

Education

BS, Architecture & Design

Kansas State University, Manhattan, KS

Before EMI

Rex comes to EMI with 20+ year's experience,
Kansas Farming/ranch background

EMI:

On staff for 17+ years

Architect & Project Leader

59 Projects: many are
healthcare and Ag related



Session Overview

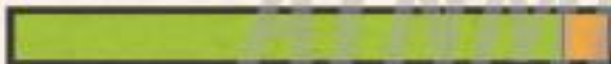
- 10/40 Window
- EMI – Overview
- Aquaponics
- Recent project trip - Food for His Children-
Sustainable Goat Farm– Karatu, TZ



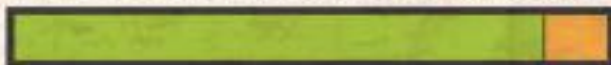
TWO-THIRDS OF THE WORLD'S POPULATION LIVE HERE
 MORE THAN **4.4 BILLION PEOPLE**



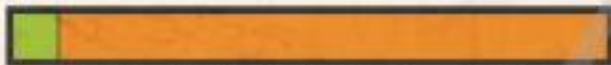
AND OF THOSE LIVING IN THE 10/40 WINDOW...



**90% OF THE PEOPLE HAVE NEVER HEARD
 THE GOSPEL MESSAGE EVEN ONCE**



85% ARE THE POOREST IN THE WORLD



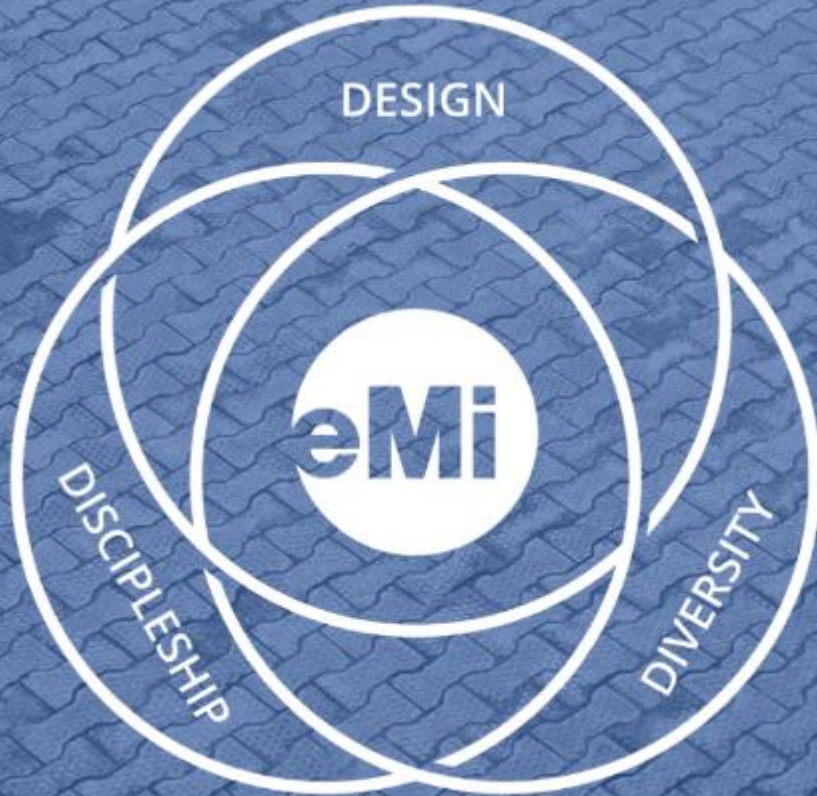
**A MERE 10% OF ALL GLOBAL
 MISSIONARY FORCES ARE ALLOCATED**

**ONLY
 5¢**

**OUT OF EVERY
 \$100 SPENT
 ON MISSIONS
 GLOBALLY
 IS DIRECTED
 TOWARD
 THE 10/40
 WINDOW**

10/40 Window

EMI's role – A partner in ministry



Together, we are
designing a world of
hope.

“Each of you should use whatever gift you have received to serve others, as faithful stewards of God’s grace in its various forms.”

1 Peter 4:10

EMI Key Statistics

- Founded in 1982
- 150+ staff, interns, 10 offices
- Completed 1500+ projects
- 90+ countries/territories



You have heard the old saying..

- You can give a man a fish that will feed him for a day or...
- you can teach him to fish and it will feed him for life or...

Fishers of Men

- You can teach him aquaponics and it will feed him and provide an income, so he can be engaged for Kingdom Work.
- And make him a fisher of men.
- Matt 4:19, Mark 1:17
- 1 Timothy 5:8 if anyone does not provide for his own household, he has denied his faith and is worse than an unbeliever...

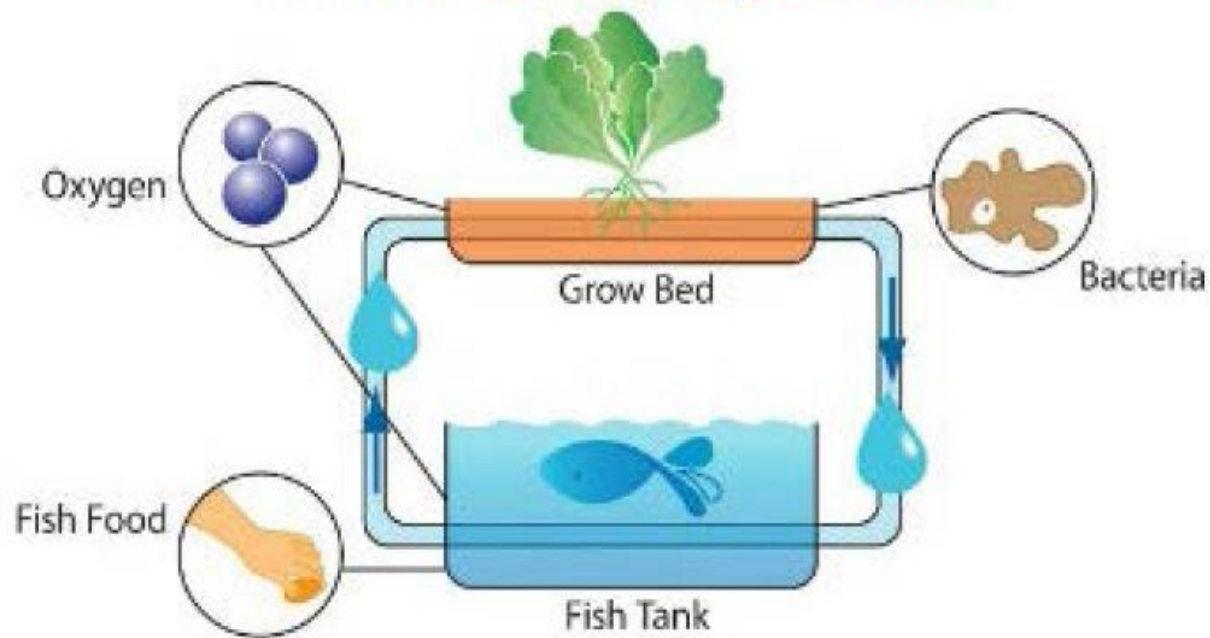
Deaths by hunger ea...

- 18 die each minute, ~1350 during this presentation
- ~25,000 die each day, by hunger
- Different world hunger org's including the UN

Aquaponics

Growing Plants and Fish Together

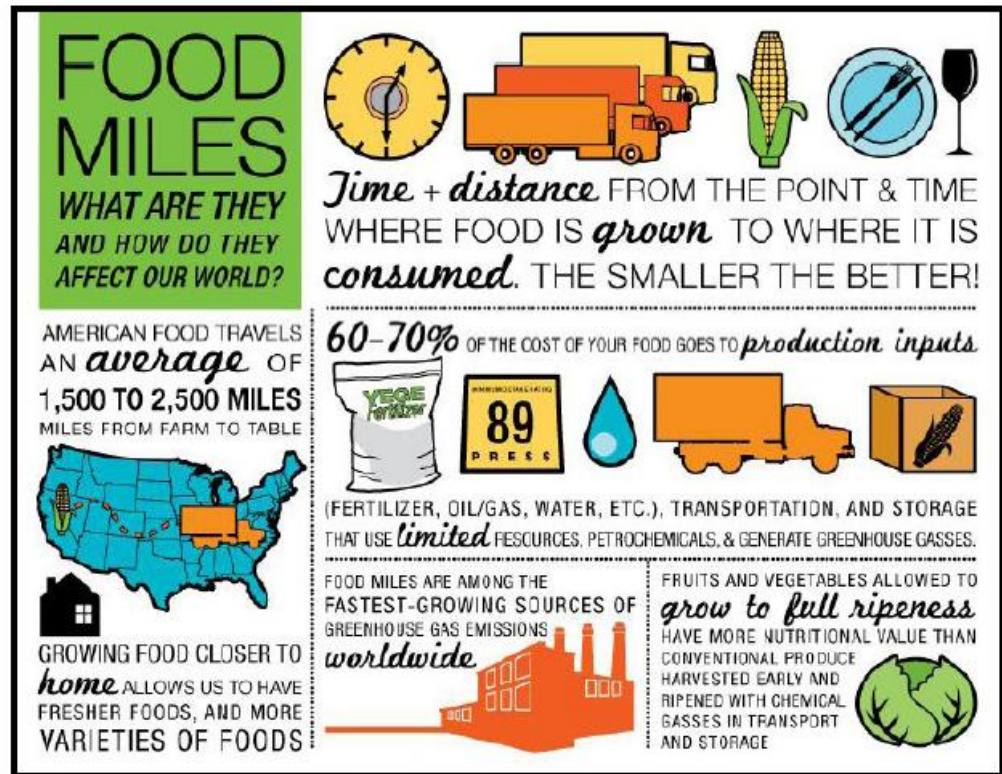
What is Aquaponics?



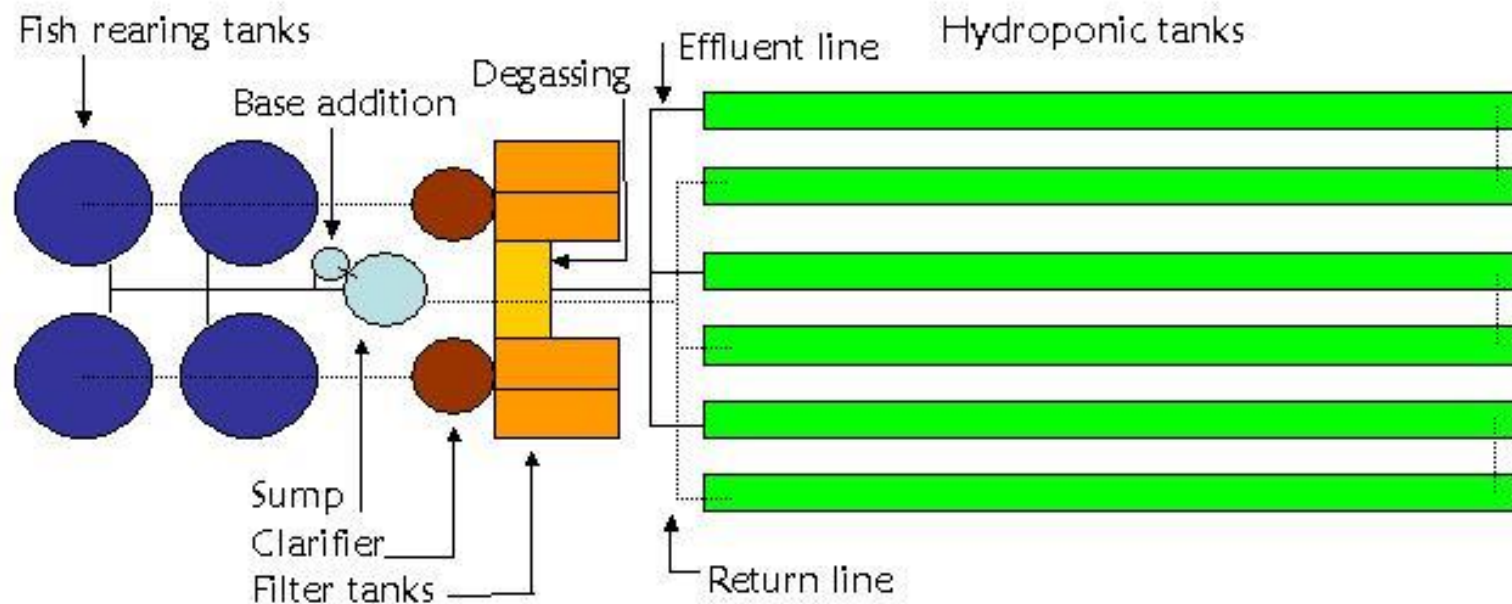
The marriage of hydroponics (soil-less gardening) and aquaculture (farming fish).

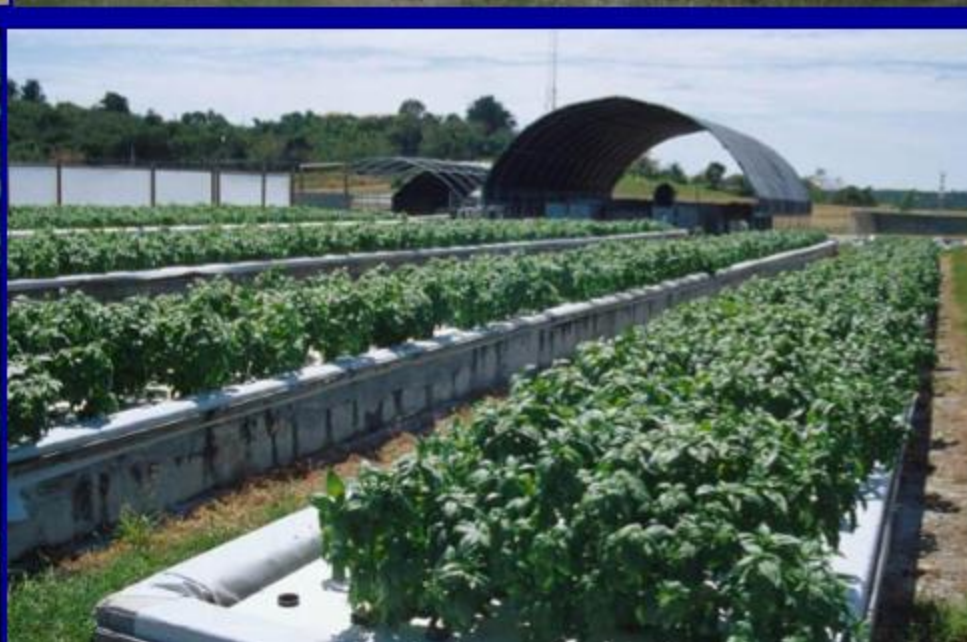
Why Aquaponics?

- Uses a fraction of the water, about 10% of soil growing
- Works in drought or places with poor soil quality
- No need to purchase, store and apply fertilizer
- No soil-borne diseases, no tilling, no weeds
- Grow two food products together, protein and produce
- No waste – hydroponics waste solution, aquaculture waste, fish solids; aquaponics all waste is used
- No pesticides or herbicides, only fish fertilizer
- Food security, grow your own food, indoors, year-round



The UVI Aquaponic System





Basic Aquaponics System



Media - Flood and Drain System

Description:

- Plants are growing in a 6-8 inch bed of rocks or similar material.
- Water from the fish tank is used to fill the grow-bed till approximately 1 inch below the top of the rocks and then is allowed to drain back to the fish tank.
- There are many different versions of these systems utilizing timers, bell siphons, overflow drains and more. These will be discussed later in the manual.



Pros

- Work great for most hobby aquaponics
- Easy to find components, easy to build
- You can grow lots of different plants in one system
- Make as big or small as you want

Cons

- Can build-up anaerobic zones
- Needs larger fish tank than raft system, due to water flooding into the grow bed then draining back to the fish tank.
- May need to be cleaned out occasionally or use worms in the grow bed to clean up excess fish matter.
- You can not easily grow as many plants per ft² as you can in a raft system.

Raft System

Description:

- Plants are growing on floating rafts of insulation. Plant roots are constantly immersed in warm nutrient filled water promoting very fast growth.
- Requires approximately 30 lbs of fish for each 100 sq ft of plants.

Pros

- Great for commercial setups, especially leafy green plants. Ideal for commercial lettuce production.
- Very high yield of both fish and plant crops, very efficient. A head of lettuce can grow to harvest in approximately 30 days.
- Can average 4-6 plants per square ft of growing space
- Typically installed inside a greenhouse (although in tropical locations they are outside)

Cons

- Can requires more extensive filtration methods
- Usually grows a specific type of crop like lettuce or basil.
- Not the best method for tomatoes, peppers, cucumbers any other vines



Tilapia

- Commonly used in aquaponics with great results.
- Warm water fish (74-78F) They will die if the water temperature drops to around 50-55F.
- Tolerates pH shifts, temp changes, high ammonia, and low dissolved oxygen.
- Omnivorous – pellet fish food, duckweed, veggies from the system
- Grows to plate size in about 6-9 months (ideal conditions)

**Also called
St Peter's Fish**



Baby tilapia, about 1/4" / 6-35 mm long. It would take a LOT of fish this size to start your system, so try to find some larger fish!



One of the great things about tilapia is the feed conversion. It will typically take 1.4 lbs of fish food to get 1.0 lbs of growth in the fish. This is among the most efficient feed conversion ratios in the animal world.

17 Plants

Vegetables

- Lettuce
- Beans
- Squash
- Zucchini
- Broccoli
- Peppers
- Cucumbers
- Peas
- Spinach

Herbs

- Basil
- Thyme
- Cilantro
- Sage
- Lemongrass
- Wheatgrass
- Oregano
- Parsley

Lettuce

- Lots of different varieties
- Really easy to grow
- Ready to harvest in about 30-50 days
- Shallow root system
- Grows in either media or raft system
- Ideal Temp 60-80F*, can tolerate down to 45F without problems
- Temps over 90°F can cause lettuce to bolt.
- Likes lots of airflow across their leaves.



Beneficial Insects

An Organic Farmer's Best Friends



Ladybug

Adults and larvae prey on aphids, insect eggs, soft-bodied insects, and whiteflies



Big-Eyed Bug

Preys on flea beetles, mites, small caterpillars, thrips, worm eggs, and other bugs



Lacewing Larvae

Preys on aphids, insect eggs, leafhoppers, mealybugs, mites, psyllids, small caterpillars, thrips, and whiteflies



Minute Pirate Bug

Preys on aphids, mites, psyllids, small caterpillars, thrips, and whiteflies



Parasitic Wasp

Preys on a variety of pests; larvae feed on or inside pest insects, killing their hosts



Damselfly

Preys on flea beetles, leafhoppers, mites, small caterpillars, thrips, worm eggs, and other bugs



Assassin Bug

Preys on aphids, caterpillars, leafhoppers, and other bugs



Syrphid Fly

Preys on aphids and soft-bodied insects

We plant "host crops" (flowering plants like buckwheat, alfalfa, clover, California poppy, and many others) around our fields as habitat for beneficial insects — these "good bugs" help protect our organic crops by eating adult pests and their eggs, or by becoming parasites inside pest insects themselves.



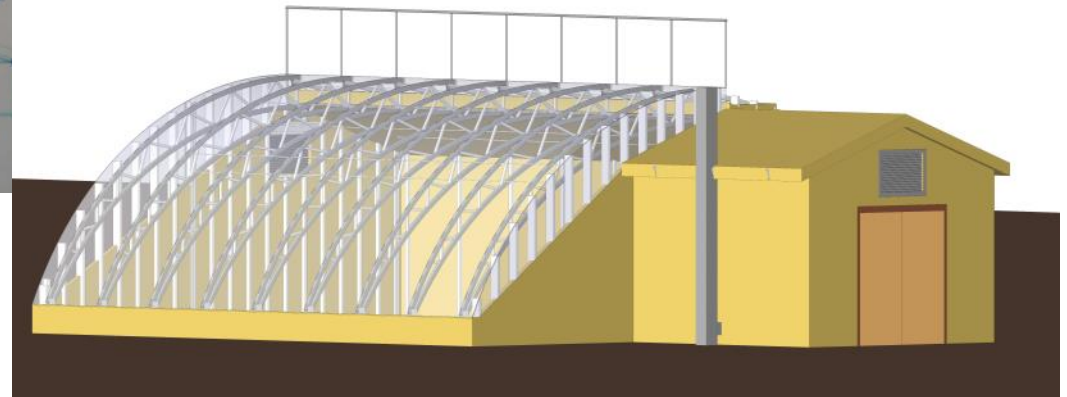
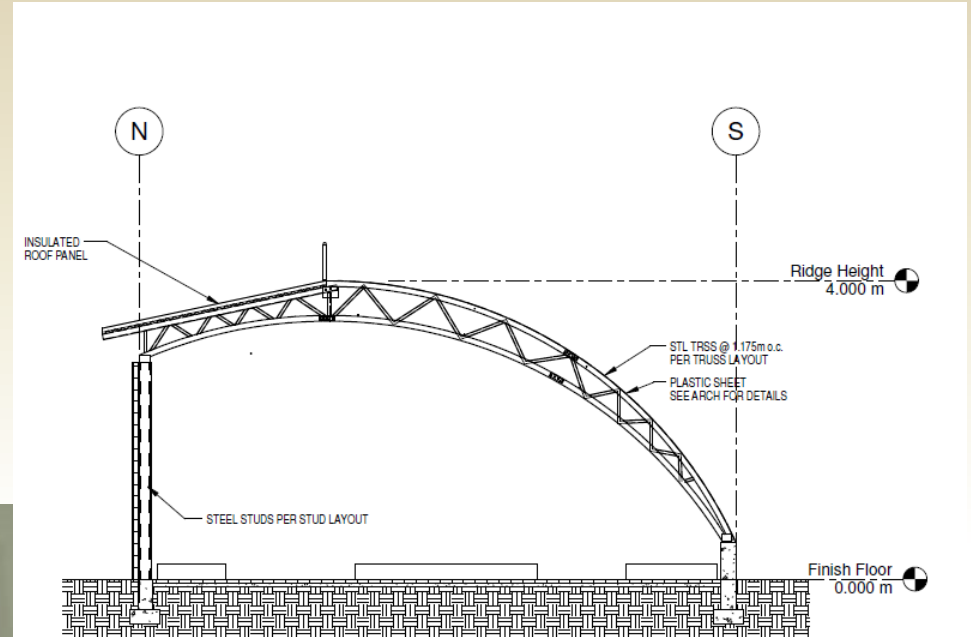
Harmful Insects

Aphids:

- Aphids are a 6 legged pear shaped soft body insects with distinctive dual-exhaust tailpipes called cornicles.
- There are over 4,000 species of aphids, 250 of which are pests in agriculture.
- There are many colors of aphids from green to red to nearly transparent.
- They damage plants by sucking the juices out of the plant. They can also transmit diseases and viruses.
- They secrete a sugary substance called honeydew which can in turn cause sooty mold problems.
- Ants and aphids will travel together frequently. If you have one, look for the other.



Case study





Aquaponics Sustainability

EME
RGE









In summary, start small...IBC Aquaponics





Food for His Children – Karatu, TZ

In-country Presentation US- 0729

Feb, 2019



FOOD FOR
HIS CHILDREN



FFHC

Food For His Children is a missionary organization in Karatu, Tanzania working to provide families in the local communities with dairy goats to improve their livelihoods and economic ability.



FOOD FOR
HIS CHILDREN



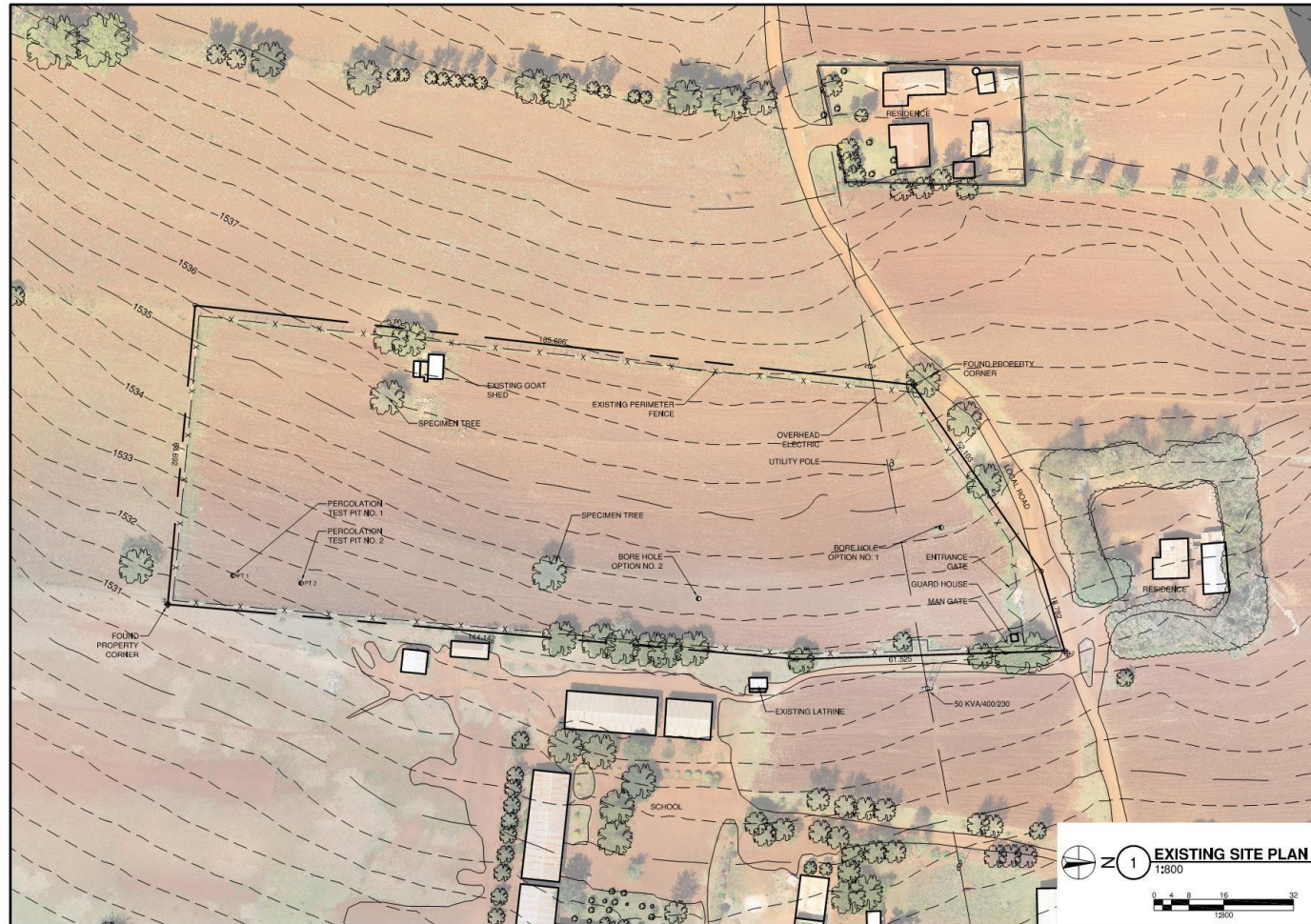
Site Photo



FOOD FOR
HIS CHILDREN



Survey



designing a world of hope
emworld.org

Karatu, Tanzania

Goat Farm and Innovation Center
Food for His Children

EXISTING SITE PLAN

CONCEPTUAL
DRAWINGS
NOT FOR
CONSTRUCTION

FEB 2019

C-0



FOOD FOR
HIS CHILDREN



Priority Matrix

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FOOD FOR
HIS CHILDREN



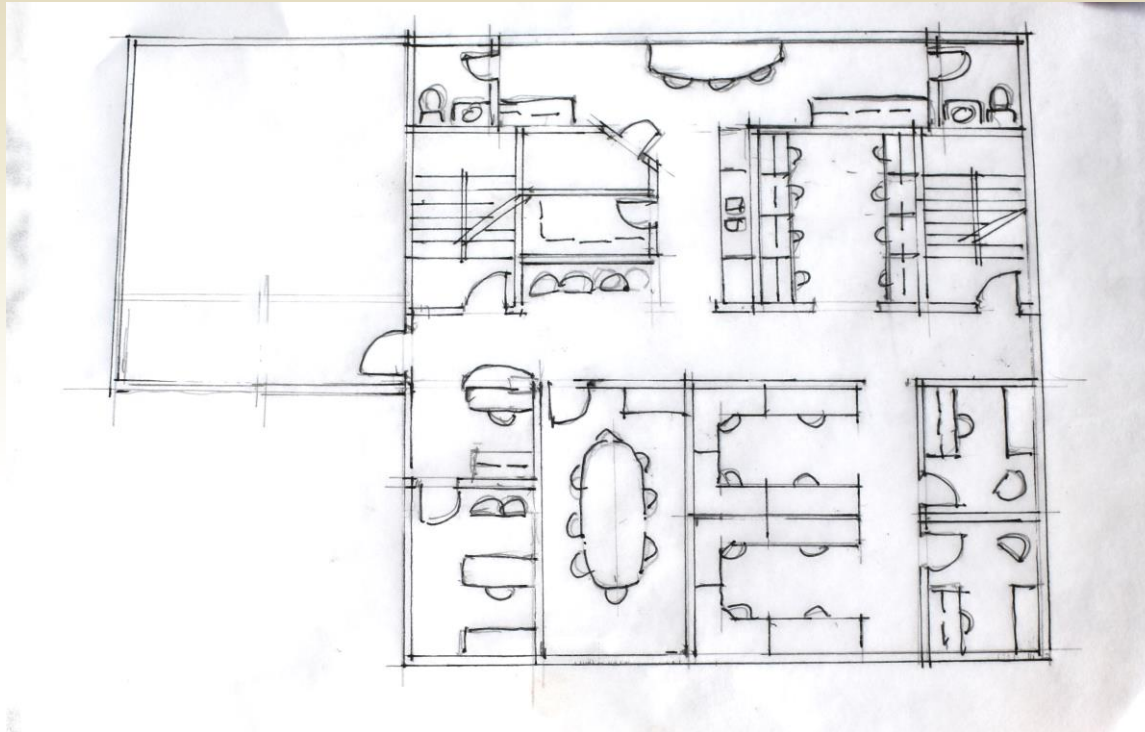
Master Plan



FOOD FOR
HIS CHILDREN



Building Design – Innovation Center 2nd Floor



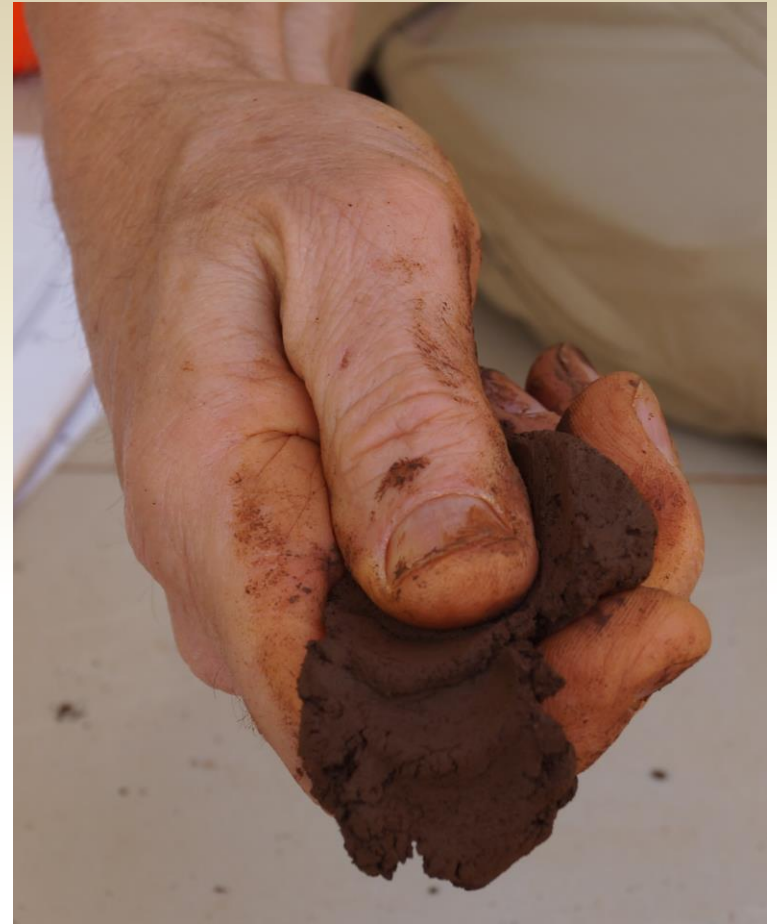
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Agriculture: crops and soil



Field Sampling Crew



Volcanic Clay



FOOD FOR
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Agriculture: crops and soil



Sand 85% Silt 12 % Clay 3-4%



**Nitrogen
(N)
Depleted**

**Phosphorous
(P)
Adequate to
Sufficient**

**Potassium
(K)
Adequate**



FOOD FOR
HIS CHILDREN



Master Plan



FOOD FOR
HIS CHILDREN



Master Plan- Agriculture

Canopy Trees

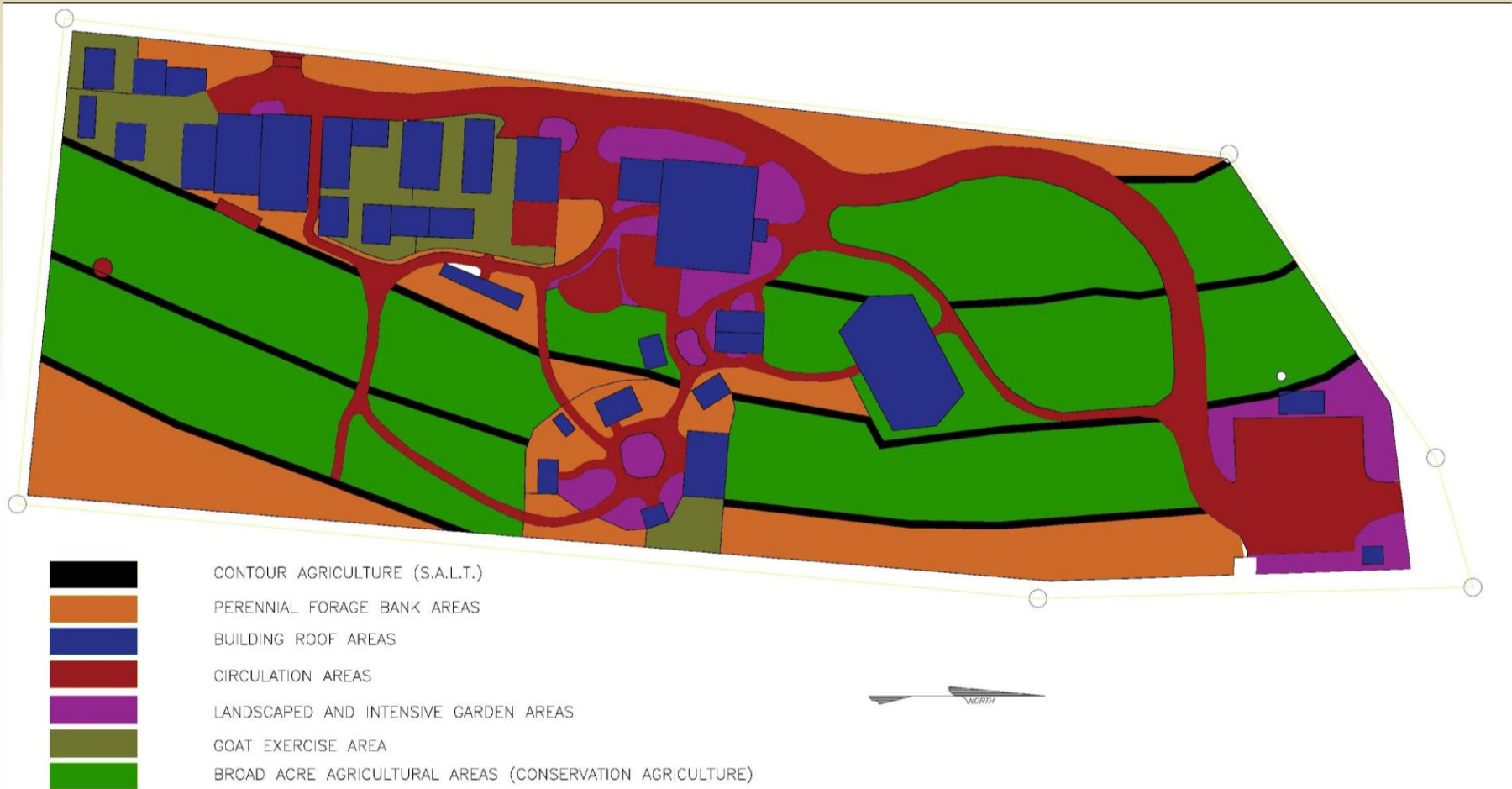


FOOD FOR
HIS CHILDREN



Master Plan- Agriculture

Land Use Map

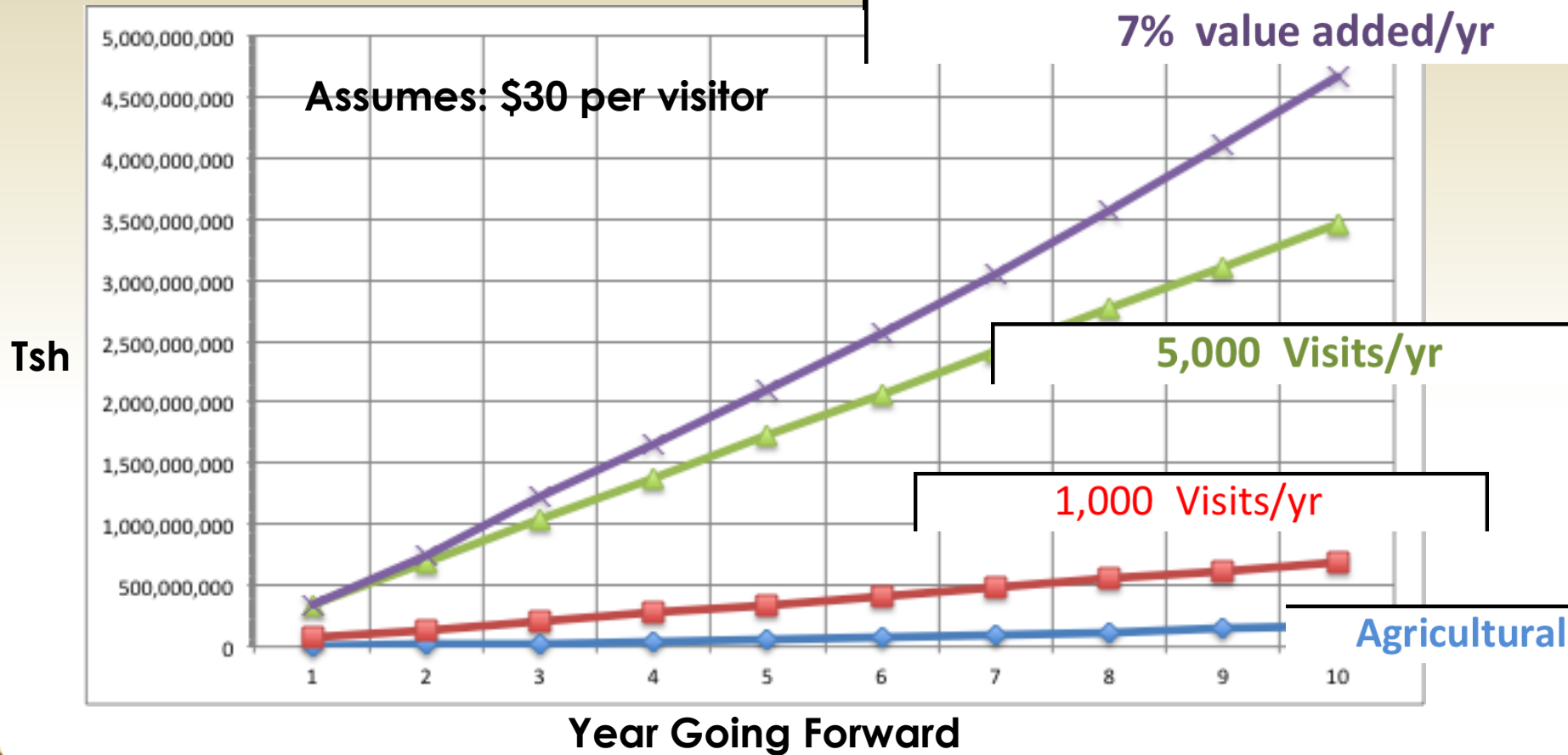


FOOD FOR
HIS CHILDREN



Business As Mission – Life Cycle

ANALYSIS OF ALTERNATIVES 10 YR LIFE CYCLE TOTAL INCOME STREAM



Value Added Items Huge from A Life Cycle Standpoint

FOOD FOR
THIS CHILDREN



Cost Estimate: **Not Final**

	Tanzanian (Tsh)	United States (US\$)
INFRASTRUCTURE	Tsh 209,889,904.	\$ 91,256
A. In Country Design	Tsh 14,229,824.	\$ 6,187
B. Site Roads, Grading, Parking	Tsh 15,525,000.	\$ 6,750
C. Site Water	Tsh 89,700,000.	\$ 39,000
D. Site Wastewater	Tsh 17,250,000.	\$ 7,500
E. Site Electrical	Tsh 33,350,000.	\$ 14,500
F. Site Trees, Plants	Tsh 10,580,000.	\$ 4,600
G. Site Agricultural Planting	Tsh 11,467,800.	\$ 4,986
H. Contingency 10%	Tsh 17,787,280.	\$ 7,734
FACILITIES	Tsh 575,703,000.	\$ 250,306
A. In Country Design	Tsh 36,639,828.	\$ 15,930
B. Entrance Pavilion	Tsh 59,367,600.	\$ 25,812
C. Water Closet	Tsh 23,087,400.	\$ 10,038
D. 15 Points Homestead	Tsh 7,521,000.	\$ 3,270
E. Visitor Center / Office Building	Tsh 335,591,850.	\$ 145,910
G. Parlor / Maintenance / Equipment	Tsh 3,726,000.	\$ 1,620
H. Goats (Does (7), Weathers/Doelings (4), Bucks (1)	Tsh 18,768,000.	\$ 8,160
I. Feed Storage	Tsh 9,936,000.	\$ 4,320
J. Contingency 10%	Tsh 45,799,785.	\$ 19,913
K. Inflation 7% (1 year)	Tsh 35,265,834.5	\$ 15,333
TOTAL - INFRASTRUCTURE AND FACILITIES	Tsh 785,592,904.	\$ 341,562



Questions / Comments
