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**AQUAPONO SOP: Microsystem Assembly**

*Materials: AquaPono Microsystem and included parts; duct or gorilla tape; waterproof electrical strip*

*Instructions: Please read steps carefully before attempting to assemble the AquaPono Microsystem*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
|  |  | **Assembling The Frame** |
| □ | 1 | Open the tub. Organize PVC pieces into groups: Short PVC, Long PVC, Elbows, T’s |
| □ | 2 | Locate 2 PVC T’s. Connect 1 short PVC at the center of the 2 T’s, Making a capital letter “I.” |
| □ | 3 | Connect 1 short PVC piece to 1 elbow. Repeat 4 times. |
| □ | 4 | Connect pieces from step #3 to capital “I” |
| □ | 5 | Connect 4 long PVC “legs” to the elbow pieces. Steady and align the frame. |
|  |  | **ASSEMBLING THE TANKS** |
| □ | 6 | Place first tub (without a hole) underneath PVC frame. |
| □ | 7 | Make 4 tape rolls and apply to wood pieces on top of frame, paralleling the capital “I.” |
| □ | 8 | Locate the “stand-pipe.” It is the PVC with black rubber grommet. Snap into second tub (with hole). |
| □ | 9 | Place grow bed on top of frame, aligning the stand-pipe with the wood piece that has a hole. |
| □ | 10 | Locate the “media guard.” It is a black PVC pipe with pre-cut slits. Center evenly over the stand-pipe. Secure with gorilla tape. |
| □ | 11 | Locate the “up-pipe.” It is a long PVC with a “hook” shape. Connect into pump. Do not plug the pump in. |
| □ | 12 | Place up-pipe and pump into the bottom tub, on the opposite side of the media guard. Secure with Velcro to the side of the grow bed. |
| □ | 13 | Have an assistant place their hand on top of the media guard. If not assistant is available, still cover the media guard so no media gets inside. Scoop pre-rinsed media into top tub until 1” from the top of the media guard. Media should be well above standpipe by ½”. ***No media should be inside media guard.*** |
| □ | 14 | Locate “bell siphon.” It is the PVC with cap. Insert into media guard over the stand-pipe. |
| □ | 15 | Let water stand for 24 hours in a bucket. Add this de-chlorinated water into bottom tub (without hole) 3” from the top. |
| □ | 16 | Plug in pump that is now submerged in water into waterproof power strip. |
| □ | 17 | Make sure the system is running smoothly. |

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**AQUAPONO SOP: Adding Fish and Plants**

*After system has been set-up and is running smoothly you can stock your bottom tank with fish.*

*Materials: 2 to 3 small ornamental fish (such as comets); Pack of seeds*

*Instructions: Please read steps carefully before attempting to transplant*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Make sure the system is properly set up and is running smoothly. |
| □ | 2 | Add two to three small ornamental fish to the fish tank. |
| □ | 3 | Place pre-fabricated 50/50 shade cloth on top of the fish tank. |
| □ | 4 | Ensure the holes in the shade cloth are aligned with the stand-pipe and up-pipe. |
| □ | 5 | Secure 50/50 shade cloth with bungee cord. |
| □ | 6 | Gradually add a few fish every couple of weeks to the system until you reach the maximum stocking rate of 1” -2” of fish per gallon of water. |
| □ | 7 | Once the tank has been set up with fish in it for four weeks you can plant seeds into the top grow bed. |
| □ | 8 | Check the level of the water before planting: it should ½” under the surface of the LECA before it drains back into fish tank. Note: The height of the stand-pipe determines the water level. Adjust by gently pushing up or pulling down with a twist before adding plants. Be careful to not dislodge the grommet from the tank. |
| □ | 9 | Choose a leafy green variety to plant in the grow bed. |
| □ | 10 | Open the package carefully and pace 1 seed at a time in a row inside the tank. |
| □ | 11 | Space each seed 1” apart unless it is a variety that is planted close together (i.e. arugula, spring mix, etc.) |
| □ | 12 | Do not cover seeds with media or it may be planted too deep for proper germination. |
| □ | 13 | Lightly sprinkle nutrient rich water from up-pipe over the seeds if the media is completely dry. Only do this before germination and after, with the exception of leaves. |
| □ | 14 | Wait for germination and re-seed as needed. |
| □ | 15 | Thin seedlings out as needed. Harvest when ready! |

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**AQUAPONO SOP: Water Quality Testing**

Materials:

* 1. API® Aquarium Pharmaceuticals pH (6.0-7.6) test kit
  2. API® Aquarium Pharmaceuticals High Range pH (7.4-8.8) test kit
  3. API® Aquarium Pharmaceuticals Ammonia (NH3/NH4+) test kit
  4. API® Aquarium Pharmaceuticals Nitrite (NO2-) test kit
  5. API® Aquarium Pharmaceuticals Nitrate (NO3-) test kit

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands. The use of gloves is recommended. |
| □ | 2 | Place test kits, clean test tubes, sample bottles and directions for each test kit on a workbench or clean workspace. A clipboard is suggested. |
| □ | 3 | If you have more than one system, run one system’s tests before moving on to the next. |
| □ | 4 | Always take water samples from the same place in each system each time you run water quality tests. Always double rinse the sample bottle with water from the same tank. Dump water outside of tank before moving on. |
| □ | 5 | Take your sample from running water from the up-pipe in the system. |
| □ | 6 | Follow the directions supplied in the test kits to run the water quality tests. Refer to the directions below. |
| □ | 7 | Record parameters on a data log sheet and file in maintenance binder accordingly. |
| □ | 8 | When completed, invert test tubes to dry. Put test kits, cleaned test tubes and sample bottle back in their storage place. |
| □ | 9 | **pH Test** |
| □ | a. | Rinse test tube twice using water from the tank being tested. |
| □ | b. | Fill water from tank 1 to the line (5 mL) in the test tube (make sure to get as close to the line as you can, take the time to do it one or twice to be as accurate as possible) |
| □ | c. | Take the blue pH test solution (#1 on back of bottle) and add 3 drops (remember to make sure the bottle and test tube are straight up and down) |
| □ | d. | Cap the test tube and gently rotate the tube from left to right to make sure there is even distribution of solution in the water. |
| □ | e. | Match the pH of the water in tube to the color chart. |
| □ | f. | When emptying tube do not dump the contents of the tube back into the tank. The tube now contains chemicals that you do not want to put in the tank with your fish and plants. |
| □ | g. | Clean test tube by filling with water from that tank. Place the cap over the tube and rotate. Dump water (once again, do not dump into tank). Fill the tube with water a second time. Place cap over the tube and shake. Dump this water. |
| □ | h. | If servicing multiple systems, move on to the next tank and repeat the above steps until all tanks have been tested. |
| □ | 10. | **High Range pH Test:** |
| □ | a. | Fill water from tank 1 to the line (5mL) in the test tube (make sure to get as close to the line as you can, take the time to do it once or twice to be as accurate as possible). |
| □ | b. | Add 5 drops of the test solution (remember to make sure the bottle and test tube are straight up and down). |
| □ | c. | Cap the test tube and gently rotate the tube from left to right to make sure there is even distribution of solution in the water. |
| □ | d. | Match the pH of the water in tube to the High Range pH chart. |
| □ | e. | When emptying tube do no dump the contents back into the tank. The tube now contains chemicals that you do not want to put in the tank with your fish and plants. |
| □ | f. | Clean test tube by filling with water from that tank. Place the cap over the tube and rotate. Dump water (once again, do not dump into tank). Fill the tube with water a second time. Place cap over the tube and shake. Dump this water. |
| □ | g. | If servicing multiple units, move on to the next tank and repeat the above steps until all tanks have been tested. |
| □ | 11. | **Ammonia Test:** |
| □ | a. | Fill water from tank 1 to the line (5mL) in the test tube (make sure to get as close to the line as you can, take the time to do it once or twice to be as accurate as possible). |
| □ | b. | Take the yellow Ammonia Test Solution (**Bottle #1**) and add **8 drops** (remember to make sure the bottle is straight up and down). |
| □ | c. | Cap the test tube and gently rotate the tube from left to right to make sure there is even distribution of solution in the water. Do not shake. |
| □ | d. | Take the clear Ammonia Test Solution (**Bottle #2**) and add **8 drops** (remember to make sure the bottle is straight up and down). |
| □ | e. | Cap the test tube and gently rotate the tube from left to right to make sure there is even distribution of solution in the water. Shake for five seconds. |
| □ | f. | Wait for **5 minutes**. |
| □ | g. | Match the contents of the tube to the Ammonia chart. |
| □ | h. | When emptying tube do not dump the contents of the tube back into the tank. The tube now contains chemicals that you do not want to put in the tank with your fish and plants. |
| □ | i. | Clean test tube by filling with water from that tank. Place the cap over the tube and rotate. Dump water (one again, do not dump into tank). Fill the tube with water a second time. Place cap over the tube and shake. Dump this water. |
| □ | 12. | **Nitrite Test** |
| □ | a. | Fill water from tank 1 to the line (5mL) in the test tube (make sure to get as close to the line as you can, take time to do it once or twice to be as accurate as possible). |
| □ | b. | Take the pink Nitrite Testing Solution and add **5 drops** (remember to make sure that the bottle and test tube are straight up and down). |
| □ | c. | Cap the test tube and gently rotate the tube from left to right for 5 seconds to make sure there is even distribution of solution in the water. |
| □ | d. | Wait for **5 minutes.** |
| □ | e. | Match the contents of the tube to the Nitrite chart. |
| □ | f. | When emptying tube do not dump the contents of the tube back into the tank. The tube now contains chemicals that you do not want to put in the tank with your fish and plants. |
| □ | g. | If servicing multiple units, move on to the next tank and repeat the above steps until all tanks have been tested. |
| □ | 13. | **Nitrate Test** |
| □ | a. | Fill water from tank 1 to the line (5mL) in the test tube (make sure to get as close to the line as you can, take the time to do it once or twice to be as accurate as possible). |
| □ | b. | Take the purple Nitrate Test Solution (**Bottle #1**) and add **10 drops** (remember to make sure that the bottle and test tube are straight up and down). |
| □ | c. | Cap the test tube and gently rotate the tube from left to right to make sure there is an even distribution of solution. |
| □ | d. | Shake the Nitrate Test Solution for 30 seconds |
| □ | e. | Add **10 drops** of **Bottle #2** Nitrate Test Solution (remember to make sure the bottle is straight up and down) |
| □ | f. | Cap the test tube and shake vigorously. Make sure there is even distribution of solution in the water – do this for 1 minute |
| □ | g. | Wait for **5 minutes** |
| □ | h. | Match the contents of the tube to the Nitrate chart |
| □ | i. | When emptying tube do not dump the contents of the tube back into the tank. The tube now contains chemicals that you do not want to put in the tank with your fish and plants. |
| □ | j. | Move on to the next tank. Fill the tube with water from that tank. Place cap over the tube and shake. Dump water (once again don’t dump into tank). Full the tube with water a second time. Place the cap over the tube and shake. Dump this water. |
| □ | k. | If servicing multiple units, move on to the next tank and repeat the above steps until all tanks have been tested. |

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**AQUAPONO SOP: Fish Tank Cleaning**

*Materials: Clean soft sponge, hard brush, clean bucket*

*Instructions: This maintenance can be done every 2 weeks or as needed.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
|  |  | **Assembling The Frame** |
| □ | 1 | Safety first! Be sure to unplug the pump before beginning the fish tank cleaning. |
| □ | 2 | Remove the bungee cord and the shade cloth from the fish tank. |
| □ | 3 | Disconnect the up-pipe from the pump. |
| □ | 4 | Transfer the water from the fish tank into a clean bucket. |
| □ | 5 | With a clean soft sponge, clean the bottom and sides of the fish tank until all the algae residuals are removed. |
| □ | 6 | Locate your pump. Take off the green pad and rinse off thoroughly or spray with a hose until all residuals are removed. |
| □ | 7 | With a hard brush, clean in between slits of the pump until you can see through it. Rinse off thoroughly. |
| □ | 8 | Replace the cleaned green pad onto the pump. Make sure the slits are entirely covered. Secure with zip ties or rubber bands. |
| □ | 9 | Locate the up-pipe. With a thin bottlebrush, clean inside the up-pipe removing algae until clean. Make sure to get inside the “hook” area. |
| □ | 10 | Reconnect the up-pipe to the pump filter. |
| □ | 11 | Replace fish and nutrient rich water from the bucket into the fish tank. |
| □ | 12 | Place the pump into fish tank, with hook part of the stand-pipe on the opposite side from the media guard in the grow bed. |
| □ | 13 | Secure the up-pipe with velcro to the grow bed. |
| □ | 14 | Replace the 50/50 shade cloth on the fish tank. Remember to guide up-pipe through the front shade cloth hole. Secure with a bungee. Pull tight until all corners are secure. |
| □ | 15 | Plug the water pump into the water proof power strip. |
| □ | 16 | Make sure the system is running smoothly. |

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**AQUAPONO SOP: Cleaning of the Grow Bed with LECA**

*Materials: Two 5 gallon buckets, a high powered water hose and at least 1 or more colanders (recommended 3-4 per 5 gallon bucket), duct or gorilla tape*

*Instructions: Please read steps carefully before attempting to clean the grow beds. Cleaning grow beds should be done after harvesting or when the water becomes cloudy.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
|  |  | **Assembling The Frame** |
| □ | 1 | Unplug the water pump from electrical socket before beginning. |
| □ | 2 | Disconnect the up-pipe from the water pump inside the fish tank and set aside in a safe place. Also remove the splash guard. |
| □ | 3 | Allow the water to drain from the grow bed as much as possible without moving the grow bed. A small amount of cloudy water will remain in the grown bed. This will be dumped after the LECA has been removed. |
| □ | 4 | Scoop the LECA into a colander and pour into a clean bucket until the grow bed is empty. *Note: Use a large spoon to scoop into colander and then into bucket if needed.* |
| □ | 5 | After the grow bed has rained as much as possible, filter any remaining LECA using a colander; pour excess water onto grass. |
| □ | 6 | Unplug the stand pipe by popping it out of the bottom **before** setting down the grow bed (do not set grow bed down with stand pipe inside). |
| □ | 7 | Thoroughly rinse the grow bed with the high-powered hose attachment. Use a sponge if necessary to clean off the residuals. |
| □ | 8 | Scrub the media guard and make sure the slits are clear. Use a bottle brush to clean the stand pipe. |
| □ | 9 | Dry all pieces. |
| □ | 10 | Center the media guard and secure with super strength duct tape or gorilla tape. Avoid covering the slits. |
| □ | 11 | Adjust the stand pipe to be **2 inches** below the top of the bell siphon using a twisting motion. |
| □ | 12 | Take the buckets filled with LECA over to the water hose. |
| □ | 13 | Pour the LECA from bucket into colanders to clean individually. Rinse by agitating with a plastic spoon or using your hands. |
| □ | 14 | Rinse thoroughly until all roots and residuals are washed away and LECA appears clean. |
| □ | 15 | Pour LECA from the colander into a clean bucket. |
| □ | 16 | Take the buckets filled with clean LECA over to the prepped grow bed. |
| □ | 17 | Have an assistant place their hand over the media guard. |
| □ | 18 | Scoop the LECA from the buckets using a colander or scoop. Avoid pouring the entire bucket into grow bed at one time. |
| □ | 19 | Replace the water pump and up pipe. Add de-chlorinated water, if necessary. |
| □ | 20 | Make sure that the pump is submerged in water. Plug in the water pump into the secure electrical outlet. |
| □ | 21 | Replace the splash guard. |
| □ | 22 | Make sure the system is running smoothly. |

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**AQUAPONO SOP: What to do when a Micro-system floods**

*Instructions: Please read steps carefully before attempting to address a flooded system. This SOP covers the proper way to repair a system back to normal operation when it becomes flooded. The system will flood if the stand pipe becomes clogged; water will become trapped in the grow bed and the fish tank water level will drain to dangerously low levels as the pump keeps pumping water up the up pipe into the grow bed. Clogging can happen if a piece of LECA gets inside the media guard and is sucked into the stand pipe during draining in the AquaPono Micro-Aquaponic system. This is not a normal occurrence but is a potential problem.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Unplug the water pump **immediately** to discontinue the flow of water from the fish tank into the grow bed. Disassemble pump and set aside in a safe place. |
| □ | 2 | Harvest all remaining crops from the grow bed. |
| □ | 3 | Remove the bell siphon. **Do not** remove the media guard or stand pipe. |
| □ | 4 | Unclog the stand pipe by using fingers or tweezers to remove the LECA. |
| □ | 5 | Replace the bell siphon to create the suction needed to drain the grow bed. Unclogging the stand pipe allows for water to be drained back into the fish tank; this will make the grow bed weigh less and be easier to work with. |
| □ | 6 | After the water has drained into the fish tank, remove LECA from grow bed. Remove the bell siphon and media guard. |
| □ | 7 | Lift the grow bed off the frame. Rest on top of a 5 gallon bucket **with the down pipe in the center of the bucket.** |
| □ | 8 | Remove the stand pipe to allow for the rest of the water to drain into the bucket. |
| □ | 9 | Thoroughly wash and dry the grow bed and media guard so the duct tape will stick. |
| □ | 10 | Replace the stand pipe. |
| □ | 11 | Place the media guard over the stand pipe. |
| □ | 12 | Rip strips of duct tape and place vertically on the media guard. Make sure not to cover the horizontal slits on the media guard. |
| □ | 13 | Rip strips of duct tape and horizontally circle it around the media guard to secure the strips of vertical duct tape. Overlap the strips of duct tape so there are no gaps. This will prevent LECA from getting underneath the media guard if it floats. |
| □ | 14 | Place the grow bed back on the frame. |
| □ | 15 | Have an assistant place their hand over the media guard to prevent LECA or media from getting inside the media guard. |
| □ | 16 | Replace the LECA back into the system by carefully pouring or scooping. |
| □ | 17 | Level the LECA in the grow bed. |
| □ | 18 | Replace the bell siphon. |
| □ | 19 | Add de-chlorinated water to the fish tanks if necessary. |
| □ | 20 | Replace the water pump and secure the up-pipe to the grow bed. |
| □ | 21 | Put the splash guard back. |
| □ | 22 | Make sure that the water pump is submerged and plug into waterproof switch. |
| □ | 23 | Make sure system is running smoothly. |

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**AQUAPONO SOP: Fish Net Cleaning**

*Instructions: Please read steps carefully before beginning. The purpose of this Standard Operating Procedure (SOP) is to provide consistent instruction on the proper way to maintain biosecurity during aquaponic operations through sterilization of fish nets. Each fish tank in the aquaponics system should have its own nets and equipment. Disease can easily travel around tanks and systems on shared equipment, buckets, etc. Sharing of equipment between tanks and aquaponics systems should be avoided. Keeping the fish in several tanks, not just on large tank, in each system also helps you isolate outbreaks of disease. One big challenge when treating sick fish is the fact that so many fish diseases are highly communicable.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash your hands before handling fish and equipment, especially diseased fish. |
| □ | 2 | After using a net in the daily routine and after removing “sick fish” into a quarantine tank, we need to make sure the fish net has been thoroughly sterilized before using them again. Otherwise, the infection could spread from “sick fish” to our healthy stock. |
| □ | 3 | Boil several gallons of water – enough to completely cover your net – and pout it into a bucket. Allow the water to cool slightly. |
| □ | 4 | Add bleach at a concentration of one part bleach for 20 parts water (1 cup of Clorox to 19 cups of degassed tap water). |
| □ | 5 | Make sure the entire surface of the net, including the handle, is submerged. |
| □ | 6 | Dip the net in the solution of bleach and water. Make sure the entire surface of the net, including the handle, is submerged in bleach solution. |
| □ | 7 | Let the “USED FISH NETS” sit in the bleach solution for at least one hour. |
| □ | 8 | Remove the nets and rinse thoroughly until there is no small of bleach. |
| □ | 9 | “Disinfected” nets should be air dried. This can be done on a clothesline. |
| □ | 10 | Keep the bleach solution in a LABELED BUCKET used for no other purpose than to sterilize the net before each use. |
| □ | 11 | LABEL the Storage Container for Bleach Solution. Make sure that it is tightly capped. |
| □ | 12 | Disinfected Fish Nets should be left on the clothesline to dry until next day use. |

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**AQUAPONO SOP: Adding LECA To Grow Bed**

*Instructions: Please read carefully.*

*Materials needed: LECA, large plastic bin, water hose, 3 colanders, scissors*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | **1** | * Wash hands thoroughly |
| □ | **2** | * Make sure that you have enough LECA for amount of systems required to fill |
| □ | **3** | * Get an adequately sized bin to pre-wash LECA |
| □ | **4** | * Arrange materials close to a water source - an outdoor water hose works best |
| □ | **5** | * Place unopened bag of LECA into bin |
| □ | **6** | * With a pair of scissors, carefully cut a hole at bottom of bag * Lift bag upwards emptying balls directly into bin |
| □ | **7** | * Turn on hose and fill bin with water |
| □ | **8** | * Agitate LECA and water by constantly mixing from bottom to top to ensure cleanliness |
| □ | **9** | * Have an assistant place their hand over top of gravel guard to keep LECA out of gravel guard and stand-pipe |
| □ | **10** | * Fill colanders with LECA and add to grow bed until LECA is 1” below gravel guard and ½” above height of stand-pipe |
| □ | **11** | * Add bell siphon |
| □ | **12** | * Replace pump with up-pipe and plug in to a waterproof power strip |
| □ | **13** | * Make sure system is working properly |

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**AQUAPONO SOP: Quarantining Fish**

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | * Thoroughly wash your hands |
| □ | 2 | * Prepare a bucket or tub with de-chlorinated water - water that has been sitting for at least 24 hours * *Note: if only a few fish need treatment place in bucket; if all fish need treatment use large blue tub* |
| □ | 3 | * Get blue aerator from top shelf in outdoor Rubbermaid cabinet * *Note: Make sure batteries are not dead in aerator; there are batteries on top shelf of Rubbermaid cabinet; if for any reason there are no batteries please call your supervisor immediately* * Tape aerator to outside of bucket * Be sure *airstone* is touching bottom of bucket or tub * Press large black button to turn on aerator * *CAUTION: Bubbles will start to form in bucket when aerator is turned on* |
| □ | 4 | * Use fish net to remove fish from fish tank * Place fish in bucket or tub with prepared de-chlorinated water and airstone |

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**AQUAPONO SOP: Grow Bed and Crop Analysis**

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | * Thoroughly wash your hands |
| □ | 2 | * Collect grow bed and crop analysis folder |
| □ | 3 | * If starting a new crop use a new grow bed and crop analysis bi-monthly report form |
| □ | 4 | * Start with tank you are collecting data on and document information requested on report form |
| □ | 5 | * Measure same plants each time to get accurate information for report |
| □ | 6 | * Document for each tank every two weeks: one month of growth will be entered per form |
| □ | 7 | * Documentation should be taken 1st day after germination, 2 weeks after 1st day of germination, and 4 weeks after 1st day of germination |
| □ |  | * Remember to also document crop cards with requested information when planting crops |
| □ | 8 | * Data should be entered monthly into computer |

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**AQUAPONO SOP: Partial Water Change**

***Purpose****: Partial water changes are needed when Ammonia and Nitrate levels are above safe levels for fish. For our mini systems consider Ammonia levels above 0.50ppm and Nitrate levels above 1.0ppm toxic to fish. If unsafe levels are seen during water quality testing use partial water change to bring levels down into safe zone.*

***Materials****: Empty 5-gallon bucket; degassed water; small plastic Tupperware container*

***Instructions****: Please read steps carefully before attempting to assemble. Use only Method 1 or 2 depending on which is easier for you personally; there is no need to do both methods during a partial water change.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | * Thoroughly wash your hands |
| □ | 2 | * Undo bungee * Fold back shade cloth so fish tank is visible |
| □ | 3 | * If grow bed is not drained lift bell siphon and wait for water to flow into stand-pipe * When water is flowing into stand-pipe replace siphon to promote draining of grow bed |
| □ | 4 | * Once grow bed starts to drain unplug pump to prevent fish tank water from entering grow bed * Choose either Method #1 or Method #2 and proceed |
| Method #1 | | |
| □ | 5 | * Place an empty 5-gallon bucket beside system needing water change * Place small plastic Tupperware container into fish tank and allow it to fill with water * Dump water into empty bucket * Continue to do this until water is low in tank but so that enough water is left in tank for fish to move around comfortably |
| □ | 6 | * Dump water in 5-gallon bucket onto grass * Replace water from fish tank with a bucket that has degassed water by pouring degassed water into fish tank * Pour to Sharpie marked line in fish tank (line is 2” below top of fish tank) |
| □ | 7 | * Retest water quality parameters that were above safe levels for fish |
| □ | 8 | * If levels are now in a safe zone you are done removing and adding water * If levels are still outside safe zone then repeat steps 5-7 until levels are safe |
| □ | 9 | * Plug pump back in and ensure system is running smoothly |
| □ | 10 | * Replace shade cloth over fish tank * Secure shade cloth with bungee |
| □ | 11 | * Replace degassed water from bucket used by filling bucket back up with new water from tap |
| Method #2 | | |
| □ | 5 | * Place an empty 5-gallon bucket beside system needing water change |
| □ | 6 | * Disconnect up-pipe from grow bed * Disconnected up-pipe from pump * Remove up-pipe from shade cloth * Reconnected up-pipe to pump |
| □ | 7 | * Hold up-pipe over bucket -- make sure that pump is not out of water at any point * Have your partner plug pump back in * Allow water from up-pipe to drain water from fish tank into empty 5-gallon bucket |
| □ | 8 | * During this procedure make sure pump is always submerged in water * Continue to drain water from fish tank until it is low but allow enough water to remain in fish tank for fish to move around comfortably * Have your partner unplug pump when enough water has been drained |
| □ | 9 | * Dump water in 5-gallon bucket onto grass * Replace water from fish tank with a bucket that has degassed water by pouring degassed water into fish tank * Pour to Sharpie marked line in fish tank (line is 2” below top of fish tank) |
| □ | 10 | * Retest water quality parameters that were above safe levels for fish |
| □ | 11 | * If levels are now in a safe zone you are done removing and adding water * If levels are still outside safe zone then repeat steps 5-10 until levels are safe |
| □ | 12 | * Remove up-pipe from pump * Put up-pipe back through shade cloth * Place up-pipe back into pump |
| □ | 13 | * Reconnect up-pipe to grow bed * Plug in pump and ensure system is running smoothly |
| □ | 14 | * Replace shade cloth over fish tank * Secure shade cloth with bungee |

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**AQUAPONO SOP: Housekeeping**

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | * Clean tables with sponge/rag |
| □ | 2 | * Clean outside of fish tank, grow bed, and frame with sponge/rag |
| □ | 3 | * Unplug pump * Detach up-pipe from pump * Remove green filter pad * Clean green filter pad and pump by spraying with hose; be careful not to get electrical cords and outlets wet * Replace green filter pad |
| □ | 4 | * Clean algae off of up pipe and down pipe using a bottle brush for inside and rag for outside * Attach up-pipe * Plug pump back in and make sure system is running smoothly |
| □ | 5 | * Clean algae off bottom of stand-pipe using a rag |
|  | 6 | * Fill empty degassing buckets with water from hose * Recently filled buckets should be in back (by wall) while buckets ready for use should be towards front |
| □ | 7 | * Spray dirt, sand and debris off of green “grass” under tables using hose with sprayer attached |
| □ | 8 | * Pick up trash around yard |
| □ | 9 | * Rake and sack leaves around yard |
| □ | 10 | * Sweep sidewalk with broom |
| □ | 11 | * Clean and organize cabinet; put supplies back where they belong |
| □ | 12 | * Rinse all rags and hang to allow for drying * Fold dry rags that are hanging and place in Dirty Towel cooler (blue cooler with white lid) |

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**AQUAPONO SOP: Airflow Adjustments**

*This SPO applies to what to do when you need to adjust air flow. Each fish tank, degassing tank, and raft tank has a true union ball valve (air flow adjustment valve). Adjustments only need to take place if DO levels are outside of the 5-7 ppm range. Read all instructions carefully first before attempting to adjust airflow.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | * Wash hands properly. |
| □ | 2 | * The true union ball valves will all have to be adjusted in order to balance the flow to the air diffusers. |
| □ | 3 | * Open the valve to the degassing tank wide open. |
| □ | 4 | * Adjust the fish tank and raft tank valves until you see fine bubbles. |
| □ | 5 | * Ensure that fine bubbles are evenly being expelled from all of the diffusers. |
| □ | 6 | * *NOTE: be sure to turn down the air flow to the diffusers in the fish tanks when stocking small fish to ensure that the bubbles don’t cause the fish to tumble around. As fish grow the flow will need to be increased.* |
| □ | 7 | * Air flow should always be enough to maintain dissolved oxygen levels, though not too much were large bubbles are breaking the water surface or creating turbulence that makes it difficult for the fish to swim. |

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**AQUAPONO SOP: Saltwater Treatment of Diseased/Stressed Fish SOP**

*Instructions: This SOP applies to what to do when you need to treat diseased fish, fish that are going to be stressed due to transport and handling, and fish that are being purged for harvest. Read all instructions carefully before beginning.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands thoroughly. |
| □ | 2 | Thoroughly dry hands and put on gloves. *Note: always wear gloves when there is potential you will be handling fish. This protects the fishes’ mucus layer from your hands and protects your hands from any disease on the fish.* |
| □ | 3 | Prepare the purge system for use as a hospital or in the case of harvesting for purging. |
| □ | 4 | Fill the system with degassed water if it is not already full. |
| □ | 5 | Unplug the water pump. |
| □ | 6 | Close the purge tank drain valve. |
| □ | 7 | Check the filters; if the filters are not clean then you must clean by doing the following   * 1. Firmly hold the filter canister in place while removing the filter lid from the filter tank 1. Hold the base in place with your feet while you turn the lid.   2. Remove and thoroughly rinse the bag.   3. Make sure the internal mesh basket in the filter is properly in place.   4. Reinstall the filter bag by pushing the bag all the way down so the top of the bag slides down below the incoming water line.   5. Lastly reinstall the filter lid; ensure that the O-ring is well-lubricated and in place. DO NOT DAMAGE THE O-RING. Lubricate with food-grade silicone grease, which can be purchased locally.   6. Repeat steps a-e on filter tank 2. |
| □ | 8 | Open the purge tank valve. |
| □ | 9 | Plug in the water pump. |
| □ | 10 | Ensure purge system is running smoothly. |
| □ | 11 | Use the table below to decide the concentration and duration of the treatment based on the disease/stressor/purging for harvest of the fish:   |  |  |  | | --- | --- | --- | | Diseases or Stressor | Concentration | Duration | | External parasites to include: *Costia, Epistylis, Trichodina*, and *Chilodonella*; and the flukes *Dactylogyrus* and *Gyrodactylus* | 10ppt (10,000ppm) also considered 1 | Prolonged treatment; 30-60 minutes or up to several hours (until the fish show signs of stress); provide the fish with aeration | | External parasites to include: *Costia, Epistylis, Trichodina*, and *Chilodonella*; and the flukes *Dactylogyrus* and *Gyrodactylus* | 30ppt (30,000ppm) also considered 3% | Dip treatment; 30 seconds to 1 minute or until fish show signs of stress | | Stress During Transport and While Handling | 1-10ppt (1,000-10,000ppm) also considered 0.1-1.0% | Indefinite treatment | | During Purging for Harvest | 4-6ppt (4,000-6,000ppm) also considered 0.4-0.6% | Continuous during the 3-4 day purge | |
| □ | 12 | Before any salt treatment is attempted follow the guidelines below:   1. Use accurate doses for treatment of small volumes of water. 2. Know the volume of the purge tank.    * 1. Values located in saltwater treatment log book. 3. Test treatment on a few fish before attempting a large-scale treatment.    * 1. Salt reacts differently among different species and water qualities.   d. Be prepared to remove the fish or flush the purge tank with fresh water when the fish first show signs of stress (In general, fish should be left in the salt solution until they lose equilibrium and roll over). |
| □ | 13 | Collect the NaCl (Sodium Chloride) from the chemical storage unit. *Note: When using chemicals from the chemical storage unit make sure you are familiar with the chemical by reading the MSDS (Material Safety Data Sheet) form for that chemical. Forms are located in the chemical storage unit in the MSDS folder. Use appropriate personal protective equipment (PPE) for chemical being used. PPE is located in the PPE storage unit.* |
| □ | 14 | Using the values located in the saltwater treatment log book measure out the appropriate amount of NaCl. |
| □ | 15 | Record the amount of NaCl used in the chemical storage unit log book. |
| □ | 16 | Place the measured amount into the purge tank and measure the salt concentration with a hygrometer. |
| □ | 17 | If levels are not at appropriate concentration add more salt (in small amounts) and test again with hygrometer until appropriate concentration is reached. |
| □ | 18 | When using prolonged or indefinite treatments or at high concentrations make sure to place a form of aeration into the purge system. |
| □ | 19 | Find a clean net. |
| □ | 20 | Net out a few fish that need to be treated and place in system, observe the fish and look for signs of stress. Use these fish as a base for treatment duration. |
| □ | 21 | Be prepared to drain the purge system and fill with fresh water at the first sign of fish stress. |
| □ | 22 | When treatment is complete and the purge system has been drained and fish have recovered in fresh water use a clean net and return fish to main system. |
| □ | 23 | After all treatments have been performed clean all supplies used during treatment and make sure all supplies are put away. |
| □ | 24 | Log treatment in the saltwater treatment log book. |

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**AQUAPONO SOP: Pest and Insect Control**

*Instructions: This SOP applies to what to do when you need to do when you need to control pest and insects. Read all steps carefully before beginning.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands thoroughly. |
| □ | 2 | If you see any plant pest or disease problems in your plants it is best to remove the plant. |
| □ | 3 | Check the monitoring cards that have been placed around the raft tanks for insects. |
| □ | 4 | If insects are on the cards use a magnifying glass and identify type and number of insects on the card as well as where the card was in the raft tanks and log in the crop health log book. |
| □ | 5 | Replace old monitoring card with new monitoring card. Log if card was replaced in crop health log book. |
| □ | 6 | If an uncontrollable outbreak occurs take action with biological controls by searching the internet to find the nearest source of biological control supplies. *Note: biological controls can be in the form of pathogens, viruses, and other insects that target specific problem insects and control the population.* |

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**AQUAPONO SOP: pH Adjustment and Nutrient Supplementation**

*Instructions: This SOP applies to what to do when you need to adjust pH and supplement nutrients to the system. Please read the steps carefully before attempting to adjust pH and supplement nutrients in the system. MAKE SURE TO READ THE MATERIAL SAFETY DATA SHEET (MSDS) BEFORE HANDLING ANY CHEMICALS. MSDS sheets are in the MSDS folder located in the chemical storage cabinet.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
|  |  | **Low pH Procedure:** |
| □ | 1 | Wash hands thoroughly. |
| □ | 2 | Collect the pH adjustment log book from the chemical storage cabinet and see which chemical was used last (calcium hydroxide or potassium hydroxide). *Note: the chemicals should be used alternately to ensure that both calcium and potassium are supplemented into the system.* |
| □ | 3 | Depending on which was used last in the pH adjustment log book use to opposite chemical. |
| □ | 4 | Remove the chemical to be used from the chemical storage cabinet. |
| □ | 5 | Remove a known amount of water from the system (such as 5 gallons). |
| □ | 6 | Weigh out the chemical in known amounts and add to the 5 gallons until the desired pH is reached to determine the rate of application.  Use the following equation to find the rate of application to the system  Weight of chemical added/amount sample of system water = weight of chemical that needs to be added/amount of total system water  For example: Lets say you add 2 grams of calcium hydroxide to a 5 gallon sample of system water and the total amount of system water is 4800 gallons  2g/5gallons=x/4800gallons  5x=2 x 4800  5x= 9600  x=9600/5  x=1920 g of chemical to be added to 4800gallons of system water |
| □ | 7 | Once you have found the known amount of chemical needed for the entire system weigh it out and log down the amount of chemical used in the chemical storage log book. |
| □ | 8 | Add the base chemical to the degassing tank in small amounts over an extended period of time. *Note: it is important not to shock the plants or fish with rapid fluctuation in pH.* |
| □ | 9 | When you are finished clean supplies and put them back where they belong. |
|  |  | **High pH Procedure** |
| □ | 1 | Wash hands properly. |
| □ | 2 | Collect the acid (nitric, phosphoric, or acetic) from the chemical storage cabinet |
| □ | 3 | Remove the chemical to be used from the chemical storage cabinet. |
| □ | 4 | Remove a known amount of water from the system (such as 5 gallons). |
| □ | 5 | Weigh out the chemical in known amounts and add to the 5 gallons until the desired pH is reached to determine the rate of application.  Use the following equation to find the rate of application to the system  volume of chemical added/amount sample of system water = volume of chemical that needs to be added/amount of total system water  For example: Lets say you add 2 mL of nitric acid to a 5 gallon sample of system water and the total amount of system water is 4800 gallons  2mL/5gallons=x/4800gallons  5x=2 x 4800  5x= 9600  x=9600/5  x=1920 mL of chemical to be added to 4800gallons of system water |
| □ | 6 | Once you have found the known amount of chemical needed for the entire system measure it out and log down the amount of chemical used in the chemical storage log book. |
| □ | 7 | Add the acid to the degassing tank in small amounts over an extended period of time. *Note: it is important not to shock the plants or fish with rapid fluctuation in pH.* |
| □ | 8 | When you are finished clean supplies and put them back where they belong. |

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**AQUAPONO SOP: Water Flow Rates and Adjustments**

*Instructions: This SOP applies to what to do when you need to adjust water flow rates. The water in the aquaponic system will seek the level of the rafts in the raft tanks. Water will need to be added to the system when the water level in the system drops. The height of the incoming water is regulated by the float automatic fill valve in the degassing tank. Incoming water will automatically flow into the sump tank when the water level drops below the automatic fill valve. Please read the steps carefully before attempting to adjust water flow rates.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands thoroughly. |
| □ | 2 | Be aware that the water pump that moves the water into the fish tanks pumps at a set rate. Rate of water flow can be adjusted with the flow rate valves on the pipe where the incoming water enters the fish tanks. |
| □ | 3 | Each fish tank has a separate valve. |
| □ | 4 | Ensure that the valves are adjusted to a rate of one fish tank exchange per hour for normal operation (5 gallons/minute or 1 gallon per 12 seconds).   1. Using a one-gallon bucket count how long it takes to fill the bucket. If it takes less than 12 seconds the flow rate is too fast. If it takes longer than 12 seconds the flow rate is too slow. |
| □ | 5 | It may be necessary to adjust the flow. |
| □ | 6 | Check that the incoming water flow matches the outgoing water flow to keep the system at a proper flow rate. |
| □ | 7 | Ensure that the adjustment of the water flow is not too low (no more than half way) when the pump is running because you may damage the pump. |
| □ | 8 | Log any adjustments made to the water level or flow rate in the daily log. |

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**AQUAPONO SOP: Weighing Fish for Proper Feeding Application**

*Instructions: This SOP applies to what to do when you need to weigh fish for proper feeding application. Please read all steps carefully before attempting to weigh fish for proper feeding application.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands properly. |
| □ | 2 | Thoroughly dry hands and put on gloves. *Note: always wear gloves when there is potential you will be handling fish. This protects the fishes’ mucus layer from your hands and protects your hands from any disease on the fish.* |
| □ | 3 | Prepare the purge system for use for salt bath to reduce fish stress for weighing. |
| □ | 4 | Fill the system with degassed water if it is not already full. |
| □ | 5 | Unplug the water pump. |
| □ | 6 | Close the purge tank drain valve. |
| □ | 7 | Check the filters; if the filters are not clean then you must clean by doing the following   1. Firmly hold the filter canister in place while removing the filter lid from the filter tank 1. Hold the base in place with your feet while you turn the lid. 2. Remove and thoroughly rinse the bag. 3. Make sure the internal mesh basket in the filter is properly in place. 4. Reinstall the filter bag by pushing the bag all the way down so the top of the bag slides down below the incoming water line. 5. Lastly reinstall the filter lid; ensure that the O-ring is well-lubricated and in place. DO NOT DAMAGE THE O-RING. Lubricate with food-grade silicone grease, which can be purchased locally. 6. Repeat steps a-e on filter tank 2. |
| □ | 8 | Open the purge tank valve. |
| □ | 9 | Plug in water pump. |
| □ | 10 | Ensure purge system is running smoothly. |
| □ | 11 | Check the water quality in the purge system to ensure that the temperature and the pH of the water match that of the culture system. |
| □ | 12 | Add NaCl to the system until the concentration is between 4-6ppt. |
| □ | 13 | Before any salt treatment is attempted follow the guidelines below.   * 1. Use accurate doses for treatment of small volumes of water.   2. Know the volume of the purge tank.      1. Values located in saltwater treatment log book. |
| □ | 14 | Collect the NaCl (Sodium Chloride) from the chemical storage unit. *Note: When using chemicals from the chemical storage unit make sure you are familiar with the chemical by reading the MSDS (Material Safety Data Sheet) form for that chemical. Forms are located in the chemical storage unit in the MSDS folder. Use appropriate personal protective equipment (PPE) for chemical being used. PPE is located in the PPE storage unit.* |
| □ | 15 | Using the values located in the saltwater treatment log book measure out the appropriate amount of NaCl. |
| □ | 16 | Record the amount of NaCl used in the chemical storage unit log book. |
| □ | 17 | Place the measured amount into the purge tank and measure the salt concentration with a hygrometer. |
| □ | 18 | If levels are not at appropriate concentration add more salt (in small amounts) and test again with hygrometer until appropriate concentration is reached. |
| □ | 19 | Collect a clean net. |
| □ | 20 | Net 11 fish from one tank in the culture system and move them to the prepared purge tank.   1. If 110 fish are present in the tank then 11 fish would be 10% of the population which should be a reasonable sample size |
| □ | 21 | Allow fish to remain in purge tank for 30 minutes to allow them an appropriate amount of time in salt bath to reduce stress. |
| □ | 22 | Collect the bucket used to weigh fish and zero out the fish scale to the weight of the bucket. Make sure the weight is in grams. |
| □ | 23 | Collect a clean net. |
| □ | 24 | Remove one fish from purge tank and place in the bucket. |
| □ | 25 | Weigh the fish and bucket. |
| □ | 26 | Log the weight of the fish |
| □ | 27 | Replace fish into culture it was removed from |
| □ | 28 | Repeat steps 24-27 until all fish have been weighed |
| □ | 29 | Add the weights to get a total and divide by 11, this will give you an average fish weight in the culture tank. |
| □ | 30 | Repeat steps 20-29 on each culture tank until and average weight has been established for all culture tanks. |
| □ | 31 | The average weights of the fish will allow you to calculate the amount of feed needed per tank. |
| □ | 32 | Use the average weight per tank and multiply by 0.015 to get the 1.5% body weight amount in grams. Multiply this by 110 (number of fish) to get the total grams of feed to be added per tank. Log the amount of grams of feed in the Fish Feeding log. |
| □ | 33 | Once weights have been completed drain the purge system and clean the system for next use. |
| □ | 34 | Log the average fish weights in the Fish Weight log book. |

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**AQUAPONO SOP: Purging and Icing of Tilapia for Harvest**

*Instructions: This SOP applies to what to do when you need to purge and ice for harvest. Please read all steps carefully before attempting to weigh fish for proper feeding application.*

|  |  |  |
| --- | --- | --- |
| Checkbox | Step | Task |
| □ | 1 | Wash hands properly. |
| □ | 2 | Thoroughly dry hands and put on gloves. *Note: always wear gloves when there is potential you will be handling fish. This protects the fishes’ mucus layer from your hands and protects your hands from any disease on the fish.* |
| □ | 3 | Prepare the purge system for use for purging fish. |
| □ | 4 | Fill the system with degassed water if it is not already full. |
| □ | 5 | Unplug the water pump. |
| □ | 6 | Close the purge tank drain valve. |
| □ | 7 | Check the filters; if the filters are not clean then you must clean by doing the following   1. Firmly hold the filter canister in place while removing the filter lid from the filter tank 1. Hold the base in place with your feet while you turn the lid. 2. Remove and thoroughly rinse the bag. 3. Make sure the internal mesh basket in the filter is properly in place. 4. Reinstall the filter bag by pushing the bag all the way down so the top of the bag slides down below the incoming water line. 5. Lastly reinstall the filter lid; ensure that the O-ring is well-lubricated and in place. DO NOT DAMAGE THE O-RING. Lubricate with food-grade silicone grease, which can be purchased locally. 6. Repeat steps a-e on filter tank 2. |
| □ | 8 | Open the purge tank valve. |
| □ | 9 | Plug in water pump. |
| □ | 10 | Ensure purge system is running smoothly. |
| □ | 11 | Check the water quality in the purge system to ensure that the temperature and the pH of the water match that of the culture system. |
| □ | 12 | Add NaCl to the system until the concentration is between 4-6ppt. |
| □ | 13 | Before any salt treatment is attempted follow the guidelines below.   * 1. Use accurate doses for treatment of small volumes of water.   2. Know the volume of the purge tank.      1. Values located in saltwater treatment log book. |
| □ | 14 | Collect the NaCl (Sodium Chloride) from the chemical storage unit. *Note: When using chemicals from the chemical storage unit make sure you are familiar with the chemical by reading the MSDS (Material Safety Data Sheet) form for that chemical. Forms are located in the chemical storage unit in the MSDS folder. Use appropriate personal protective equipment (PPE) for chemical being used. PPE is located in the PPE storage unit.* |
| □ | 15 | Using the values located in the saltwater treatment log book measure out the appropriate amount of NaCl. |
| □ | 16 | Record the amount of NaCl used in the chemical storage unit log book. |
| □ | 17 | Place the measured amount into the purge tank and measure the salt concentration with a hygrometer. |
| □ | 18 | If levels are not at appropriate concentration add more salt (in small amounts) and test again with hygrometer until appropriate concentration is reached. |
| □ | 19 | Collect a clean net. |
| □ | 20 | Net fish from system and move them to the prepared purge tank. |
| □ | 21 | The purge system is intended to handle 30-40 lbs. of fish at any one time. The greater the density, the more frequently you will need to do partial water changes. |
| □ | 22 | Slowly lower the temperature of the water during the 3-4 day purge until the final temperature reaches 62°F. During the purge remember to test the water quality and exchange water as needed. Remember to add cold enough water to keep temperatures reduced; adding warmer water will increase the water temperature and enable user to properly reduce the water temperature for fish. |
| □ | 23 | To increase survival of tilapia while lowering temperature decrease at a rate of 0.9°F every 5 hours. Therefore if initial system temperature is 75°F reduce to 62°F using the following table:   |  |  | | --- | --- | | Hours | Temperature | | < hour – Initial | 75°F | | 5 hours | 74.1°F | | 10 hours | 73.2°F | | 15 hours | 72.3°F | | 20 hours | 71.4°F | | 25 hours | 70.5°F | | 30 hours | 69.6°F | | 35 hours | 68.7°F | | 40 hours | 67.8°F | | 45 hours | 66.9°F | | 50 hours | 66°F | | 55 hours | 65.1°F | | 60 hours | 64.2°F | | 65 hours | 63.3°F | | 70 hours | 62.4°F | | 75 hours | 62°F – hold at 62°F | |
| □ | 24 | Once the purge is complete collect a fish to market container for “Live Haul” |
| □ | 25 | Take container to purge system. |
| □ | 26 | Collect a clean net. |
| □ | 27 | Remove fish from purge system and put them degassed water in industry standard “Live Haul” tank – the goal is keep the internal temperature to at least 72°F. |
| □ | 28 | Take the container to the cooler unit and place fish inside unit. |
| □ | 29 | Label the container with the number of fish and date “Live Haul” |
| □ | 30 | Log the container in the Cooler Unit log book. |
| □ | 31 | Repeat steps 1-27 until all fish have been harvested that need to be harvested. Each tank should contain around 150lbs of fish and only 30-40lbs of fish can be purged in tank system at one time taking 3-4 days per purge. |
| □ | 32 | Fish are now ready to be taken to market. |
| □ | 33 | When harvest is completed, drain the purge system and clean the system for next use. |
| □ | 34 | Log the harvest in the Fish Harvest log book. |