.5W
1200lph=14.5W
1500lph=25W
2000lph=48W
3000lph=66W



1/6 hp
3,000 gallons/hr

Specifications

	1/3 HP Model BW1033	1/2 HP Model BW1050
GPH @ 0’	3200	4000
GPH @ 10’	2200	2820
Pump diameter	6.2”	6.2”

Pump Size to Use at 250V (lph=liters per hour)
750 lph=10.5W
1200lph=14.5W
1500lph=25W
2000lph=48W
3000lph=66W

One Pump System Costs

Pump	H.P.	Watts	Kw	Kw/ day	P/ kwh	cost/day	Harvest days	Pump Electrical Cost	L/hr @ 0' head	L/hr @ 10' (3m) head	pond size in liters
1/8	0.134	100.0	0.10	2.40	9.00	25.91	120.00	**3,109.28**	3,000	2,400	1,200

1/6 hp
3,000 gallons/hr

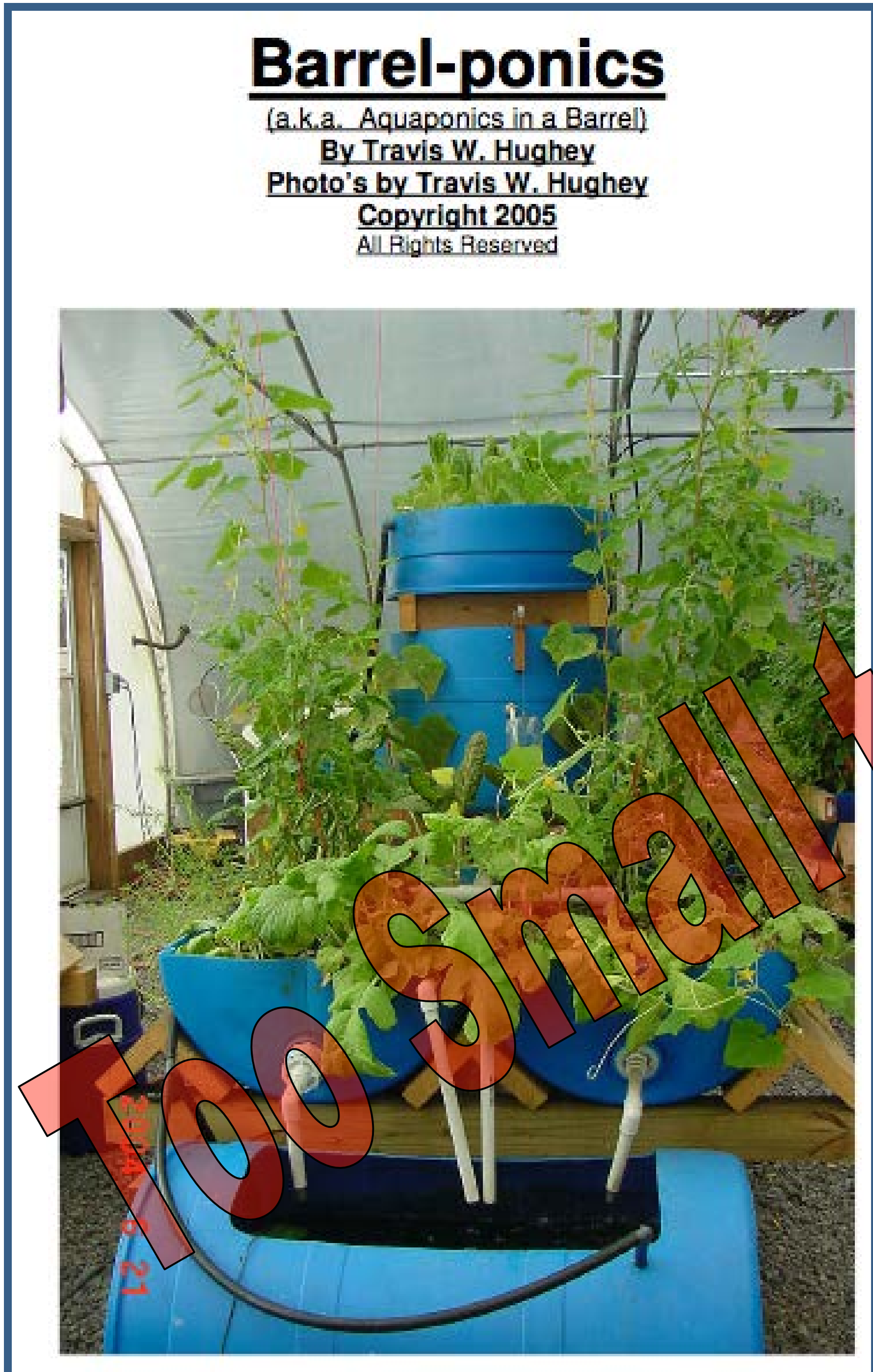
Specifications

	1/3 HP Model BW1033	1/2 HP Model BW1050
GPH @ 0’	3200	4000
GPH @ 10’	2200	2820
Pump diameter	6.2”	6.2”

24 hours Large Flow Gardening Pumps
Non-clogging Vortex type

Liquid temperature : 0 °C to 40 °C / +32 °F to +104 °F
HP range : 1/5 to 1HP / 150 W to 750 W
pH : 6 to 8
Protection class : IP68
Maximum immersion depth : 6M
Solid pass : 6.5mm equipped with our strainers.
For horizontal & vertical usage.

Vertical Use



Too Small to be Stable

1.5 barrels X 200L = 300 L


Extra
Head
Too Small to be Stable


Atlanta, Georgia
Too Small to be Stable

IBC Tote Liquid

1.000 liters

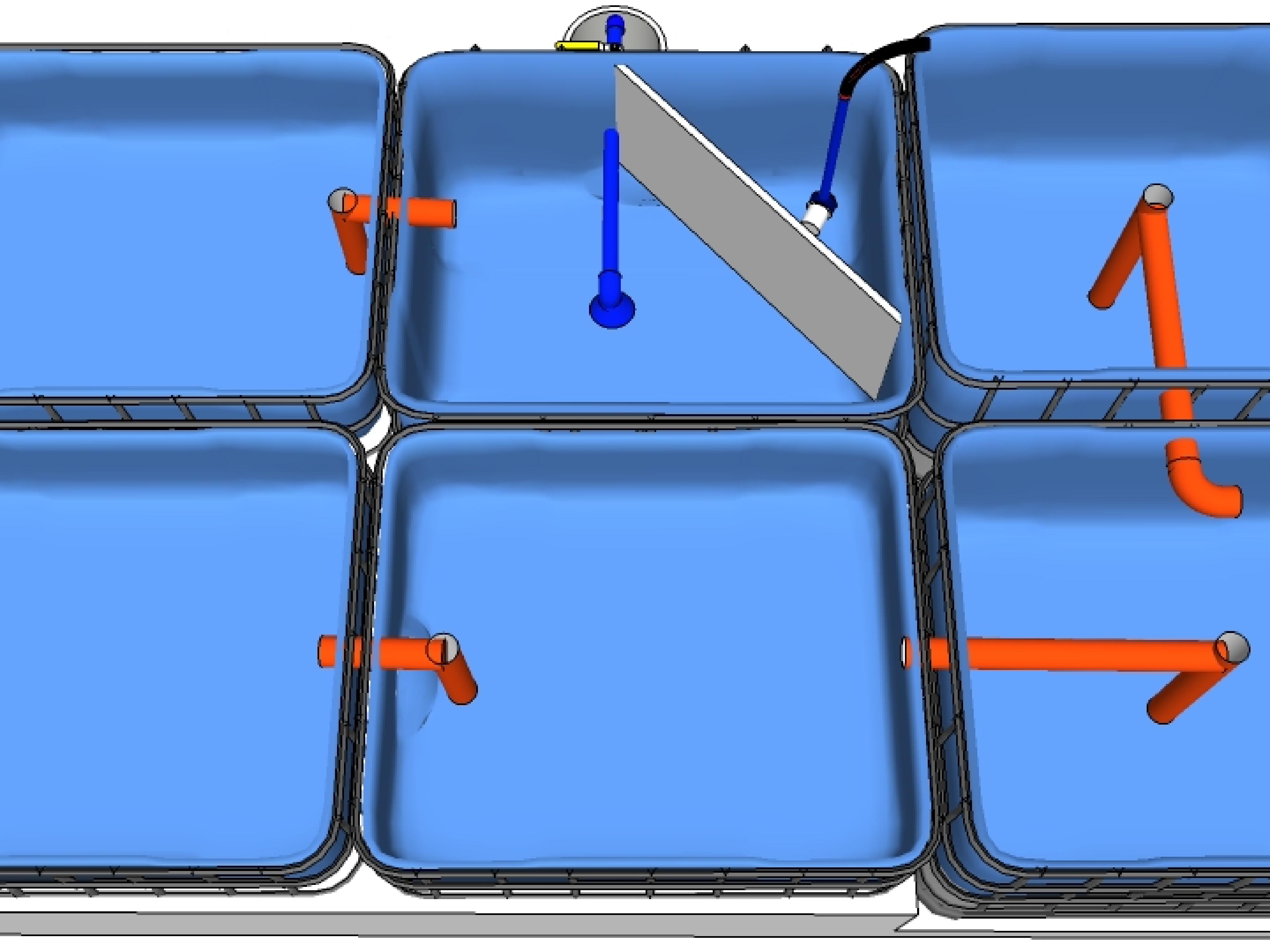
500 liters for fish and 300 liters grow bed

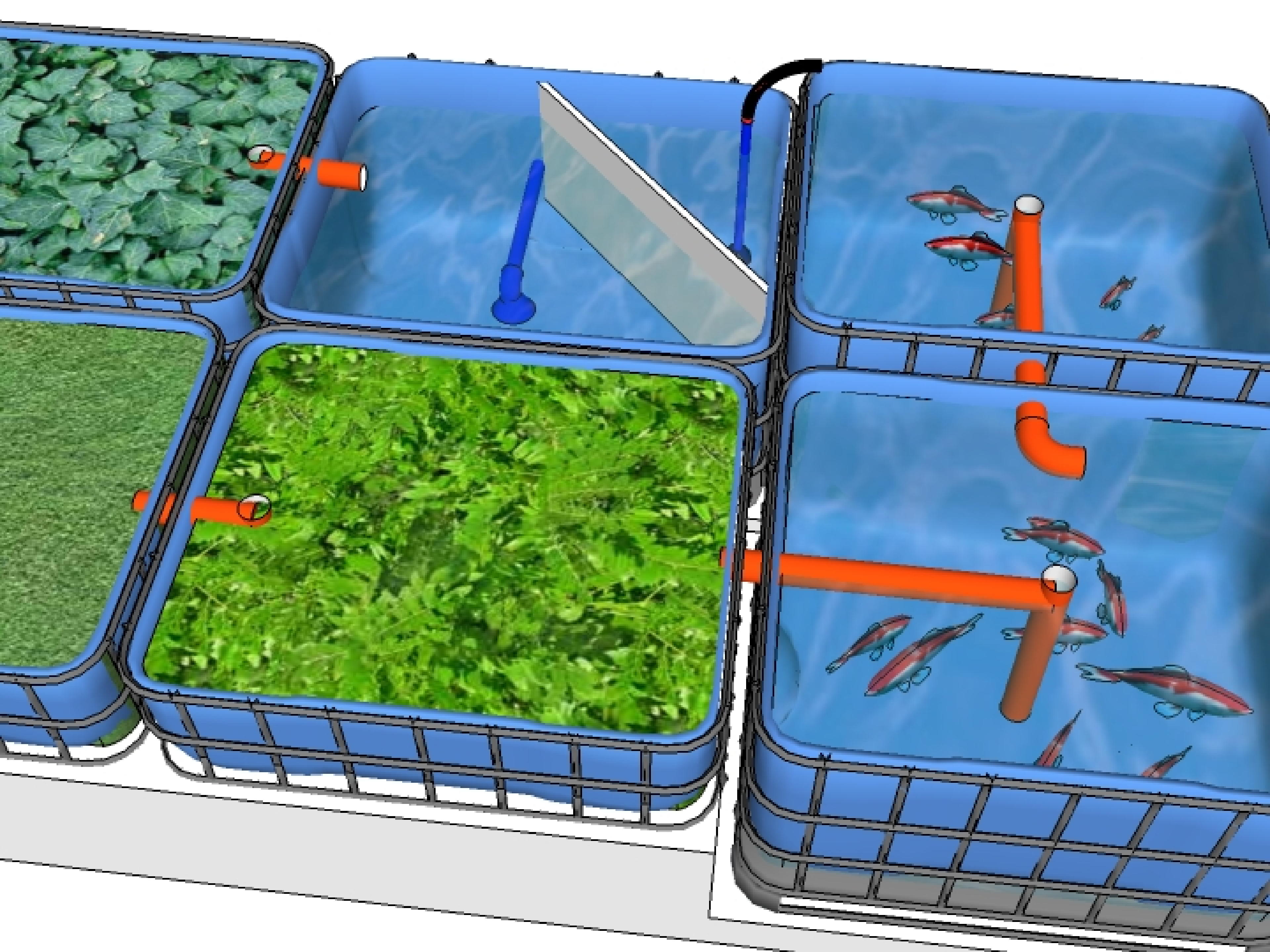
International Bulk Container

IBC Tote Liquid

1,000 liters

1,000 liters water minimum for a stable system!





1,000 liters water minimum for a stable system!

Pump Size to Use at 250V (lph=liters per hour)
750 lph=10.5W
1200lph=14.5W
1500lph=25W
2000lph=48W
3000lph=66W

One Pump System Costs

Based on average Philippine Power rates

Pump	H.P.	Watts	Kw	Kw/ day	P/ kwh	cost/day	Harvest days	Pump Electrical Cost	L/hr @ 0' head	L/hr @ 10' (3m) head	pond size in liters
1/8	0.134	100.0	0.10	2.40	9.00	25.91	120.00	3,109.28	3,000	2,400	1,200

stocking rate	harvest wt	harvest in kilos	sale peso/ kilo	fish income	beds	income/ bed	vege income	profit
316	0.33	105	80	8,412.63	2.4	1,333.00	3,199.20	8,502.55

1/8 hp
3,000 gallons/hr

Specifications

	1/3 HP Model BW1033	1/2 HP Model BW1050
GPH @ 0’	3200	4000
GPH @ 10’	2200	2820
Pump diameter	6.2”	6.2”

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1/6	0.167	124.6	0.12	2.99	9.00	32.29	120.00	**3,875.00**	11,400	9,120	4,560
1/4	0.250	186.5	0.19	4.48	9.00	48.34	120.00	**5,800.90**	17,000	13,600	6,800
1/3	0.333	248.4	0.25	5.96	9.00	64.39	120.00	**7,726.79**	22,000	17,600	8,800
1/2	0.500	373.0	0.37	8.95	9.00	96.68	120.00	**11,601.79**	30,400	24,320	12,160
1	1.000	746.0	0.75	17.90	9.00	193.36	120.00	**23,203.58**	60,800	48,640	24,320

1/6 hp
3,000 gallons/hr

Specifications

	1/3 HP Model BW1033	1/2 HP Model BW1050
GPH @ 0’	3200	4000
GPH @ 10’	2200	2820
Pump diameter	6.2”	6.2”

Pump Size to Use at 250V (lph=liters per hour)
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316	0.33	105	80	**8,412.63**	2.4	1,333.00	**3,199.20**	**8,502.55**
1200	0.33	400	80	**31,968.00**	9.1	1,333.00	**12,156.96**	**40,249.96**
1789	0.33	596	80	**47,671.58**	13.6	1,333.00	**18,128.80**	**59,999.48**
2316	0.33	771	80	**61,692.63**	17.6	1,333.00	**23,460.80**	**77,426.64**
3200	0.33	1,066	80	**85,248.00**	24.3	1,333.00	**32,418.56**	**106,064.77**
6400	0.33	2,131	80	**170,496.00**	48.6	1,333.00	**64,837.12**	**212,129.54**

1/6 hp
3,000 gallons/hr

Specifications

	1/3 HP Model BW1033	1/2 HP Model BW1050
GPH @ 0’	3200	4000
GPH @ 10’	2200	2820
Pump diameter	6.2”	6.2”

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750 lph=10.5W
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One Pump System

Solar/wind Success – store your wattage for rainy days

- ✓ Low head
- ✓ Must be RELIABLE!
- ✓ Inexpensive storage and delivery of power
- ✓ Step up power to industry efficient 220v water pumps and air blower

  Or
- ✓ Find efficient 12v water pumps and air blowers

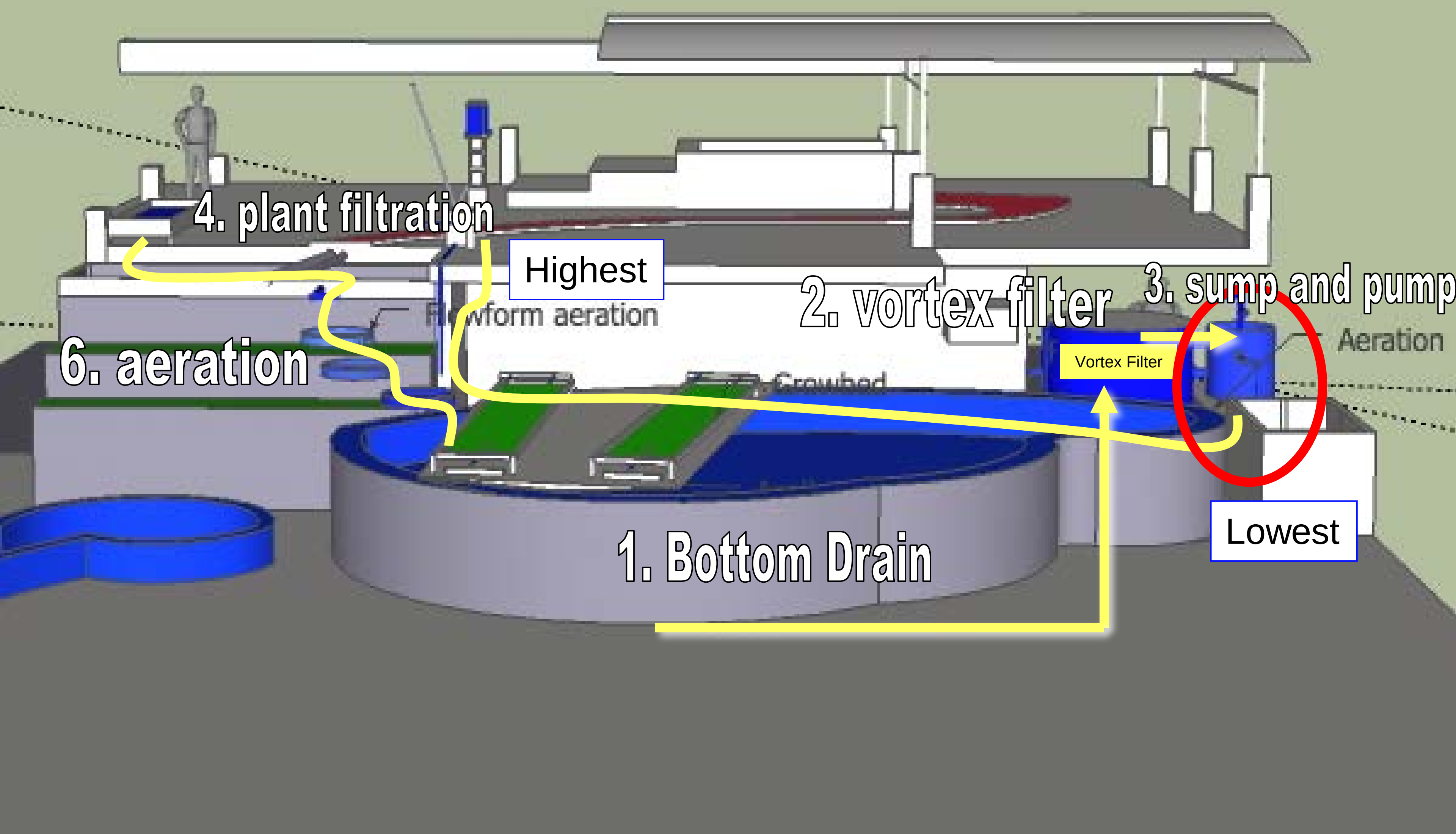
  (harder to find in developing countries)

(batteries do not last long in the tropics)

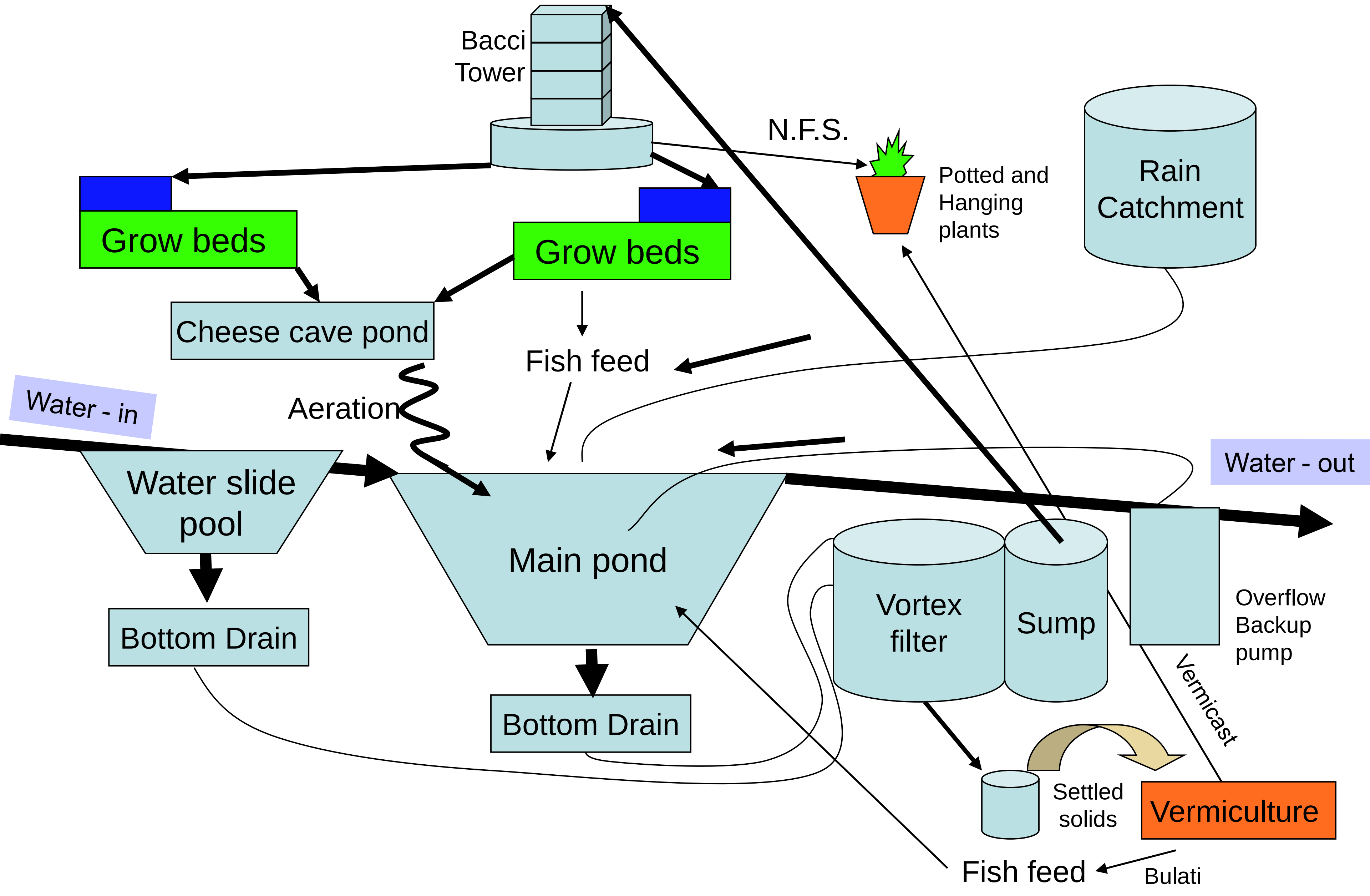
220v 150 watt aquarium pump

220v 150 watt aquarium pump

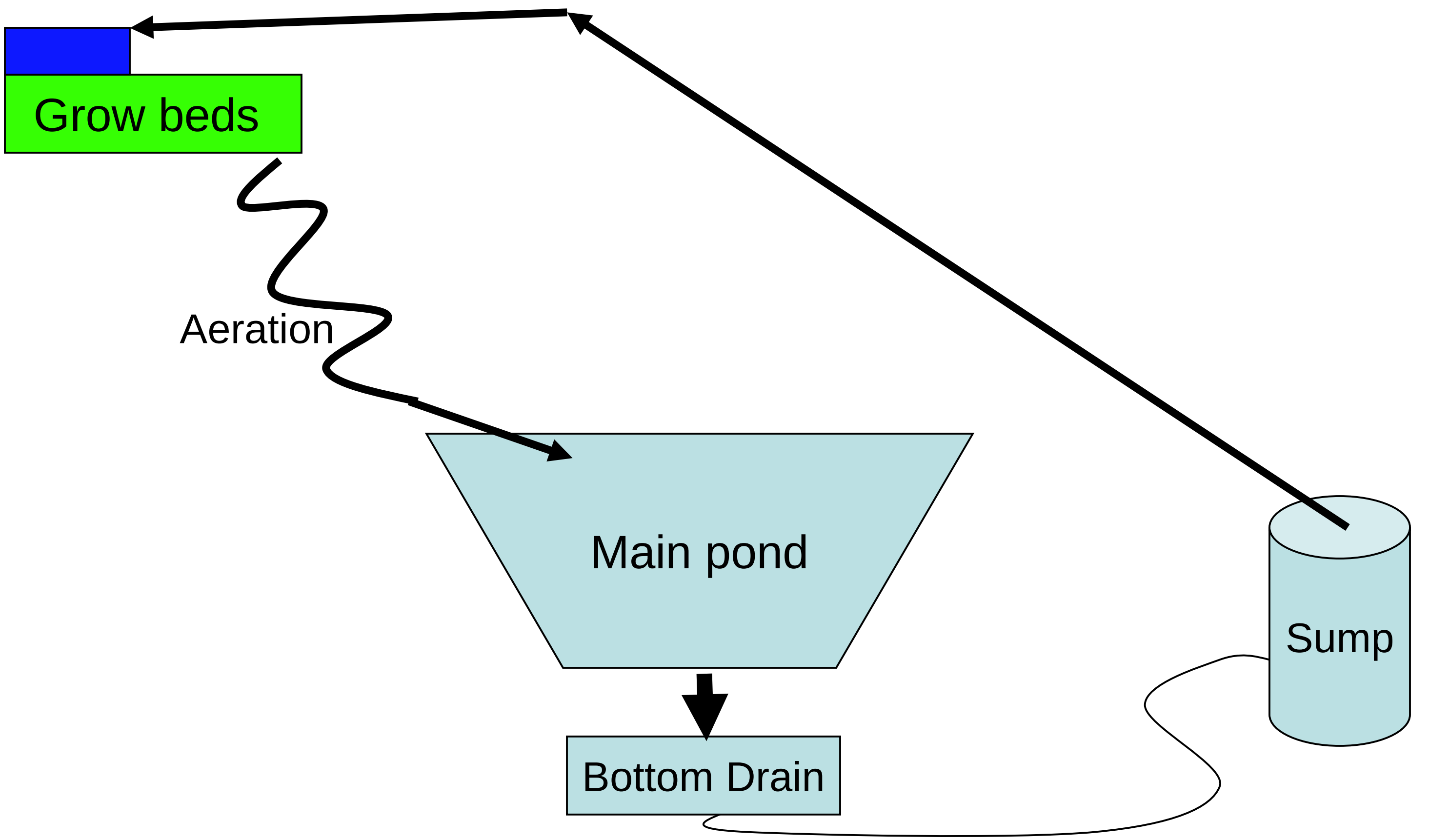
Efficient One Pump Recirculating Closed Loop System



Efficient One Pump Recirculating Closed Loop System

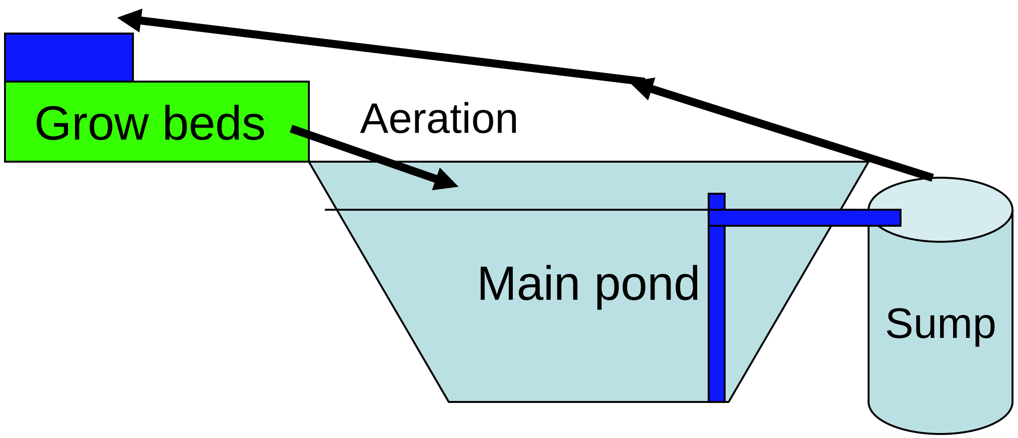


Efficient One Pump Recirculating Closed Loop System



Efficient One Pump Recirculating Closed Loop System

CHOPS



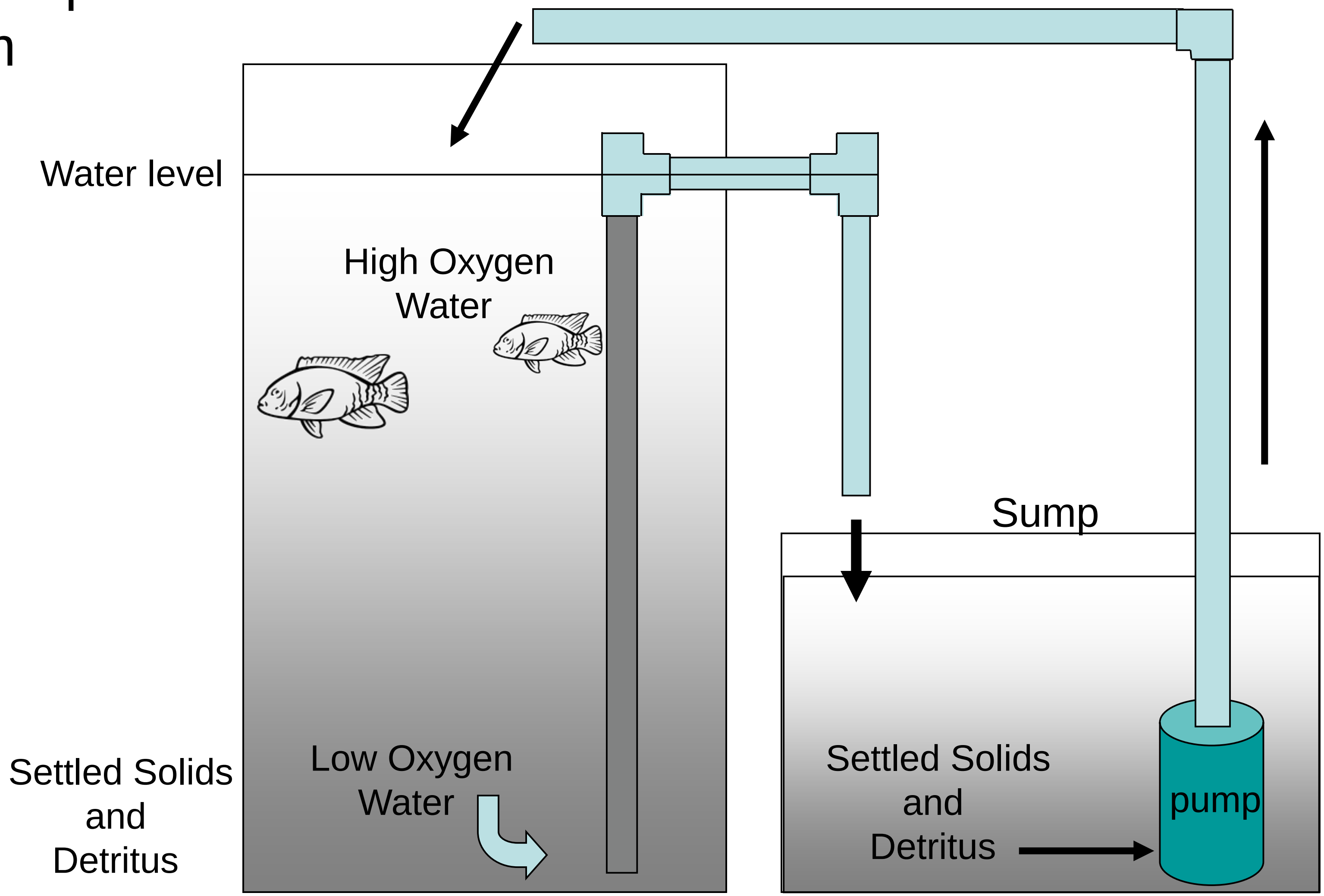
Lift water extra high to generate electricity off a dynamo?

Watts spent lifting water will be greater than watts generated

C.H.O.P.S.

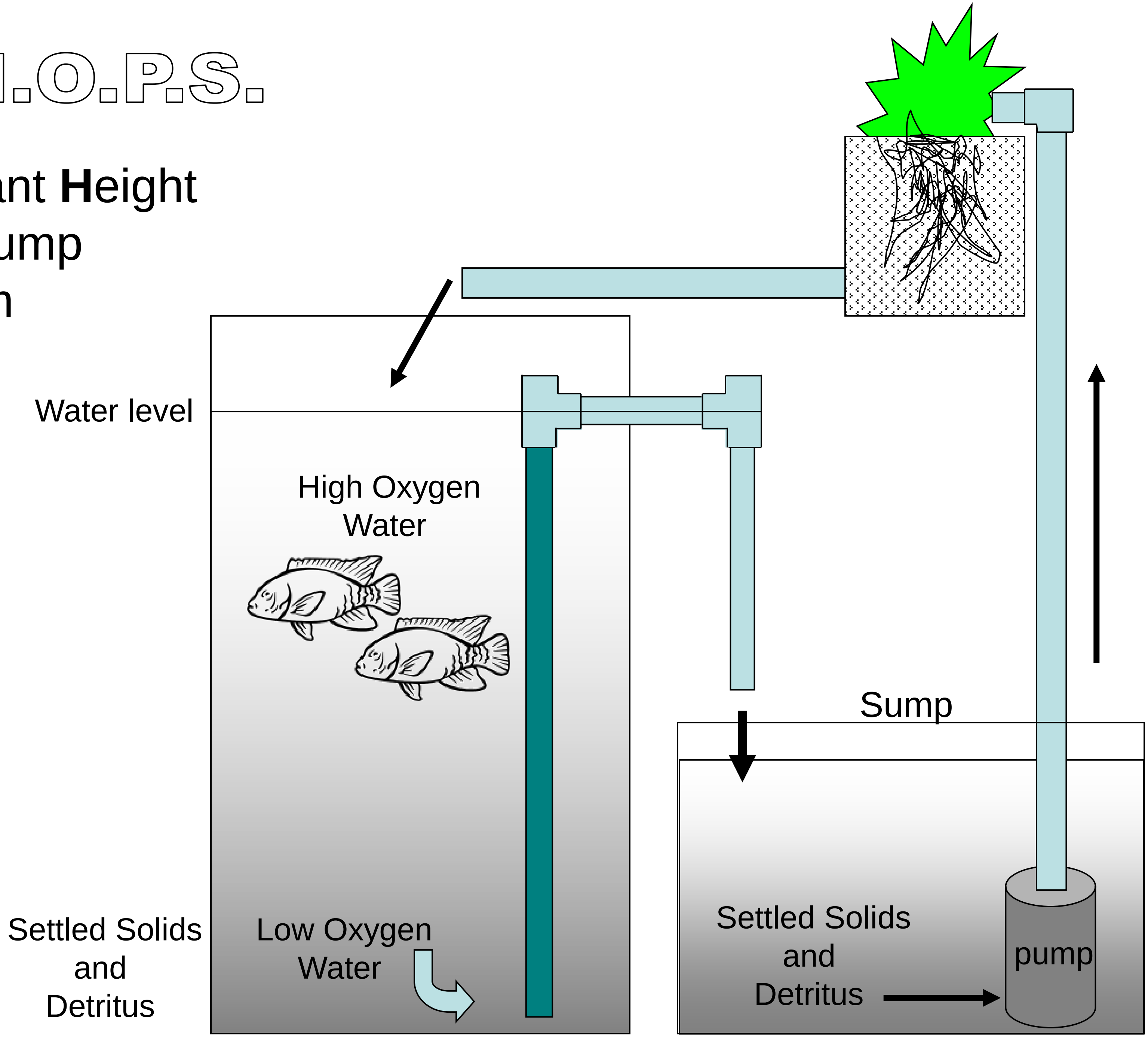
Constant **H**eight
One **P**ump
System

Culture Types
Tank
Pond
Cage



C.H.O.P.S.

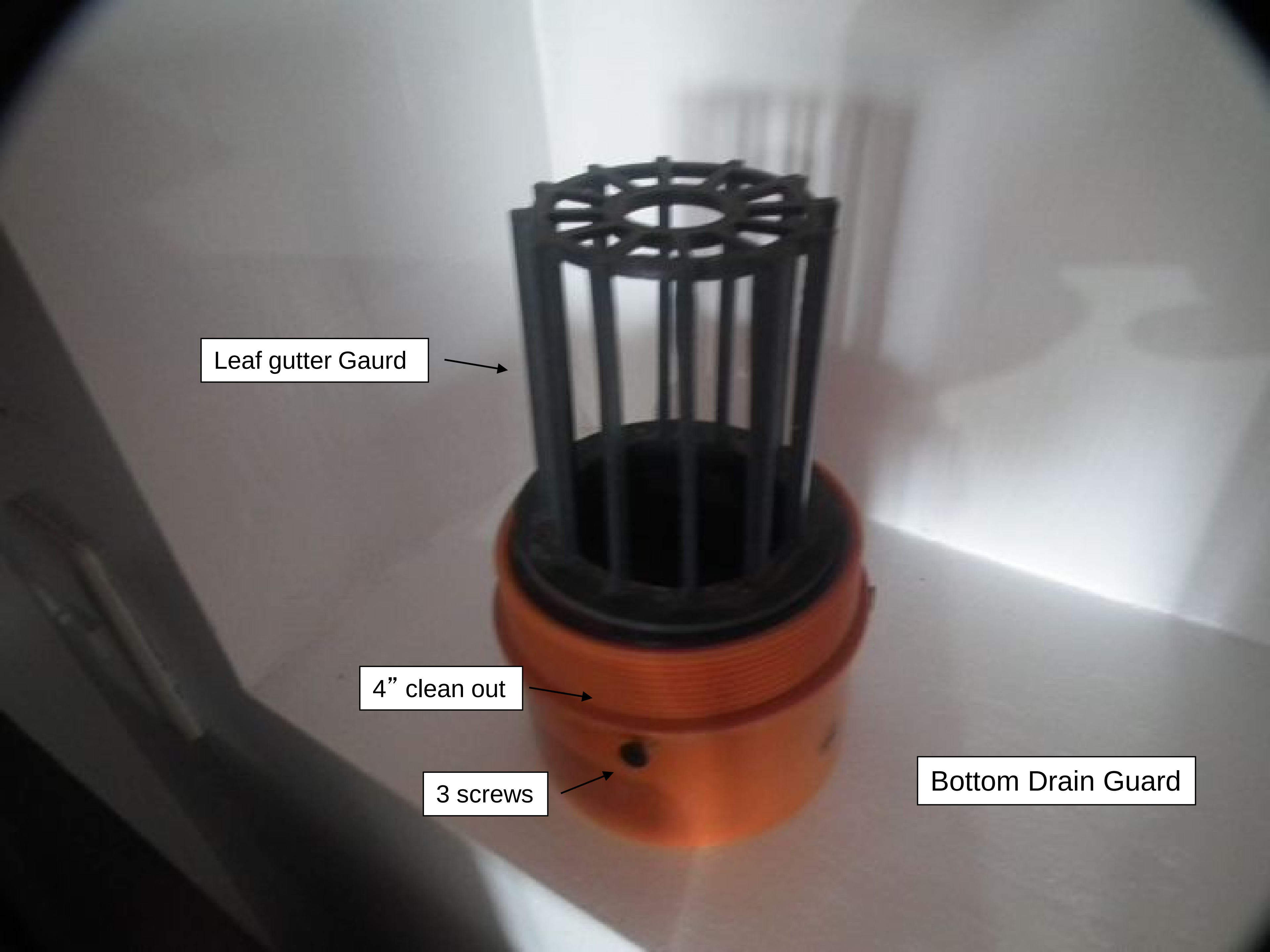
Constant **H**eight
One **P**ump
System

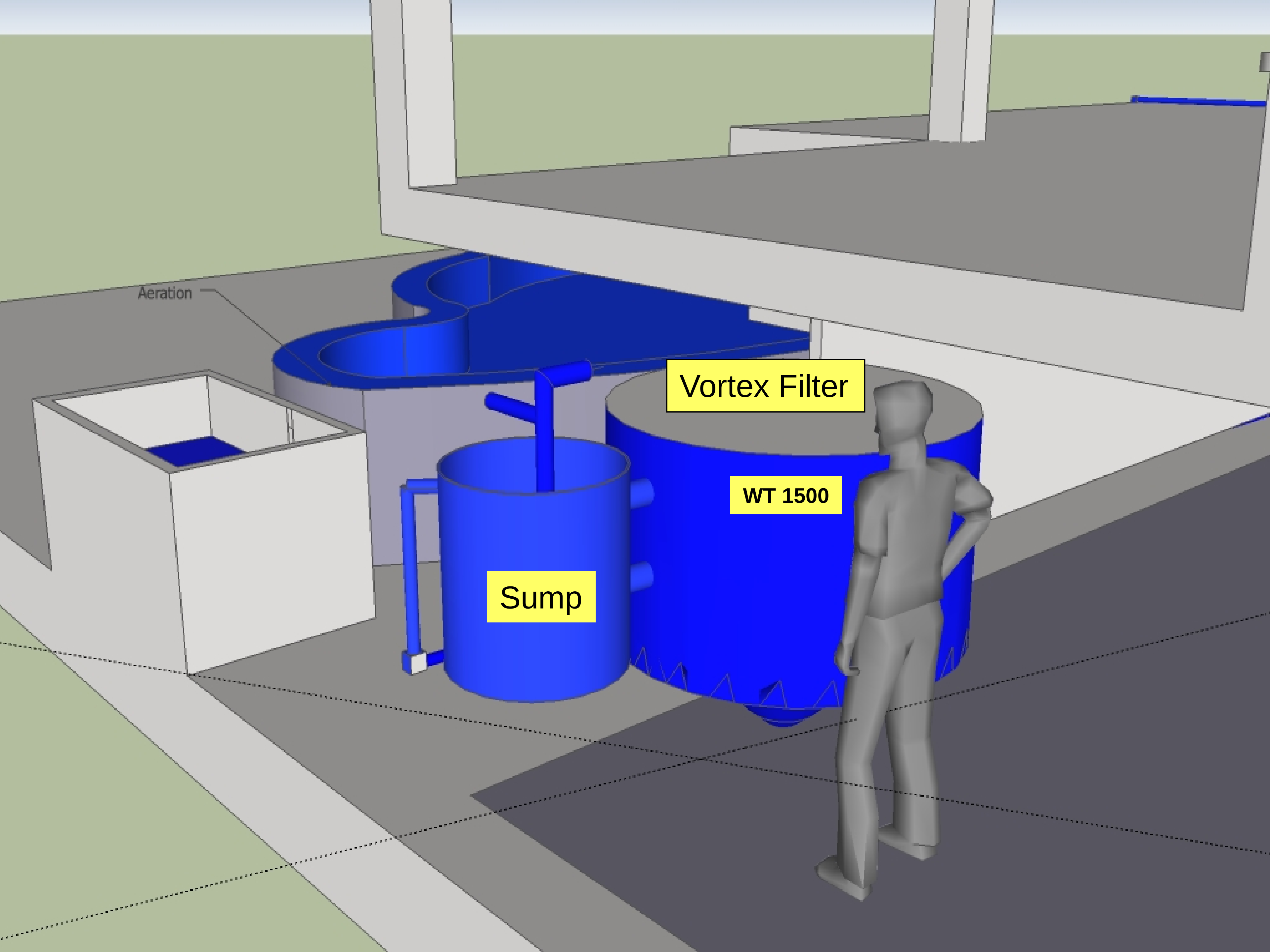


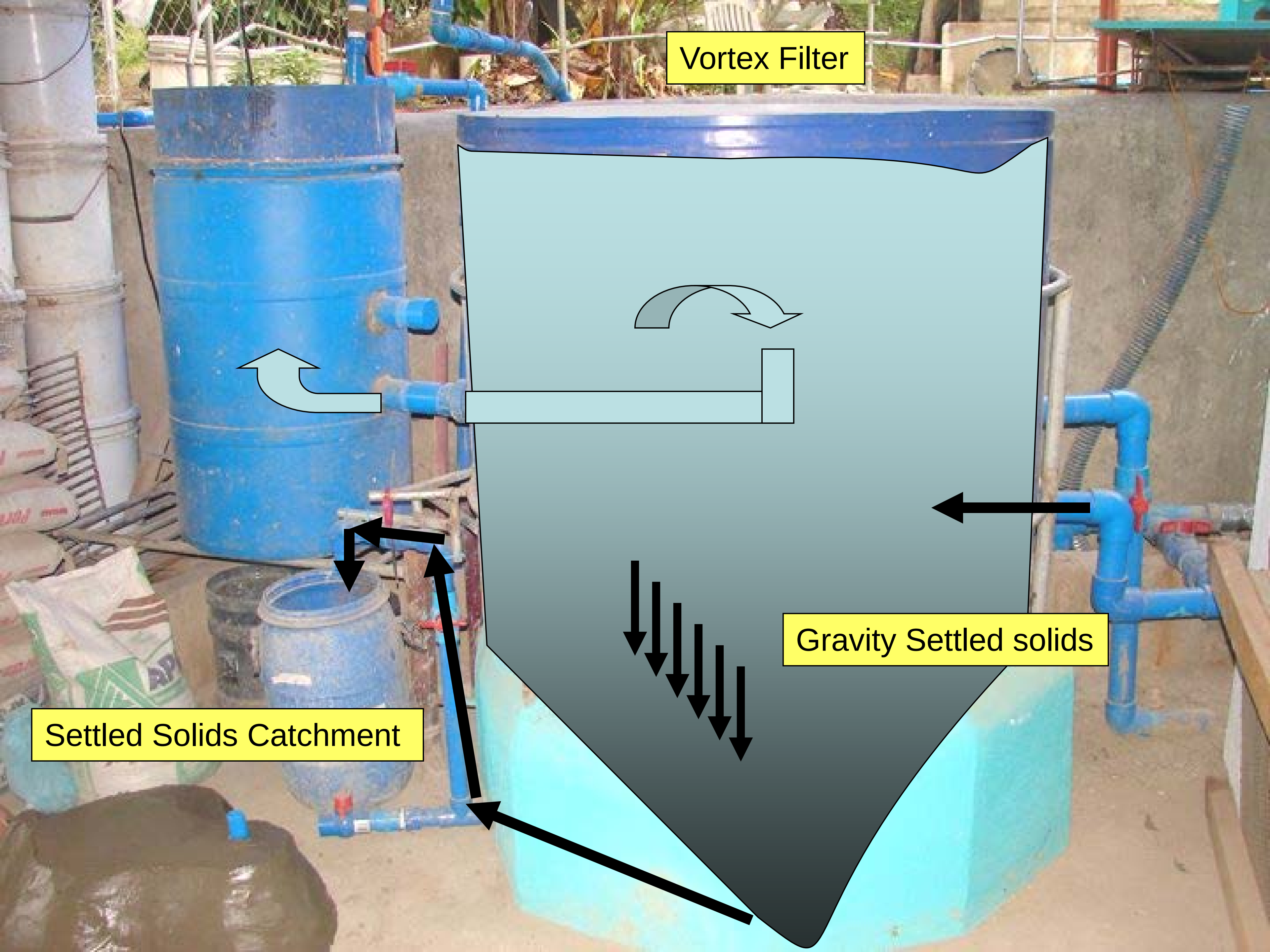
Observation Filter with Bell Siphon


Redundant upper drain
“In the unlikely event of clogage”
Bottom Drain Guard

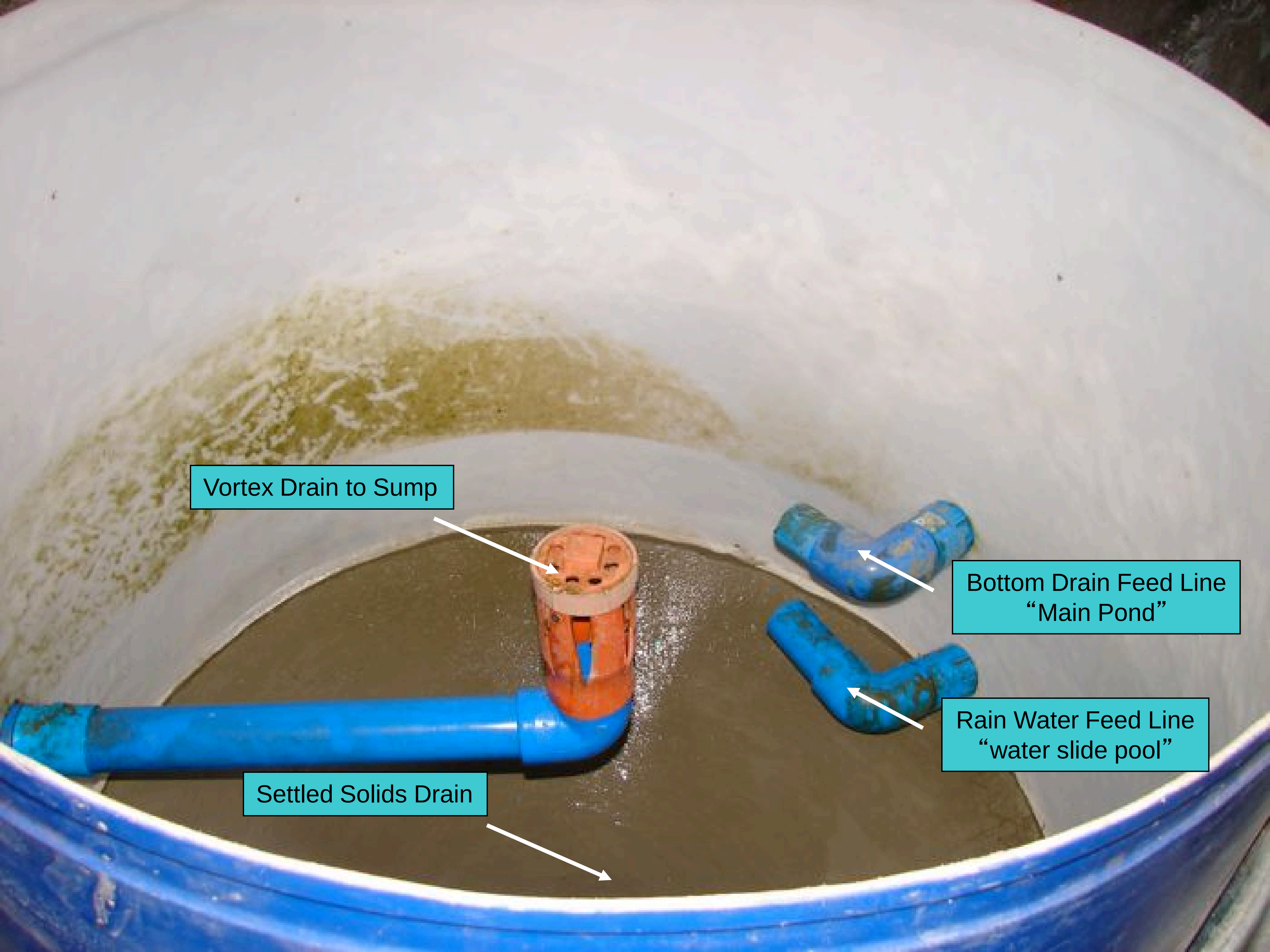

Redundant upper drain
Bottom Drain Guard


Leaf gutter Gaurd
4” clean out
3 screws
Bottom Drain Guard

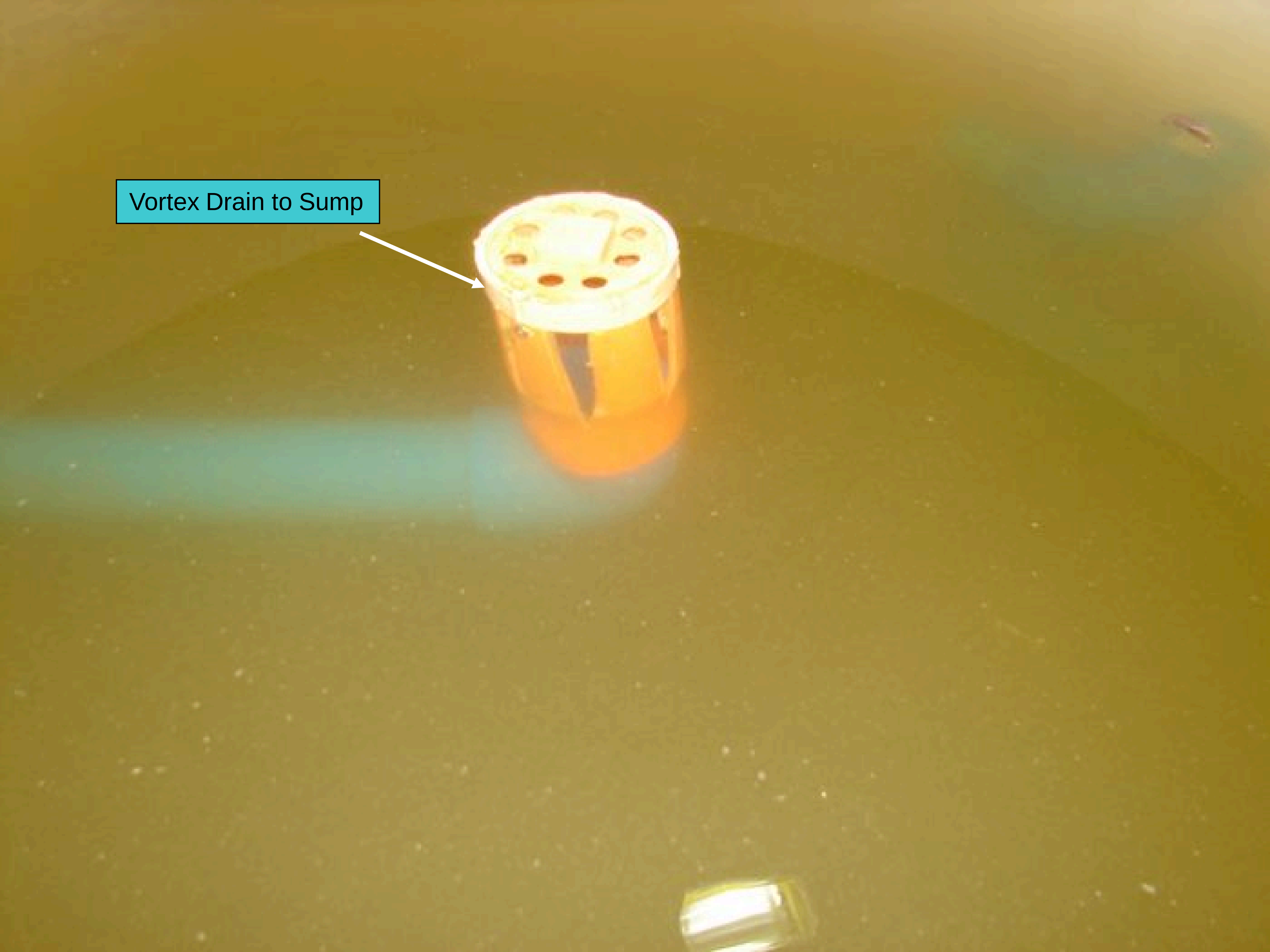

Aeration
Vortex Filter
WT 1500
Sump


Vortex Filter
Gravity Settled solids
Settled Solids Catchment


2 ponds, 2 bottom drains
Rain Water Feed Line
“water slide pool”
Bottom Drain Feed Line
“Main Pond”

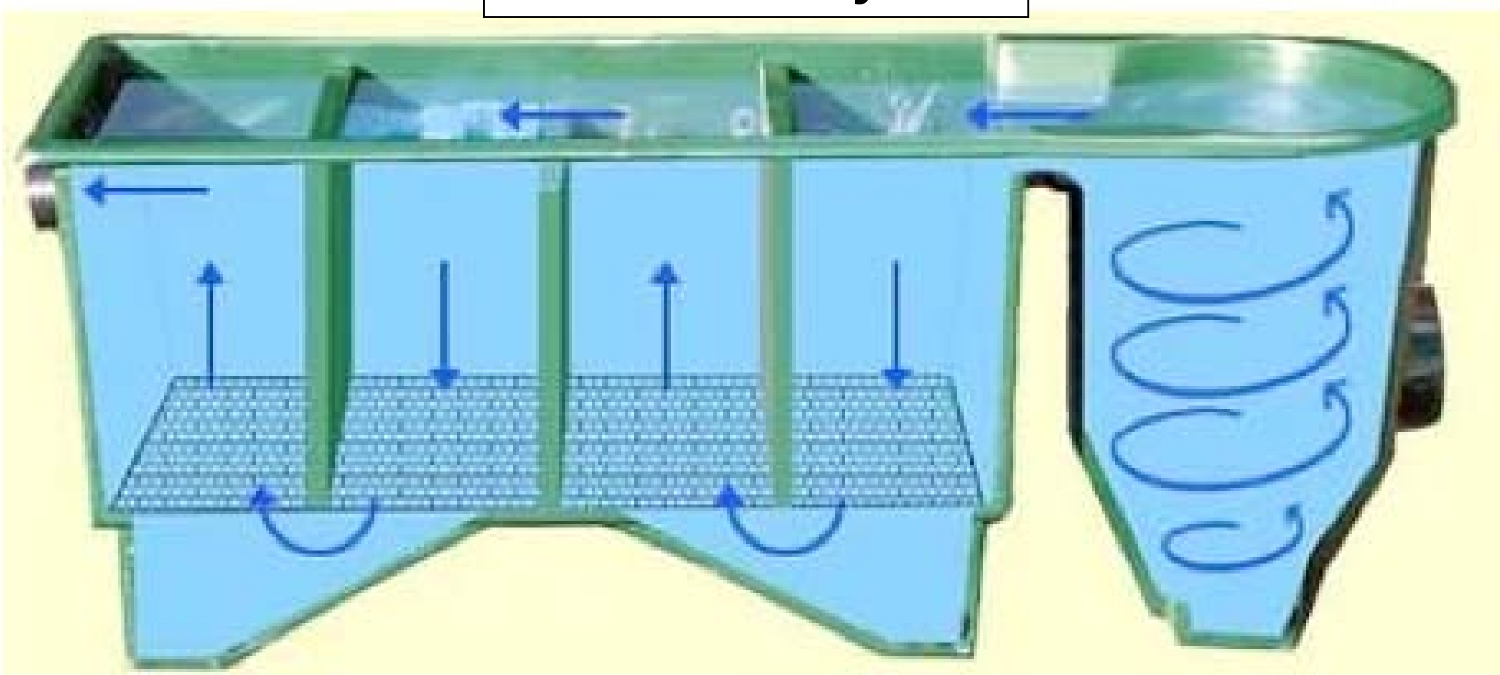

Vortex Drain to Sump
Bottom Drain Feed Line
“Main Pond”
Rain Water Feed Line
“water slide pool”
Settled Solids Drain

Vortex Filter


Vortex Drain to Sump


Settled Solids Drain
To Vermiculture
(earthworms)

Commercial system



External pump

Cement vortex filters

In-ground Koi filters


錦鯉


Longhu Aqua-Tech Manufacturing Co.,