# Friendly Aquaponics, Inc. 2020 Commercial Aquaponics Training

This material copyright 2008-20 by Friendly Aquaponics, Inc., Susanne Friend, and Tim Mann. Copying or using portions of or excerpts from this material without the express written permission from the authors is prohibited by Federal law. Friendly Aquaponics, Inc., PO Box 1196, Honokaa, Hawaii 96727 Version NF20-1.0

## **Commercial System Manual Table of Contents**

## **Background: Aquaponics In Our World**

How To Have Fun And Make Money With Aquaponics		Page 1
1.	Features	
2.	Benefits	
3.	Energy Implications	

- 4. Quick Summary of Aquaponics' Applications
- 5. Glossary of Terms and Definitions

## B. How Do You Find The Right System For You?

## Aquaponic Technology, System Processes, and Water Chemistry

## Friendly Aquaponics Technology

**Short Overview Of Aquaponics** 

A. General Principles

Page 11

Page 7

- A. How We Got Started
- B. Things To NOT Do
- C. How To Set Up A Useful Experiment In Aquaponics
- D. So You Still Want To Do An Experiment
- E. Our Philosophy, Technology, and Systems: LD and HD
- F. Value Engineering: Reducing Costs Using Alternatives: Tank, Raft, and Trough Discussion
- G. Aeration, Blowers, and Pumps
- H. Electrical Requirements and Alternate Energy
- I. Greenhouses And High Tunnels
- J. Water Temperature, How Much Greenhouse Do You Need, And What's The Most Important Thing To Know About Your Greenhouse? Page 33
- K. How To Get A Free Greenhouse (Or Nearly So!)
- L. INside And OUTside Aquaponics Combined
- M. Aquaponics And Permaculture Combined

#### Aquaponic System Parts, Sequences, Processes, and Scaling Page 41

- A. Low Density (LD) Systems
- B. High Density (HD) Systems
- C. Aeration Requirements in Fish Tanks and Troughs
- D. Water Pumps and Flow Rate In the Vegetable Troughs
- E. How To Scale A System Larger Or Smaller
- F. Last But Not Least, The "Float"

### **Organic Aquaponic System Water Chemistry**

- Page 56
- A. Measurement Methods
- B. What We Measure In Our Systems, What It Means, And What To Add
- C. Water Temperature, Aeration (DO), And Nutrient Levels in Organic Aquaponics Systems

E.	Using Sensors, Electronic Regulating Equipment, and Autor Aquaponic Systems: Additions (And Things NOT To Add!) System Overflow Tank For Irrigation Of In-Ground Plants	matic Controls For		
System Startup, Operation, and Maintenance				
A. B. C. D. E.	artup Summary Verify Source Water Quality And Fill Up Add Fish How To Keep Your Fish Healthy and Alive While Hauling Inoculate Your System Helping Your Fish Survive The Nitrite Spike Potential Startup Problems	Page 68		
A. B.	rs Summary Feeding The Fish/Making Your Own Fish Food Sampling/Measurements/Record Keeping Checking/Cleaning	Page 86		
A. B.	Harvesting Fish/Restocking/Carrying Capacity of Systems Harvesting Vegetables/Replanting Nutrient Adjustment (Why You Dont Need To Worry About	Page 90		
Ā.	r Longer Summary Maintenance/Repairs Cleaning Your System; Fish Tank And Troughs	Page 91		
A. B.	Matastrophes And Recovery Techniques Water Loss Or Water Circulation Loss Air Supply Loss Power Loss	Page 93		
What Grows Well in Aquaponics, And How To Make A Profit With It				
B.	ction Doing Your Test Grows, Or "How Do I Know What To Grow Our Planting Trials Results How To Grow Organic Aquaponic Tomatoes	Page 95 ?" Page 104 Page 118		
A. B. C. D. E.	And Planting Systems Where To Get Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work For Germination And Sprouting Transferring To The Rafts	Page 120		
High-Density Planting Strategies And Specialized Techniques For Greens Crops				
В. С.	Summary: What To Do High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks	Page 129 Page 141		

<ul><li>A. Cut And Come Again</li><li>B. Batch Harvesting</li></ul>	
C Pick Vogotabloc/Pomovo Unwanted Growth	
<ul><li>C. Pick Vegetables/Remove Unwanted Growth</li><li>D. Value-Added Processing</li></ul>	
E. Packaging And Labeling Your Product To Sell	Page 150
The Business Of Aquaponics	Page 152
<ul><li>A. How Big Is Big? And How Small Is Small?</li><li>B. How To Start Small And Generate Cash Flow!</li></ul>	
C. How Much Can I Count On Growing, And What Should	I Grow First?
D. Marketing Your Product: <i>Research, Sell It, Then Grow I</i> E. Pros And Cons Of The Different Ways To Sell	
F. Advertising, Marketing, And Promotion	Page 164
G. The Production Timeline And Getting Off The Ground	3
H. Selecting The Right Aquaponics Technology To Use	
<ul><li>I. Things ARE Going To Change!</li><li>J. Zac Hosler's Successful Example (One of Our Most Successful Example)</li></ul>	receful Studente)
K. How To Use The Crop Prediction Spreadsheets	Page 177
Organic Certification, Food Safety Certification, And HACCP	Certification ge 179
A. What Are They? The Law, Benefits, And Market Prefere B. Organic Certification	
C. Site Selection Considerations For Your Organic Farm	Page 183
D. How To Find Your Perfect Organic Aquaponic Farm Site	
E. Food Safety Certification	
F. FSMA And GMP With HACCP Certification Summary:	Page 186
How To Win The War On Bugs	
First, The Really Big Pests	Page 194
General Insect Information	Page 195
Integrated Doct Management	
Integrated Pest Management BioPesticide Crop Treatments	Page 199 Page 204
Integrated Pest Management BioPesticide Crop Treatments Other Aquaponic System Pests	Page 199 Page 204 Page 209
BioPesticide Crop Treatments	Page 204
BioPesticide Crop Treatments Other Aquaponic System Pests	Page 204 Page 209 Page 210 What:
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand \	Page 204 Page 209 Page 210 What:
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand \ Troubleshooting Case Studies And Technical Support  The Technical Support/Troubleshooting Question List	Page 204 Page 209 Page 210  What: Ort  Page 213
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support  The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8	Page 204 Page 209 Page 210  What: Ort  Page 213
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species	Page 204 Page 209 Page 210  What: Ort  Page 213 Page 219
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species  What Kind Of Fish For You?  Aquatic Species In Our Systems A. Tilapia tilapia sp.	Page 204 Page 209 Page 210  What: Page 213 Page 219  Page 226
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species  What Kind Of Fish For You?  Aquatic Species In Our Systems  A. Tilapia tilapia sp. B. Chinese Catfish Clarias fuscus	Page 204 Page 209 Page 210  What: Page 213 Page 219  Page 226
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species  What Kind Of Fish For You?  Aquatic Species In Our Systems  A. Tilapia tilapia sp. B. Chinese Catfish Clarias fuscus C. Malaysian Giant River Prawn	Page 204 Page 209 Page 210  What: Page 213 Page 219  Page 226
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species  What Kind Of Fish For You?  Aquatic Species In Our Systems A. Tilapia tilapia sp. B. Chinese Catfish Clarias fuscus C. Malaysian Giant River Prawn D. Mosquito Fish	Page 204 Page 209 Page 210  What: Page 213 Page 219  Page 226
BioPesticide Crop Treatments Other Aquaponic System Pests Bees For Your Aquaponics/Greenhouses  If Something's Wrong And You Don't Understand Variableshooting Case Studies And Technical Support The Technical Support/Troubleshooting Question List Troubleshooting Case Studies #'s 1-8  Fish And Aquatic Species  What Kind Of Fish For You?  Aquatic Species In Our Systems  A. Tilapia tilapia sp. B. Chinese Catfish Clarias fuscus C. Malaysian Giant River Prawn	Page 204 Page 209 Page 210  What: Page 213 Page 219  Page 226

Stocking And Grow-Out Strategies And Systems  A. Batch Stocking and Harvesting  B. Concurrent Mixed Stocking/Graded Harvesting (CMSGH)  C. Where Do You Get The Fish To Stock With?  D. What If You Don't Have A Hatchery Nearby?	Page 237
Harvesting Fish A. Live Harvesting Versus Dead/Chill Harvesting B. Purge Tank/ Saltwater Purge Tank C. Harvesting CMSGH System	Page 238
How To Sell Fish  A. Whole Fish Direct-To-Consumer: Live-Haul Tank, Chilled B. Specialty Ethnic Markets C. To Wholesaler/Distributor D. To Retailers/Hotels/Restaurants E. Value-Added Possibilities And Requirements	Page 239
Regulations, Permits, And Other Hoops	
Statutory Requirements  A. County Building Department Regulations  B. State Health Department Requirements For Wastewater  C. State Agriculture Department Plant Quarantine Branch Re  D. Processing Requirements For Vegetables  E. Processing Requirements For Fish	Page 241 gulations
A. Small Business Help Available and General Advice B. State Extension Agents: Agriculture And Aquaculture C. New USDA Farm Microloan Program D. National Resource Conservation Service (NRCS) E. How To Apply For Loans and Grants: If You Need It, You Conservation	Page 244 Can't Get It
Current Research	
Off-Grid or Low-Energy-Use Aquaponics	Page 248
Taro In Aquaponics Systems	Page 249
Alternate Fish Foods  A. Black Soldier Fly Larvae B. The Duckweed Curse C. Hibiscus manihot D. Moringa, The "Miracle Tree"	Page 251
The Friendly Verticals (Amicus Verticalis), A High Capacity, Low-Cost, Energy-Efficient Indoors Vertical Growing System  A. Development Of The Verticalis B. Technology Of The Verticalis C. Drawbacks Of The Verticalis	Page 255
Future Research and Development Of Aquaponics Systems For Developing Nations  A. Modification Of Techniques To Use Cheap Materials B. What Staple Plants And Aquatic Species Are Usable C. Alternatives To Energy-Intensive First-World Techniques	Page 260
Alternatives To Just Buying Energy	Page 260

- A. Biogas For Electrical Generation And Waste Heat
- B. Wind-Powered Pumping And Aeration For Aquaponics
- C. Photovoltaic (PV) Off-Grid Aquaponics Systems

## **Spin Off Industries/Businesses**

**Page 261** 

- A. Fish food/Animal food processing plant
- B. Coco fiber collecting and processing
- C. Hatcheries for Prawns, Tilapia, Catfish, and other species
- D. Seed Farming For Aquaponics and Other Producers
- E. Medicinal Herbs and Plants

## **Roof Top And Urban Aquaponics**

**Page 263** 

- A. General Overview
- B. Technology, Considerations, And Permitting
- C. The Best Time Was Twenty Years Ago

Addendum A: Page 264

## Small Business Resources in Hawaii; List of Services and Government Help

(Even if you are NOT in Hawaii, this list is still a good guide as to what State and Federal agencies exist you can obtain assistance from; many are identical from State to State).

Addendum B: Page 266

Aquaponics system monitoring and recording form that we use

### Addendum C:

Electronic Files will be downloaded to you from Dropbox.com when you purchase this course, either the "live" or the "DIY" versions. This is a plethora of additional potentially useful aquaponics information constituting about 500 printed pages and other digital data. These include the CAD drawing files for the construction plans (to be printed at your local digital print shop); all the slideshows and videos we use to present our live courses with, organic certification applications and information, spreadsheets and business plans, and more. If you do not automatically receive an email from dropbox.com with a clickable link to these folders, please email me (Tim) at training@friendlyaquaponics.com and let me know, we'll get the link to you right away. Aloha from us.