

Aquaponics Troubleshooting Flowchart – Links to Specific Documentation

Revised: 11/13/2014

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General Questions on Aquaponics

FAQ: University of Hawaii Aquaponics Workforce Development

<http://www.hawaii-aquaponics-workforce.com/faqs-1.html>

Tags: fish feed species fingerlings health diseases plants hydroponics mediums methods nutrition physical system components operation maintenance location design time resource requirements water quality energy commercial vendors

University of Hawaii Master Gardener Program-Tropical Topics-Aquaponics/Aquaculture

<http://www.ctahr.hawaii.edu/uhmg/tropical-topics.asp#aqua>

Tags: barrel-ponics challenges opportunities bell siphon hydroponic lettuce production ipm integrated pest management food safety suspended net pot non-circulating

CTAHR Cooperative Extension Service Aquaculture and Aquaponics

<http://www.ctahr.hawaii.edu/site/ExtAQU.aspx>

Tags: Soilless Farming Research Outreach Program AquacultureHub Training Online Learning ATOLL

Dr. Clyde S. Tamaru: Extension Specialist Department of Molecular Biosciences and Bioengineering

<http://www.ctahr.hawaii.edu/sustainag/leaders/tamaru.html>

Tags: aquaculture aquaponics hydroponics fishponds sustainable agriculture videos downloads publications

Dr. Robert Howerton: Resources from the Introduction to Aquaponics and Aquaculture Course

<http://sustainablemaui.org/aquaponics-and-aquaculture-resources/>

Tags: water quality publications nitrite ammonia pH carbon dioxide alkalinity hardness dissolved oxygen

Aquaponics at the College of Tropical Agriculture and Human Resources (CTAHR)

http://www.ctahr.hawaii.edu/uhmg/conference/downloads/MG_aquaponic.pdf

Tags: master gardener conference 2010 ahupua'a land grant hatch act smith-lever urban agriculture tilapia feed bell siphon Waimanalo media commercial nft raft nitrogen cycle vermicast tea types water quality plant weight state hospital

Considerations for Choosing & Maintaining Your Aquaponic System

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Horner.pdf>

Tags: hapa farms hybrid tilapia breeding fno free fast growing disease resistant all male kahalū'u red black blue koilapia purple construction pros cons deep water culture nutrient film technique ebb flow food safety good agricultural practices plastics building materials ibc things you can grow

Aquaponic System Design and Management

http://www.extension.iastate.edu/forestry/tri_state/tristate_2014/talks/PDFs/Aquaponic_System_Design_and_Management.pdf

Tags: aquaculture hydroponics benefits guidelines for producers feeding rate ratio supplement aeration solids removal mechanical filtration oversize pipes biological control nitrogen cycle biological filtration pH pumps impeller airlift design considerations water source tanks hydroponic unit greenhouse lighting inspections water quality disease aeromonas pythium biosecurity

Beneficial Use of Vermicompost in Aquaponic Vegetable Production

<http://www.ctahr.hawaii.edu/sustainag/news/articles/V10-Fox-Verm-Aquaponics.pdf>

Tags: advantages limitations pH buffering potassium hydroxide calcium optimal nitrifying bacteria iron chelated sustainable renewable agricultural practices nutrient deficiencies compost worms enhance plant growth crop yield root structure worm tea microbial metabolites

Barrel-ponics

<http://www.ctahr.hawaii.edu/uhmg/downloads/barrel-ponics.pdf>

Tags: aquaponics construction parts list grow bed stand flood valve floating raft plumbing maintenance starting nitrogen cycle plants fish

University of Hawaii ATOLL: Aquaculture Training*Online Learning

<http://videolearning.uhatoll.com/>

Tags: uh video aquaponics

Commercial Scale Aquaponics: Profitability and Sustainability Preliminary Findings

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Tokunaga.pdf>

Tags: economically feasible investment cost operational cost profitability kunai iliili maris garden food safety certified organic certified performance labor intensive vegetable production pest management fish production not profitable growth rate

Research into technologies for Commercial Aquaponics

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Ako.pdf>

Tags: capital operating costs high food security sustainability sizing nutrient flux hypothesis feed cinder biofilter oxygen bioremediation red worms airstones boyd moore media cinder raft air gap water chemistry greenwater algae change denitrification solids removal results

Challenges and Opportunities for Aquaponics in the College of Tropical Agriculture and Human Resources

<http://www.ctahr.hawaii.edu/sustainag/news/articles/V6-Tamaru-aquaponic.pdf>

Tags: aquaculture research extension complex Waimanalo prototype

Nutrient Fluxes in Aquaponics Systems (ppt file)

www.ctahr.hawaii.edu/pmp/Aquaponics%20for%20workshop.ppt

Tags: definitions benefits history nutrients supplementation fish water scenarios family size mid size micro farm small farm

On-Farm Food Safety: Aquaponics

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/fst-38.pdf>

Tags: fda good agricultural gap zoonotic pathogens E.coli salmonella human sanitation harvesting produce safely warm blooded animal feces water sources zoonosis prevention waste water sample laboratory report

The Future of Commercial Scale Aquaponics

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Lau.pdf>

Tags: mari's gardens fred lau mechanization labor electrical costs renewal energy feed costs

Aquaponic Designs

<http://www2.hawaii.edu/~khanal/aquaponics/design.html>

Tags: bioenergy research group nitrogen transformations floating raft nft flood drain operation seed germination rock wool cherry tomato pak choi startup maintenance harvest water quality tan no2 no3

Evaluating Alternative Nutrient Sources In Subsistence-Level Aquaponic Systems

http://teams.gemstone.umd.edu/classof2014/mega/documents/MEGA_Thesis_FINAL_05_06_14.pdf

Tags: hydroponics aquaculture aquaponics existing systems fish plants nutrient sources metrics methodology Glossary of Terms duckweed alternative feeds tilapia weight plant biomass acceptable nitrogen concentration ranges water chemistry protocols

Construction of Automatic Bell Siphons for Backyard Aquaponic Systems

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/bio-10.pdf>

Tags: flood drain ebb flow auto siphon bell siphon

Construction of Automatic Bell Siphons for Backyard Aquaponics Systems Workshop

http://legacy.sip-hawaii.org/files/2A_Fox_aquaponics.pdf

Tags: stem types raft ebb flow timing auto-siphons theory sizing installing bulkhead fitting uniseal construction

Aquaponics: Paradigm Shift with Airlift part 1

http://www.extension.org/sites/default/files/Aquaponics-%20Paradigm%20Shift%20with%20Airlift_part1-Ron_0.pdf

Tags: inventor principle volume flow two-phase flow multiphase weaknesses disadvantages advantages geyser pump

Aquaponics: Paradigm Shift with Airlift part 2

<http://fisheries.tamu.edu/files/2013/10/Aquaponics-Paradigm-Shift-with-Airlift-Part-2.pdf>

Tags: principle olomana gardens design one way valve burper advantages

Water and Energy Conservation Grow System: Aquaponics and Aeroponics with a Cycle Timer

<http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1192&context=eesp>

Tags: electrical engineering project components solar panels grow mediums bell siphon nitrogen cycle bio-filter fish plants design

Small-Scale Lettuce Production with Hydroponics or Aquaponics

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/sa-2.pdf>

Tags: ako tray construction covers polystyrene panel net pot oasis cube shade structure type sprouting

LOKO I'A: A Manual on Hawaiian Fishpond Restoration and Management

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/Loko%20I%27a%20Full%20Publication.pdf>

Tags: history permits regulatory equipment pond health troubleshooting fish culture problems limu production business plan references economics

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New System, System Cycling, the Nitrogen Cycle

Aquaponics at the College of Tropical Agriculture and Human Resources (CTAHR)

http://www.ctahr.hawaii.edu/uhmg/conference/downloads/MG_aquaponic.pdf

Tags: master gardener conference 2010 ahupua'a land grant hatch act smith-lever urban agriculture tilapia feed bell siphon Waimanalo media commercial nft raft nitrogen cycle vermicast tea types water quality plant weight state hospital

The Chemistry and Microbiology of Aquaponics

<http://www2.hawaii.edu/~cwatters/Lesson%208%20Chemistry%20and%20Microbiology%20of%20Aquaponics.pdf>

Tags: ammonia nitrites nitrates oxygenation DO dissolved oxygen pH carbon dioxide temperature pathogens chlorine chloramines feeding nitrogen cycle cycling test kits stock capacity mg/L

Aquaponic System Design and Management

http://www.extension.iastate.edu/forestry/tri_state/tristate_2014/talks/PDFs/Aquaponic_System_Design_and_Management.pdf

Tags: aquaculture hydroponics benefits guidelines for producers feeding rate ratio supplement aeration solids removal mechanical filtration oversize pipes biological control nitrogen cycle biological filtration pH pumps impeller airlift design considerations water source tanks hydroponic unit greenhouse lighting inspections water quality disease aeromonas pythium biosecurity

Barrel-ponics

<http://www.ctahr.hawaii.edu/uhmg/downloads/barrel-ponics.pdf>

Tags: aquaponics construction parts list grow bed stand flood valve floating raft plumbing maintenance starting nitrogen cycle plants fish

The Chemistry of Aquaponics PDF from the Texas Aquaponic Guide including Terms

http://cleanfoodsolutions.org/uploads/The_Chemistry_of_Aquaonics.pdf

Tags: stages cycling water fish bacteria plant testing pH ammonia tan nitrites nitrates alkalinity hardness general carbonate chlorine chloramine dissolved oxygen DO chemical terms

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Water Quality / Chemistry

The Chemistry and Microbiology of Aquaponics

<http://www2.hawaii.edu/~cwatters/Lesson%208%20Chemistry%20and%20Microbiology%20of%20Aquaponics.pdf>

Tags: ammonia nitrites nitrates oxygenation DO dissolved oxygen pH carbon dioxide temperature pathogens chlorine chloramines feeding nitrogen cycle cycling test kits stock capacity mg/L

Testing your Aquaponic System Water: A Comparison of Commercial Water Chemistry Methods

<http://www.ctsa.org/files/publications/TestingAquaponicWater.pdf>

Tags: temperature DO dissolved oxygen pH alkalinity kH ammonia unionized ionized uia ia nh3 nh4+ macronutrients micronutrients frequency accuracy precision

Water Quality in Aquaponic Systems

<http://ag.arizona.edu/ceac/sites/ag.arizona.edu.ceac/files/Water%20Quality%20in%20Aquaponic%20Systems%20-%20Shultz.pdf>

Tags: DO dissolved oxygen nitrogen ammonia nitrite nitrate pH alkalinity carbon dioxide temperature cycle biofiltration biofilter denitrification hardness npk feeding rate supplementation

The Chemistry of Aquaponics PDF from the Texas Aquaponic Guide including Terms

http://cleanfoodsolutions.org/uploads/The_Chemistry_of_Aquaonics.pdf

Tags: stages cycling water fish bacteria plant testing pH ammonia tan nitrites nitrates alkalinity hardness general carbonate chlorine chloramine dissolved oxygen DO chemical terms

Ammonia in Aquatic Systems

<http://edis.ifas.ufl.edu/fa031>

Tags: ammonium total nitrogen tan nh_4^+ nh_3 nitrite cycle nitrospira nitrosomonas nitrobacter oxygen alkalinity salt testing uia ia pH temperature

A Preliminary Study of Microbial Water Quality Related to Food Safety in Recirculating Aquaponic Fish and Vegetable Production Systems

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/FST-51.pdf>

Tags: E.coli O157:H7 salmonella risk factors methods results

Testing for Water Borne Pathogens at an Aquaponic Farm

http://www.ctahr.hawaii.edu/sustainag/leaders/downloads/Testing_for_Water_Borne_Pathogens_at_an_Aquaponic_Farm_Feb2012.pdf

Tags: epa E.coli O157:H7 salmonella IgM materials methods results

Surface Waters: Ammonium is Not Ammonia

<http://www.extension.iastate.edu/CropNews/2008/0421JohnSawyer.htm>

Tags: tan total nitrogen un-ionized ionized nh_4^+ nh_3 uia ia

Update On Tilapia And Vegetable Production In The UVI Aquaponic System

<http://ag.arizona.edu/azaqua/ista/ista6/ista6web/pdf/676.pdf>

Tags: rakocy design snails sunfish tilapia vegetables okra nutrient deficiency water quality pH DO dissolved oxygen pythium cutting transplanting

Aquaponic Production of Tilapia and Basil: Comparing a Batch and Staggered Cropping System

http://uvi.edu/files/documents/Research_and_Public_Service/AES/Aquaculture/Tilapia_and_Basil.pdf

Tags: rakocy tilapia basil nutrient deficiency water quality pH DO dissolved oxygen biofilter tank feed pH fish vendors pythium cutting transplanting

Evaluating Alternative Nutrient Sources In Subsistence-Level Aquaponic Systems

http://teams.gemstone.umd.edu/classof2014/mega/documents/MEGA_Thesis_FINAL_05_06_14.pdf

Tags: hydroponics aquaculture aquaponics existing systems fish plants nutrient sources metrics methodology Glossary of Terms duckweed alternative feeds tilapia weight plant biomass acceptable nitrogen concentration ranges water chemistry protocols

Nitrite in Fish Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/110/>

Tags: brown blood disease nitrite toxicity treatment prevention salt calculation application

Ammonia in Fish Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/111/>

Tags: tan forms toxicity treatments un-ionized ammonia pH temperature

Interactions of pH, Carbon Dioxide, Alkalinity, and Hardness in Fish Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/112/>

Tags: dissolved oxygen DO

Algae Blooms in Commercial Fish Production Ponds

<https://srac.tamu.edu/index.cfm/getFactSheet/whichfactsheet/113/>

Tags: photosynthesis oxygen deficit shade aquatic weeds pond community blue-green nutrient flows fish production systems interactions phytoplankton mineral nutrient control options

Measuring Dissolved Oxygen Concentrations in Aquaculture

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/167/>

Tags: DO meter sensors operation calibration monitoring

Carbon Dioxide in Fish Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/115/>

Tags: decomposition organic matter pond breathing algae bloom summer problems pH graphing treatment management

Managing High pH in Freshwater Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/205/>

Tags: hydrogen ion transformation power problems managing hardness alkalinity alum organic substances plant growth

Managing Ammonia in Fish Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/169/>

Tags: pH temperature effects un-ionized total ammonia toxic dynamics sources sinks winter algae bloom management options reduced feeding increase aeration lime phosphorus pond depth flush bacterial amendments organic carbon ion exchange acid

Nitrogen Transformations in Aquaponic System

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Hu.pdf>

Tags: aquaculture production aquaponics cycle advantages performance water quality no3 no2 tan nitrogen distribution total nitrogen utilization efficiency

SRAC Factsheets: All Available Aquaculture Sheets

<https://srac.tamu.edu/index.cfm/event/viewAllSheets/>

Tags: all documents related to aquaculture

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Fish Health

Tilapia Life History and Biology

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/53/>

Tags: nile niloticus characteristics taxonomy cichlids oreochromis nest builders mouth brooders aureus mossambicus physical characteristics banding patterns coloration reproduction sexual maturity feeding behavior nutritional requirements environmental salinity dissolved oxygen temperature pH ammonia nitrite diseases growth yields regulations

Aquaponics—Integration of Hydroponics with Aquaculture

http://www.aces.edu/dept/fisheries/education/documents/aquaponics_Integrationofhydroponicswaquaculture.pdf

Tags: nutrients effluent plants fish water quality biofiltration bibliography speraneo s&s Aqua Farms rakocy organic books magazines journals

Recirculating Aquaculture Tank Production Systems: Aquaponics—Integrating Fish and Plant Culture

<http://fisheries.tamu.edu/files/2013/09/SRAC-Publication-No.-454-Recirculating-Aquaculture-Tank-Production-Systems-Aquaponics-Integrating-Fish-and-Plant-Culture.pdf>

Tags: rakocy design uvi types nft

The Role of Stress in Fish Disease

<http://fisheries.tamu.edu/files/2013/09/SRAC-Publication-No.-0474-The-Role-of-Stress-in-Fish-Disease.pdf>

Tags: physiological physical injury density handling nutrition sanitation defense infection mucus slime layer scales skin inflammation antibodies prevention water quality transporting

Francisellosis in Tilapia

http://www.ctsa.org/files/publications/Biosecurity_Pub158.pdf

Tags: Francisella fno disease noatunensis orientalis asiatica white nodules spleen kidney

Update on Francisellosis in Tilapia in Hawaii (FNO)

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/tilapia/9_Tamaru_FNO_Tilapia.pdf

Tags: Francisella tilapia disease noatunensis orientalis asiatica white nodules spleen kidney

Ich (White Spot Disease)

<http://fisheries.tamu.edu/files/2013/09/SRAC-Publication-No.-476-Ich-White-Spot-Disease.pdf>

Tags: Ichthyophthirius multifiliis identification skin salt sprinkled bumpy gills flashing life cycle tomont theronts swimmers throphonts temperature prevention treatment copper sulfate formalin potassium permagnate salt eradication

Growth Characteristics Of Two Tilapia Species

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/tilapia/7_Tran_Kim_TilapiaGrowth.pdf

Tags: blue aureas hornorum growth characteristics body weight length feed conversion

The success story of the Tilapia industry; current and future trends of the US seafood market

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/tilapia/3_Weidenbach.pdf

Tags: subsistence export commodity aquaculture global demand farmed fish world production consumption grocery sales breeds species spawning fry rearing hapas genome

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Plant Health

Integrated Pest Management for Commercial Aquaponic Systems

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-Classroom/Sugano_IPM_aquaponics.pdf

Tags: ipm id pest monitor habitat modification cultural physical control biotechnology biological control chemical control chewing beetles caterpillars leaf miners sucking vascular tissue discolor distortion honey dew sooty mold aphids whiteflies grasshoppers mealy bugs scales leaf hoppers rasping sucking mites brown discoloration ants fruit flies snails slugs nematodes root rotting galling fungus bacteria virus phyto-plasma pathogens nutrition monitoring traps population infestation location natural enemies season environmental conditions strategies habitat modification breeding sites physical barriers screens rotation fallow spacing companion planting crop selection aeration worms sanitation biotechnology pesticides label law allowed crop listed environmental hazard benefits

Are we ready for insecticide-free aquaponics system?

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/KHWang.pdf>

Tags: ipm environmental hazard biodiversity national organic program nop sunset list insectary plants wasp nesting blocks reflective raft Vermicompost thrip natural enemies lady beetle green lacewing hover fly buckwheat cilantro sunn hemp aphid-collecting wasp

Beneficial Use of Vermicompost in Aquaponic Vegetable Production

<http://www.ctahr.hawaii.edu/sustainag/news/articles/V10-Fox-Verm-Aquaponics.pdf>

Tags: advantages limitations pH buffering potassium hydroxide calcium optimal nitrifying bacteria iron chelated sustainable renewable agricultural practices nutrient deficiencies compost worms enhance plant growth crop yield root structure worm tea microbial metabolites

Update On Tilapia And Vegetable Production In The UVI Aquaponic System

<http://ag.arizona.edu/azaqua/ista/ista6/ista6web/pdf/676.pdf>

Tags: rakocy design snails sunfish tilapia vegetables okra nutrient deficiency water quality pH DO dissolved oxygen pythium cutting transplanting

Aquaponic Production of Tilapia and Basil: Comparing a Batch and Staggered Cropping System

http://uvi.edu/files/documents/Research_and_Public_Service/AES/Aquaculture/Tilapia_and_Basil.pdf

Tags: rakocy tilapia basil nutrient deficiency water quality pH DO dissolved oxygen biofilter tank feed pH fish vendors pythium cutting transplanting

Pythium

<http://extension.psu.edu/pests/plant-diseases/all-fact-sheets/pythium>

Tags: root rot rare in soilless cutting bed large losses symptoms stunted tips brown dead plant wilt at mid day yellow die brown tissue on roots management

Yield and Quality of Aquaponic Pakchoi

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-Classroom/Radovich_PakChoi.pdf

Tags: Vermicompost media variety head size weight phytonutrient

Aquaponics Bun Long Taro Cultivation

http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-Classroom/Lum_bunlong.pdf

Tags: colocasia esculenta Chinese taro grow media leaf quality farm yield commercial taste luau leaf corm taro chip keiki

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Pond Construction

Aquaculture: Realities and Potentials When Getting Started

<https://srac.tamu.edu/index.cfm/getFactSheet/whichfactsheet/276/>

Tags: self assessment power failure pipe clogging water quality problems equipment expenses facilities levee ponds watershed ponds cages raceway flow-through tanks recirculating systems location new exciting traps investigate markets produce start small water quality management financial position budget feed glossary

Site Selection of Levee-Type Fish Production Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/1/>

Tags: water sources soil characteristics topography wetlands climate contaminants predators environmental

Construction of Levee Ponds for Commercial Catfish Production

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/2/>

Tags: pond morphology design of levees drainage site preparation construction

Watershed Fish Production Ponds Guide to Site Selection and Construction

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/3/>

Tags: water supplies soil type topography safety adequate watershed area design layout sizing depth costs equipment building soil moisture compaction drainage concrete ballasts sizing riser barrel pipes emergency spillways dam freeboards establishing vegetation

Calculating Area and Volume of Ponds and Tanks

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/4/>

Tags: square rectangular ponds circular triangular irregularly shaped ponds conversion tables

Repairing Fish Pond Levees

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/5/>

Tags: repair thin levees dry pond bottoms building strong levees strengthening soil reducing erosion mechanical structural treatments vegetation rebuilding ponds

Renovating Leaky Ponds

<https://srac.tamu.edu/index.cfm/event/getFactSheet/whichfactsheet/6/>

Tags: common causes improper construction permeable soil thin layer fractured bedrock identify problem treatment costs spot treatments specific problems compaction clay blanket bentonite soil dispersants liners prevention

Pond Building: A Guide to Planning, Constructing, and Maintaining Recreational Ponds

<http://www.aces.edu/pubs/docs/A/ANR-1114/>

Tags: site selection planning design construction vegetative cover maintenance

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Hydroponics

A Suspended Net-Pot, Non-Circulating Hydroponic Method for Commercial Production of Leafy, Romaine, and Semi-Head Lettuce

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/vc-1.pdf>

Tags: kratky rain shelters capillary action nutrient solution oxygen roots uv stabilized polyethelene tanks planting density water fertilizer pH seedling oasis block transplanting growing harvesting mosquitoes

Using Hydroponics for Food Production

http://www.colostate.edu/Dept/CoopExt/Adams/gh/pdf/Intro_Hydroponics.pdf

Tags: media substrates history pros cons nutrient solutions organic additives types nft ebb and flow raft wick aeroponics top feed drip vertical vegetable varieties lights led

An Economic Comparison of Commercially Available Organic and Inorganic Fertilizers for Hydroponic Lettuce Production

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/SA-5.pdf>

Tags: aquaponics synthetic pH range

Growing Hydroponic Cucumbers in a Plastic Trash Container

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/hg-44.pdf>

Tags: materials fertilizers salts construction nutrient solution roots

A Simple Hydroponic Growing Kit for Short-Term Vegetables

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/hg-42.pdf>

Tags: materials needed instructions fertilizer chem-grow growing medium seeds kai choi

Growing Plants Without Soil

<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/C1-440.pdf>

Tags: principles justification limitations methods water culture nutrient solution sand gravel absorbed-nutrient considerations

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Non-Scientific References

FYI Only. Do Not Distribute to Clients.

Fishless Cycling for Starting your Aquaponics System

<http://theaquaponicsource.com/2010/11/01/starting-your-aquaponics-system-using-fishless-cycling/>

Tags: startup advantages liquid ammonia ammonium chloride crystallized urine

FAQ: Nelson & Pade Aquaponics

<http://aquaponics.com/page/aquaponics-faq>

Tags: organic benefits plants fish stock old tanks feed greenhouse hobby school project

FAQ: How to Aquaponics

<http://theaquaponicsource.com/how-to-aquaponics/>

Tags: organic E.coli salmonella fish plants cycling worms pH grow lights

What is Aquaponics?

<http://community.theaquaponicsource.com/page/what-is-aquaponics>

Tags: hydroponics aquaculture pH feed productivity recirculating raft media history

Glossary of Aquaponics Terms & Abbreviations

<http://community.theaquaponicsource.com//page/aquaponics-glossary-of-terms>

Tags: media-based nft dwc chift pist chop chop2 constant flow flood and drain ebb and flow chemistry gh kh ph alkalinity acid base ion anions cations chelates

Rules of Thumb: Aquaponic Gardening

<http://theaquaponicsource.com/rules-of-thumb/>

Tags: diy Australia system type media beds grow fish tanks stocking density planning inert leca hydroton water flow flood drain timer bell siphon cycling fishless ammonia nitrites nitrates oxygen plants feed worms ph

Commercial Aquaponics: 10 Things to Consider Before Taking the Plunge

<http://theaquaponicsource.com/2010/10/14/commercial-aquaponics-10-things-to-consider-before-taking-the-plunge/>

Tags: consumer buyers industry produce season csa community supported agriculture zipgrow vertical towers media bed fish

Where to Get Aquaponis Stuff on Maui

<http://apnko.com/en/resources/where-to-get-stuff-on-maui>

Tags: maui vendors supplies

Friendly Aquaponics Free CAD Drawings of DWC Trough Construction

<http://friendlyaquaponics.com/docs/MicroSystem64-128-3.pdf>

Tags: plans

System Startup, Operation and Maintenance

<http://friendlyaquaponics.com/docs/SystemStartup.pdf>

Tags: water quality pH ammonia nitrite spike nitrates algae

Olomana Gardens Educational Air Lift Pump Display

<https://www.youtube.com/watch?v=aOnbB0gVxW8>

Tags: different styles of airlift pumps

The Birth of a New Business: "Aquaponics Plus"

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Sato.pdf>

Tags: oahu vendor supplies

Primavera Aquaponics LLC

<http://www.ctahr.hawaii.edu/sustainag/workshop/downloads/Aquaponics-May2013/Primavera.pdf>

Tags: oahu vendor vertical towers

The Aquaponic Gardening Community

<http://community.theaquaponicsource.com/>

Tags: forums blogs discussion groups

Bright Agrotech Blog

<http://brightagrotech.com/blog/>

Tags: aquaponics resource guide nutrients business plan commercial farming hydroponics pest control vertical farming zipgrow towers algae nitrogen nitrification

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