

### **Aquaponics System Description:**

The founders and owners of Ely Merchants, LLC, dba EMI, have created a fully integrated Flexible Aquaponic Food Production and Processing (FAFPP) System using Patented, Copy protected and COTS components. Our FAFPP systems are delivered fully assembled and ready to use in standard size containers. Options are available to satisfy the needs of each individual installation. The systems can also be ordered to retrofit existing Food Production systems with the latest technology to better manage operations, accelerate plant growth and increase safe food production.

Most components of this system follow the appropriate International Standards and best practices for manufacturing and assembly. The remaining components have matching spares as part of the standard, ready to use containerized shipment. The quantity of spares is based on standard MTTF and MTBF calculations and tests. Depot spares for all components will be maintained by supply chain management organizations selected by EMI to minimize down time and lower cost. These spare components can be shipped automatically or on demand. Special ordering procedures are in place for expediting components required for expanding existing food production facilities or adding / changing crop selection.

EMI offers research and maintenance services to help owners / operators determine the viability of adding fish / crops never before grown in this environment. Our scientists / researchers and partners have extensive experience and credentials in all the necessary disciplines to support the needs of our customers. These needs include but are not limited to seed / seedling as well as fish / fingerling selection, grow plans, harvesting methods, etc. We also sponsor individuals that want to work in this critical industry such that they can obtain the necessary education / training / certifications.

One of our major partners has a financing / social plan that may be appropriate to meet your financial / social desires / requirements (employment, etc.). We also have traditional leasing, financing and profit sharing programs that minimize the barrier to entry into this exciting and needed safe / sustainable agricultural based food production and processing system. Our approach supports the Feed the World programs as well as can help create reasonable short and long term profits for the owner / operator.

EMI's FAFPP system details:

Description: Based on a current site survey - written, photos, videos

- 1 Design Build System tailored to customer circumstances and needs
- 2 Design build of animal fodder systems
- 3 Train the trainers – Operation and maintenance
- 4 Management – guidance on which plants, fish, work best in the customer's environment to help the business model
- 5 On Line monitoring of System Condition (via internet)
- 6 Spare parts
- 7 On-site service available

## 8 Site survey services

- 1 Although the basic design of the Aquaponics system is the same regardless of size, many factors need to be considered when properly sizing and designing a system that will function correctly. These include climate, water availability and quality, power, personnel.
- 2 Efficient and modular commercial oxygen enhanced Aquaponics systems
- 3 Fodder Systems – Systems designed to specifically grow fodder for livestock minimizing the use of water and pesticides
- 4 Train the trainers
- 5 Management guide tailored to the individual customer's situation
- 6 An on-line near real time monitoring service of the system with feedback to the individual customer
- 7 A Spare parts service. All parts readily available for shipment around the world via internet ordering
- 8 For a fee, on-site service and training available

### DESCRIPTIONS:

1 Aquaponics system – Aquaponics is a system of aquaculture in which the waste produced by farmed fish or other aquatic animals supplies nutrients for plants and vegetables, which in turn purify the water. Fish waste is skimmed from the tanks and is run through a processing system whereby the solid waste is separated from the water. The solids are further processed and utilized for plant growth. The water is then run through a nitrification process where bacteria (oxygenated) change the Ammonia into nitrates. An Ultraviolet sterilizer kills any residual bacteria. The water is then sent through Flo-Vex®. Our system optimizes both the fish and plant processes through the use of the patented Flo-Vex® Aeration device. The Flo-Vex® allows the fish to be raised in a high density environment (less than 1-1/2 gallons of water per fish). The Flo-Vex® is a no-moving-parts device that operates on the flow of water through it. Water that contains no dissolved Oxygen which enters the Flo-Vex, leaves the Flo-Vex® at or near Oxygen saturation at the corresponding temperature using normal atmospheric air.

The now oxygen saturated ammonia free water is pumped back to the fish tanks and to the plant side of the system.

Water reclaimed from the plant side is recycled to the Fish Side filtration system for re-use. The daily water consumption of a six (6) tank module system is about 30 gallons a day. Loss is mostly through plant absorption and evaporation.

The Plant Side of the system utilizes three different methods for plant growth:

- A. NFT Channel – This system consists of a narrow channel in which the nutrient rich water flows continuously. The roots of the plants are in contact with the water allowing for continuous growth. This system is commonly used for leafy greens.

B. Flow trays – This system consists of wide (3' to 4') trays. Seeds are usually germinated in Flow trays and transferred to either larger pots, NFT channels or Dutch Bucket flood drain systems.

C. Flood-Drain system – These systems are used for tomatoes, cucumbers, peppers, strawberries and other larger plants. The nutrient rich water periodically floods the Bucket and automatically drains. This allows for rapid nutrient uptake and growth.

Aquaponics Systems achieve 1:6 to 1:10 times the growth of normal in-ground agriculture using a minimum amount of water.

The big advantage our systems have over other Aquaponics systems is the near Oxygen saturated water flowing through the plants. This has shown to be significant in increasing plant growth.

2 Hydroponic systems – Hydroponic systems are similar to the plant side of our aquaponics systems. The main difference is that no fish waste is utilized for plant nutrients. Instead concentrated nutrients are added to the plant circulation water which is recycled through the plants.

Several plant systems are utilized including Flow Trays, NFT Channels and Dutch Bucket flood-Drain systems. All water is recycled.

The Hydroponic systems also utilize the Flo-Vex® oxygenation device to deliver oxygen saturated nutrient water to the plant roots boosting their growth.

3 Fodder System – the fodder system is similar to the Hydroponic system except that Flow Trays are utilized to sprout seeds directly. When the seeds sprout and reach a harvestable size, usually 7 days, and the fodder is rolled up and then fed to the animals. The big advantages are Low water use, High yield in a small area, High nutritional value to the animals, Lower feed costs, no fertilizers, pesticides or herbicides required. Types of fodder that can be grown Alfalfa, Barley, Millet, Oat, Red Wheat, Ryegrass, Sorghum as well as Canola, Cottonseed, Orchard grass, Clover, Triticale, Wheat, and Buckwheat.

### **LEFT Diagram**

that is the existing PR Harris system. Its the first of the Gen 4 design. It was designed to fit the modular concept. The filtration is contained on a skid. The skid can support 20,000l/hr. up to 40,000l/hr. just by changing the pumps.

The specs for the PR Harris system are listed. Basically, you harvest the fish one tank, once per month.

I indicate how many flow beds and Dutch buckets are installed.

The flow beds are listed in sq. ft.

One (1) sq. foot of flow bed = 10 sq. ft. of dirt planting.

One Dutch Bucket holds one plant such as tomato, pepper, etc.

Tomatoes grow to 15 feet high in Dutch buckets.

Because of the high nutrient delivery and O<sub>2</sub>, plant growth rates are 1.8 times faster than dirt farming.

### **MIDDLE Diagram**

Future systems will have the fish side installed on a flat 8' x 40', pre piped and wired.

Optional - the system can be installed in a standard, insulated ISO 40' high cube sea container with external connections.

The specs indicate the maximum amount of DB and Flow Beds the system can support.

### **RIGHT Diagram**

the system is designed to support 6-180 gallon tanks. this increases the amount of nutrients generated because of the number of fish.

The specs indicate the number of flow beds and Dutch buckets that can be supported.

### **EXTERNAL OPTIONS**

Power Module - Diesel Backup, solar, Grid power. Installed in a 20' ISO sea container.

Water Conditioning Module - Water pre-filtration, storage, conditioning.

Food Processing Modules:

- Fish Preparation
- Smoker
- Vegetable preparation
- Portable Kitchen
- Solar refrigeration/Freezer module (COTS)
- Office w/spare parts and maintenance table

**Shelters:**

Hoop House with fans, heater, cooler, bug screens.

Air Frame structure / Hangar for Plants (customized as required).

**Other Options:**

LED Grow Lights

LED security lighting

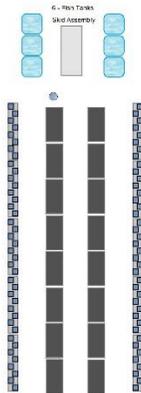
UV lights

Biofilm (barriers and surface) all natural germicide



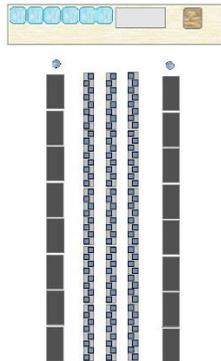
Annual Fish Production 600  
 Flow Bed Area 288sqft  
 Dutch Bucket 80

Fish Tanks Six(6) 110 Gallon Capacity  
 Flow Beds Sixteen(16) 3' x 6'  
 Dutch Bucket Eighty(80) 12" x 12" x 14"



Annual Fish Production 600  
 Flow Bed Area 288sqft  
 Dutch Bucket 150

Fish Tanks Six(6) 110 Gallon Capacity  
 Flow Beds Twenty-Four(24) 3' x 6'  
 Dutch Bucket One Hundred Fifty(150) 12" x 12" x 14"



Annual Fish Production 1080  
 Flow Bed Area 576sqft  
 Dutch Bucket 200

Fish Tanks Six(6) 180 Gallon Capacity  
 Flow Beds Thirty-two(32) 3' x 6'  
 Dutch Bucket Two Hundred(200) 12" x 12" x 14"

