Friendly Aquaponics, Inc. 2014 Commercial Aquaponics Training

This material copyright 2008-14 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 C14-2.0				
Commercial System Manual Table of Contents				
Introduction	Page 1			
Aquaponics In Our World				
A. How To Have Fun And Make Money With Aquaponics 1. Features 2. Benefits	Page 2			

B. Short Overview Of Aquaponics

3. Energy Implications

Page 7

- 1. General Principles
- 2. Different Kinds Of Systems Available; Pros and Cons
- 3. How Do You Find The Right System For You?

4. Quick Summary of Aquaponics' Applications

5. Glossary of Terms and Definitions

Technology, System Processes, and Water Chemistry

A. Friendly Aquaponics Technology Page 10

- indiy Aquaponics reciniolog
- How We Got Started
 Things To NOT Do
- 3. How To Set Up A Useful Experiment In Aquaponics
- 4. So You Still Want To Do An Experiment
- 5. Our Philosophy, Technology, and Systems: LD and HD
- 6. Value Engineering: Reducing Costs Using Alternatives Tank Discussion Raft Discussion
- 7. Aeration, Blowers, and Pumps
- 8. Electrical Requirements and Alternate Energy
- 9. Greenhouses, High Tunnels, And Insulation: A Short Course

B. System Proportions, Sequences, Processes, and Scaling

Page 31

- 1. LD/Off-Grid Systems
- 2. HD Systems
- 3. Aeration Requirements in Fish Tanks and Troughs
- 4. Water Pumps and Flow Rate In the Vegetable Troughs
- 5. How To Scale A System Larger Or Smaller

C. Organic Aquaponic System Water Chemistry

Page 48

- 1. Measurement Methods
- 2. What We Measure In Our Systems, What It Means, And What To Add
- 3. Water Temperature', Aeration (DO), And Nutrient Levels in Organic Aquaponics Systems
- 4. Additions (And Things NOT To Add!)
- 5. System Overflow Tank For Irrigation

System Startup, Operation, and Maintenance

A. System		Page 53
	Verify Source Water Quality And Fill Up Add Fish	
	How To Keep Your Fish Healthy and Alive While Hauling	
	Inoculate Your System	
5.	Helping Your Fish Survive The Nitrite Spike	
B. Daily T	asks	Page 67
	Feeding The Fish/Making Your Own Fish Food	
	Sampling/Measurements/Record Keeping Checking/Cleaning	
Э.	Checking/ Cleaning	
C. Weekly		Page 70
	Harvesting Fish/Restocking/Carrying Capacity of Systems	
	Harvesting Vegetables/Replanting Nutrient Adjustment/Cleaning the Net Tank	
	· · · · · · ·	
	y Or Longer Maintenance (Panaire	Page 70
1.	Maintenance/Repairs	
	Catastrophes And Recovery Techniques	Page 71
	Water Loss Or Water Circulation Loss	
	Air Supply Loss Power Loss	
3.	Power Loss	
	Well in Aquaponics Systems,	
What Grows	• • • • • • • • • • • • • • • • • • • •	
	Make A Profit With It	
And How To		
And How To A. Plant S	election	Page 73
And How To A. Plant S 1.	selection Doing Your Test Grow, Or "How Do I Know What To Grow?	
And How To A. Plant S 1.	election	
And How To A. Plant S 1. 2. B. Sprout	selection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems	
And How To A. Plant S 1. 2. B. Sprout 1.	Selection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2.	Telection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results Ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3.	Selection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4.	Selection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results Sing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5.	Telection Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens	o,"
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks eting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks eting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3. 4.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks cting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth Remove And Process	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3. 4.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks eting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3. 4. 5.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks iting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth Remove And Process Value-Added Processing	Page 95
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3. 4. 5. 6.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks cting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth Remove And Process Value-Added Processing siness Of Aquaponics How To Start Small And Generate Cash Flow!	Page 95 Page 103
And How To A. Plant S 1. 2. B. Sprout 1. 2. 3. 4. 5. 6. C. High-D 1. 2. 3. D. Harves 1. 2. 3. 4. 5. E. The Bu 1. 2.	Doing Your Test Grow, Or "How Do I Know What To Grow? Our Planting Trials Results ing And Planting Systems Types Of Seeds Pots, Potting Mix, And Seeding Germination And Seed Testing Sprouting Table System In Aquaponics' Side Flow What Doesn't Work Transferring To The Rafts ensity Planting Strategies/Techniques For Greens High Density Technique Number One High Density Technique Number Two Raft Hole Spacing And Cycling Tricks iting and Processing Tips And Tricks Cut And Come Again Remove And Sell Whole Pick Vegetables/Remove Unwanted Growth Remove And Process Value-Added Processing	Page 95 Page 103

Selecting The Right A	g, And Promotion ine And Getting Off The Ground quaponics Technology To Use ful Example (One of Our Most Successful Students)
E. Organic Certification And Formula 1. What Are They? Beneated 2. Organic Certification 3. Food Safety Certification	efits And Market Preference
How To Win The War On Bu	gs
A. First, The Really Big Bugs B. General Insect Information C. Integrated Pest Manageme D. BioPesticide Crop Treatmer E. Other Aquaponic System Pe	nt Page 152 nts Page 157
Fish And Aquatic Species	
A. Aquatic Species In Our Sys 1. Tilapia tilapia sp. 2. Chinese Catfish Claria 3. Malaysian Giant River 4. Mosquito Fish 5. Water Fleas/Gamman 6. Biosecurity: Species I	as fuscus r Prawn
 Hotter Is Better For Fis Cooler Is Better For Ve 	een Feeding, Growth, and Temperature sh egetables P Plan Your System And Market Accordingly
C. Stocking And Grow-Out Str 1. Batch Stocking and Ha 2. Concurrent Mixed Stoc 3. Where Do You Get The 4. What If You Don't Hav	rvesting king/Graded Harvesting (CMSGH) Fish To Stock With?
D. Harvesting Fish 1. Live Harvesting Versus 2. Purge Tank/ Saltwater 3. Harvesting Batch Stock	Purge Tank
E. How To Sell Fish 1. Whole Fish Direct-To-Community 2. Specialty Ethnic Marketom 3. To Wholesaler/Distribut 4. To Retailers/Hotels/Retommunity 5. Value-Added Possibiliti	itor staurants
Regulations, Permits, And C	ther Hoops
A. Statutory Requirements 1. County Building Depar 2. National Resource Con	Page 177 tment Regulations servation Service (NRCS)

1. 2.	ss Education For The Aquaponics Operator Small Business Help Available and General Advice State Extension Agents: Agriculture, Aquaculture, State Fis How To Apply For Loans: If You Need It, You Can't Get It	Page 181 sh Vet
Current Rese	earch	
A. Off-Grid or Lov	w-Energy-Use Aquaponics	Page 183
B. Taro In Aquap 1.	onics Systems History Of Our Taro Research	Page 184
2. <i>3.</i>	Foods Black Soldier Fly Larvae The Duckweed Curse Hibiscus manihot Moringa, The "Miracle Tree"	Page 186
Low-Cost, 1. 2.	Verticals (Amicus Verticalis), A High Capacity, Energy-Efficient Indoors Vertical Growing System Development Of The Verticalis Technology Of The Verticalis Drawbacks To The Verticalis	Page 190
Future Resea	arch and Development	
1. 2.	eveloping Nations Modification Of Techniques To Use Cheap Materials What Staple Plants And Aquatic Species Are Usable Alternatives To Energy-Intensive First-World Techniques	Page 195
1. 2.	Dist Buying Energy Biogas For Electrical Generation And Waste Heat Wind-Powered Pumping And Aeration For Aquaponics Photovoltaic (PV) Off-Grid Aquaponics Systems	Page 195
1. 2. 3.	tries/Businesses Fish food/Animal food processing plant Coco fiber collecting and processing Hatcheries for Prawns, Tilapia, Catfish, Aholehole, Anae, Awa, Koi Seed Farming For Aquaponics and Other Producers Medicinal Herbs and Plants	Page 197
1.	Urban Aquaponics General Overview Technology, Considerations, And Permitting The Best Time Was Twenty Years Ago	Page 198

3. State Health Department Requirements For Wastewater4. State Agriculture Department Plant Quarantine Branch Regulations

5. Processing Requirements For Vegetables6. Processing Requirements For Fish

Addendum A: Page 200

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

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

Addendum B: Page 201

Aquaponics system monitoring and recording form that we use

Addendum C:

Electronic Files will be downloaded to you from Dropbox.com (and we may switch in the future to using Amazon S3) when you purchase this course, either the "live" or the "DIY" versions. This is a plethora of additional potentially useful aquaponics information constituting of about 500 printed pages. These include the CAD drawing files for the construction plans, to be printed at your local digital print shop. If you do not automatically receive an email from dropbox.com with a clickable link, please email me (Tim) at training@friendlyaquaponics.com and let me know, we'll get the link to you right away. Aloha from us.