## Tanks needed for UVI Aquaponic System

| Quantity | Size | Item | Purpose | Modification | Influent water | Efluent water | Price Each | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4' high x 10' diameter | circular tank | fish production tank | 4" PVC female adapter coupling as drain in center bottom. Coupling is fiberglassed to outside tank bottom with threaded end flush to inside bottom of tank. | sump | center drain to clarifier - 4" pipe | $1,870 | $7,480 | |
| 2 | 4' high x 6' diameter cylinder with 45° slope x 6' diameter bottom | cylinder tank top with cone bottom | clarifier solids removal | install PVC sheet as baffle in center and 2/3 point of the tank - 2" PVC coupling at apex for drain/connection of solid waste | fish production tanks (2 tanks supply water to 1 clarifier) | one pipe connecting to net tank - 4" pipe | $1,932 | $3,864 | |
| 4 | 6' long x 2' wide x 2.5' high | rectangular tank | net tank for fine solids removal | cut 6" opening in sidewall of each tank to connect with PVC pipe. | clarifier | degassing tank - 4" diameter pipe | $500 | $2,000 | |
| 1 | 6' long x 2.5' wide x 2.5' high | rectangualr tank | degassing tank | cut 6" holes in bottom and install stand pipe connecting to hydroponic tank. | net tank | hydroponic tanks 6" pipe | $500 | $500 | |
| 6 | 4' wide x 100' long x 16" high | poured concrete wall | hydroponic tank | line with 9' x 106' P2000 LDPE 23 mil. Fit with 6" flange between tanks and to sump. | degassing tank | sump - 6" pipe | $1,000 | $6,000 | |
| 1 | 4' high x 4' diameter | circular tank | sump | incoming pipe from hydroponic tank and outgoing pipe to pump/fish production tanks. | hydroponic tank | fish tank - 3" pipe | $370 | $370 | |
| 1 | 2.7' high x 2' diameter | circular tank | base addition | incoming pipe from sump and outgoing pipe to sump. | sump | sump - 1.5" pipe | $155 | $155 | |
| | | | | | | | | | $20,369 |

## Air Blower and Water Pump for UVI Aquaponic System

| Quantity | Size | Item | Item code | Supplier | Unit price | Total Cost | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.5 HP | Air Blower Sweetwater 3 Phase | S453 | Aquatic Ecosystms | 739.00 | $ 739.00 | | | |
| 1 | 2 HP | Air Blower Sweetwater 3 Phase | S53 | Aquatic Ecosystms | 797.00 | $ 797.00 | | | |
| 1 | | Circulating Pump Grundfos 3 Phase | UMC 80-80 or similar | Grundfos vendor | 1268.10 | $ 1,268.10 | | | |
| | | | | | | | | | $ 2,804.10 |

## Hydroponic tank liner and rafts

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 12' x 750' LDPE liner | Hydroponic tank liner | P2000 WHT/WHT | Inland Plastics Ltd. | 2187.50 | $ 2,187.50 | | | |
| 63 | 1" x 4" x 10' lumber | Lumber (rip to 1" x 2" to attach liner to tank walls) | | Local lumber yard | 7.35 | $ 463.05 | | | |
| 400 | 2.25" x 3/16" | Tapcon screw | | Local hardware store | 0.25 | $ 100.00 | | | |
| 72 | 1.5" x 4' x 8' | Hydroponic rafts | Styrofoam square edge Extruded Polystyrene Insulation | Dow Chemical Co. vendor | 35.00 | $ 2,520.00 | | | |
| 1 | 3/8" x 4' x 8' plywood | template for rafts. | | Local lumber yard | 28.00 | $ 28.00 | | | |
| 4 | gallon | Cool-Cote Paint | Non-toxic Roof Paint | Paint Locker | 22.00 | $ 88.00 | | | |
| 2 | case | 2" x 2" net pots | 5W559 | Hydro-Gardens | 142.95 | $ 285.90 | | | |
| | | | | | | | | | $ 5,672.45 |
| | | | | | | | | | $ 11,158.45 |
| | | | | | | | | Total | $40,004.00 |

# PVC Fittings, Parts and Other Supplies

| Quantity | Size | Item | Item code | Unit price | Total Cost |
|---|---|---|---|---|---|
| 12 | 6" | pipe flange SCH 80 solid ty | 851060 Total | $ 49.80 | $ 597.60 |
| 18 | 6" | 90º elbow | 406060 Total | $ 37.30 | $ 671.40 |
| 2 | 6" | T | 401060 Total | $ 58.45 | $ 116.90 |
| 3 | 6" | flexable coupling (fernco) | *1056-66 Total | $ 9.72 | $ 29.16 |
| 2 | 4" | cap | 447040 Total | $ 10.88 | $ 21.76 |
| 4 | 4" | male coupling | 436040 Total | $ 9.45 | $ 37.80 |
| 4 | 4" | female coupling | 435040 Total | $ 9.87 | $ 39.48 |
| 4 | 4" | 45º elbow coupling | 417040 Total | $ 22.71 | $ 90.84 |
| 16 | 4" | 90º elbow coupling | 406040 Total | $ 17.46 | $ 279.36 |
| 1 | 3/4" MPT | float valve | *R7003 Total | $ 25.90 | $ 25.90 |
| 3 | 3/4" | female adapter | 435007 Total | $ 0.63 | $ 1.89 |
| 1 | 3/4" | water meter | *FM2 Total | $ 69.93 | $ 69.93 |
| 1 | 3" x 2" | reducer bushing | 437338 Total | $ 4.75 | $ 4.75 |
| 4 | 3" | cap | 447030 Total | $ 4.78 | $ 19.12 |
| 4 | 3" | coupling | 429030 Total | $ 5.51 | $ 22.04 |
| 1 | 3" | 4 way cross | 420030 Total | $ 20.24 | $ 20.24 |
| 11 | 3" | 90º elbow | 406030 Total | $ 9.68 | $ 106.48 |
| 7 | 3" | T | 401030 Total | $ 14.27 | $ 99.89 |
| 4 | 2" x 1" | slip x FNPT | 438249 Total | $ 2.85 | $ 11.40 |
| 6 | 2" x 1" | reducer bushing | 437249 Total | $ 1.97 | $ 11.82 |
| 1 | 2" | cap | 447020 Total | $ 1.37 | $ 1.37 |
| 2 | 2" | male adapter | 436020 Total | $ 1.71 | $ 3.42 |
| 2 | 2" | female adapter | 435020 Total | $ 1.76 | $ 3.52 |
| 4 | 2" | 45º elbow | 417020 Total | $ 3.13 | $ 12.52 |
| 21 | 2" | 90º elbow | 406020 Total | $ 2.73 | $ 57.33 |
| 7 | 2" | T | 401020 Total | $ 3.30 | $ 23.10 |
| | | | | | |
| 2 | 1" | male adapter | 436010 Total | $ 0.81 | $ 1.62 |
| 6 | 1" | female adapter | 435010 Total | $ 0.74 | $ 4.44 |
| 4 | 1" | poly plug | *114-C Total | $ 1.68 | $ 6.72 |
| 4 | 1" | T poly hose nipple | *107-C Total | $ 2.06 | $ 8.24 |
| 4 | 1" | 90º elbow poly hose nipple | *105-C Total | $ 1.79 | $ 7.16 |
| 8 | 1" | male threaded poly hose ad | *103-C Total | $ 0.89 | $ 7.12 |
| | | | | | |
| | | | | | |
| 4 | 3" | ball valves | SBW18 | $ 48.55 | $ 194.20 |
| 1 | 2" | ball valve | SBW17 | $ 12.92 | $ 12.92 |
| 1 | 2" | 4 way cross | 420020 | $ 6.58 | $ 6.58 |
| 4 | 2" | ball valve | SBW17 | $ 12.92 | $ 51.68 |
| 725 | ft.1" | poly tube | P300 | $ 0.45 | $ 326.25 |
| 2 | 3" | toilet flange | | $ 5.00 | $ 10.00 |
| 2 | 6" | cap | 448060 | $ 10.95 | $ 21.90 |
| 2 | 5 gallon | bucket | | $ 5.00 | $ 10.00 |
| 2 | 2" | ball valve | SBW17 | $ 12.92 | $ 25.84 |
| 4 | 14' x 100' | orchard netting | | $ 62.10 | $ 248.40 |
| 8 | 1" x 2" x 7' | ceder wood slats | | $ 5.00 | $ 40.00 |
| 16 | 4" x 4" | flat angle braces | | $ 1.00 | $ 16.00 |
| 8 | yards 1000 micron | nylon net material | M1000 | $ 18.47 | $ 147.76 |
| 10 | ft. 3/4" | plastic mesh screen (vexar) | TN524 | $ 4.75 | $ 47.50 |
| 3 | sheets 3/8" x 4' x 8' | 4'x8' PVC sheet | | $ 40.00 | $ 120.00 |
| 72 | 2" x #8 | stainless steel screws | | $ 0.50 | $ 36.00 |
| 176 | 6" x 1.5" | airstones | AS15L | $ 7.84 | $ 1,379.84 |
| 88 | 1/4" NPT x 3/8" Barb | nipples | 62008 | $ 0.30 | $ 26.40 |
| 4 | 3/8" i.d. | vinyl hose | TV60 | $ 25.32 | $ 101.28 |
| 150 | 3" x 1" | airstones | AS5L | $ 2.97 | $ 445.50 |
| 150 | 1/4" NPT x 1/4" barb | nipples | 62006 | $ 0.30 | $ 45.00 |
| 6 | 1/4" i.d. | vinyl hose | TV40 | $ 20.63 | $ 123.78 |
| 6 | tube | silicone | | $ 5.00 | $ 30.00 |
| 8 | gallon | fiberglass resin and hardner | | $ 20.00 | $ 160.00 |
| 10 | | fiberglass mat | | $ 10.00 | $ 100.00 |
| 10 | | paper buckets -disposable | | $ 1.00 | $ 10.00 |
| 10 | | paint brushes - disposable | | $ 1.00 | $ 10.00 |
| 50 | | latex gloves - disposable | | $ 0.50 | $ 25.00 |
| 10 | | dust mask - disposable | | $ 2.00 | $ 20.00 |
| 1 | organic vapor | vapor mask | | $ 25.00 | $ 25.00 |
| 3 | 1" | ball valve (slip x slip) | | $ 4.50 | $ 13.50 |
| 1 | 48'x30' | Quonsset greenhouse | | $ 2,693.80 | $ 2,693.80 |
| 1 | 48'x47' | 100% shade cloth | | $ 500.00 | $ 500.00 |
| PIPE | | | | | |
| 120 | 6" | PVC pipe | | $ 4.00 | $ 480.00 |
| 80 | 4" | PVC pipe | | $ 4.00 | $ 320.00 |
| 100 | 3" | PVC pipe | | $ 4.00 | $ 400.00 |
| 120 | 2" | PVC pipe | | $ 4.00 | $ 480.00 |
| 10 | 1" | PVC pipe | | $ 4.00 | $ 40.00 |
| | | | | | $ 11,158.45 |

**Assumptions**

| | | |
|---|---|---|
| Initial construction cost - 1 system | | |
| materials and supplies | $ | 40,004 |
| labor | $ | 8,400 |
| | | |
| Annual production | | |
| tilapia (lbs) | | 9,512.58 |
| tilapia ( $/lb) | | $2.50 |
| lettuce (cases) | | 1,404 |
| | | |
| Input costs | | |
| fingerlings (ea) | | 5,220 |
| fingerlings ($/ea) | $ | 0.30 |
| fish feed | $ | 0.53 |
| Feed Conversion Ratio | | 1.7 |
| electricity ($/kw-h) | $ | 0.40 |
| Base addition (lbs/day) | | 2.2 |
| KOH ($/lb) | | $0.58 |
| Ca(OH)2 | | $0.26 |
| Chelated Iron (lb) | | 37.4 |
| Chelated Iron ($/lb) | $ | 13.18 |
| lettuce seedlings (ea) | | 44,928 |
| lettuce seedlings ($/ea) | $ | 0.013 |
| | | |
| Manager labor ($/year) | | $30,000 |
| Hired labor ($/year) | | $15,000 |

Fish budget (lbs)

| | | Units | Price or Cost/Unit | Quantity | Value or Cost per system | Value or Cost per lb. produced | Value or Cost per 6 systems | Standard Budget |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| Receipts | | | | | | | | |
| | Tilapia | lbs | $ 2.50 | 11,000 | $ 27,500.00 | $ 2.50 | $ 165,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| Variable Costs | | | | | | | | |
| | Fingerlings | ea | $ 0.30 | 5,220 | $ 1,566.00 | $ 0.14 | $ 9,396.00 | 6.1% |
| | Feed | lb | $ 0.53 | 18,700 | $ 9,945.00 | $ 0.90 | $ 59,670.00 | 39.0% |
| | Chemicals | | | | | | | |
| | KOH | lb | $ 0.58 | 400 | $ 232.23 | $ 0.02 | $ 1,393.39 | 0.9% |
| | Ca(OH)2 | lb | $ 0.26 | 400 | $ 104.10 | $ 0.01 | $ 624.62 | 0.4% |
| | | | | | | | | |
| | Electrical | kwh | $ 0.40 | 14,235 | $ 5,694.00 | $ 0.52 | $ 34,164.00 | 22.3% |
| | Manager Labor | system | $ 30,000.00 | 0.083 | $ 2,500.00 | $ 0.23 | $ 15,000.00 | 9.8% |
| | Hired Labor | system | $ 15,000.00 | 0.167 | $ 2,500.00 | $ 0.23 | $ 15,000.00 | 9.8% |
| | Equipment | system | $ 496.00 | 1 | $ 496.00 | $ 0.05 | $ 2,976.00 | 1.9% |
| Total VC | Total VC | | | | $ 23,037.34 | $ 2.09 | $ 138,224.02 | 90.4% |
| | | | | | | | | |
| Income above VC | Income above VC | | | | $ 4,462.66 | $ 0.41 | $ 26,775.98 | 17.5% |
| | | | | | | | | |
| Fixed Costs | | | | | | | | |
| | Tanks and equipment | | $ 1,807.11 | 1 | $ 1,807.11 | $ 0.16 | $ 10,842.68 | |
| Total FC | | | | | $ 1,807.11 | $ 0.16 | $ 10,842.68 | 7.1% |
| | | | | | | | | |
| Total of above costs | Total Costs | | | | $ 24,844.45 | $ 2.26 | $ 149,066.70 | 97.5% |
| | | | | | | | | |
| Net returns | Net return | | | | $ 2,655.55 | $ 0.24 | $ 15,933.30 | |
| | | | | | | | | |
| Other costs | | | | | | | | |
| | Land Charge | System | $ 225.00 | 0.015 | $ 3.37 | $ 0.00 | $ 20.24 | 0.01% |
| | General overhead | % VAR | 2.8% | $ 23,037.34 | $ 645.05 | $ 0.06 | $ 3,870.27 | 2.5% |
| | | | | | | | | |
| Total Costs | All costs | | | | $ 25,492.87 | $ 2.32 | $ 152,957.21 | 100.0% |
| | | | | | | | | |
| Returns to Risk &Mgt. | Return to risk and management | | | | $ 2,007.13 | $ 0.18 | $ 12,042.79 | |

Lettuce budget

| | | Units | Price or Cost/Unit | Quantity | Value or Cost per system | Value or Cost per case | Value or Cost per 6 systems | Standard Budget |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| Receipts | | | | | | | | |
| | Lettuce | case | $ 20.00 | 1,404 | $ 28,080.00 | $ 20.00 | $ 168,480.00 | |
| | | | | | | | | |
| | | | | | | | | |
| Variable Costs | | | | | | | | |
| | Seedlings | ea | $ 0.0130 | 44,928 | $ 584.38 | $ 0.42 | $ 3,506.30 | 5% |
| | Chemicals | | | | | $ - | | |
| | Fe | lb | $ 13.18 | 37 | $ 493.00 | $ 0.35 | $ 2,958.00 | 4% |
| | Insecticide | bags | $ 16.00 | 12 | $ 192.00 | $ 0.14 | $ 1,152.00 | 2% |
| | Electrical | kwh | $ 0.40 | 9,125 | $ 3,650.00 | $ 2.60 | $ 21,900.00 | 30% |
| | Manager Labor | system | $ 30,000.00 | 0.083 | $ 2,500.00 | $ 1.78 | $ 15,000.00 | 21% |
| | Hired Labor | system | $ 15,000.00 | 0.167 | $ 2,500.00 | $ 1.78 | $ 15,000.00 | 21% |
| | Equipment | system | $ 50.00 | 1 | $ 50.00 | $ 0.04 | $ 300.00 | 0% |
| Total VC | Total VC | | | | $ 9,969.38 | $ 7.10 | $ 59,816.30 | |
| | | | | | | | | |
| Income above VC | Income above VC | | | | $ 18,110.62 | $ 12.90 | $ 108,663.70 | |
| | | | | | | | | |
| Fixed Costs | | | | | | | | |
| | Tanks and equipment | | $ 1,911.60 | 1 | $ 1,911.60 | $ 1.36 | $ 11,469.59 | 16% |
| Total FC | | | | | $ 1,911.60 | $ 1.36 | $ 11,469.59 | |
| | | | | | | | | |
| Total of above costs | Total Costs | | | | $ 11,880.98 | $ 8.46 | $ 71,285.88 | |
| | | | | | | | | |
| Net returns | Net return | | | | $ 16,199.02 | $ 11.54 | $ 97,194.12 | |
| | | | | | | | | |
| Other costs | | | | | | | | |
| | Land Charge | System | $ 225.00 | 0.048 | $ 10.80 | $ 0.01 | $ 64.81 | 0% |
| | General overhead | % VAR | 2.8% | $ 9,969.38 | $ 279.14 | $ 0.20 | $ 1,674.86 | 2% |
| | | | | | | | | |
| Total Costs | All costs | | | | $ 12,170.92 | $ 8.67 | $ 73,025.55 | 100% |
| | | | | | | | | |
| Returns to Risk &Mgt. | Return to risk and management | | | | $ 15,909.08 | $ 11.33 | $ 95,454.45 | |

Combined budgets (lettuce)

| | | Units | Price or Cost/Unit | Quantity | Value or Cost per system | Value or Cost per unit | Value or Cost per 6 systems | Contribution of component to receipts, costs and bottom line |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| Receipts | | | | | | | | |
| | Tilapia | lbs | $ 2.50 | 9,513 | $ 23,781.45 | $ 2.50 | $ 142,688.70 | 46% |
| | Lettuce | case | $ 20.00 | 1404 | $ 28,080.00 | $ 20.00 | $ 168,480.00 | 54% |
| Total receipts | | | | | $ 51,861.45 | | $ 311,168.70 | 100% |
| | | | | | | | | |
| Variable Costs | | | | | | | | |
| | Tilapia | | | | $ 21,692.57 | $ 2.28 | $ 130,155.44 | 69% |
| | Lettuce | | | | $ 9,969.38 | $ 7.10 | $ 59,816.30 | 31% |
| Total VC | | | | | $ 31,661.96 | | $ 189,971.73 | 100% |
| | | | | | | | | |
| Income above VC | | | | | $ 20,199.49 | | $ 121,196.97 | |
| | | | | | | | | |
| Fixed Costs | | | | | | | | |
| | Tilapia | | | | $ 1,807.11 | $ 0.19 | $ 10,842.68 | 49% |
| | Lettuce | | | | $ 1,911.60 | $ 1.36 | $ 11,469.59 | 51% |
| Total FC | | | | | $ 3,718.71 | | $ 22,312.27 | 100% |
| | | | | | | | | |
| Total of above costs | | | | | $ 35,380.67 | | $ 212,284.00 | |
| | | | | | | | | |
| Net returns | | | | | $ 16,480.78 | | $ 98,884.70 | |
| | | | | | | | | |
| Other costs | | | | | | | | |
| | Tilapia | | | | $ 610.77 | | $ 3,664.59 | 68% |
| | Lettuce | | | | $ 289.94 | | $ 1,739.66 | 32% |
| Total other costs | | | | | $ 900.71 | | $ 5,404.26 | 100% |
| | | | | | | | | |
| Total Costs | | | | | $ 36,281.38 | | $ 217,688.26 | |
| | | | | | | | | |
| Returns to Risk &Mgt. | | | | | $ 15,580.07 | | $ 93,480.44 | |

| | Actual | Value or Cost per system | Value or Cost per 6 systems |
|---|---|---|---|
| Fish | | | |
| Breakeven Yield - Var Costs | 9,513 | 8,677 | 52,062 |
| Breakeven Yield - All Costs | | 9,644 | 57,865 |
| Breakeven Price - Var Costs | | $ 2.28 | |
| Breakeven Price - All Costs | $2.50 | $ 2.53 | |
| | | | |
| Lettuce | | | |
| Breakeven Yield - Var Costs | 1,404 | 498 | 2,991 |
| Breakeven Yield - All Costs | | 609 | 3,651 |
| Breakeven Price - Var Costs | | $ 7.10 | |
| Breakeven Price - All Costs | $20.00 | $ 8.67 | |

Breakeven yield - The quantity of product you need to produce to cover your costs

$$\text{Quantity} = \frac{\text{operating expenses}}{\text{expected selling price}} = \frac{\$\ 21{,}692.57}{\$\ 2.50} = 8{,}677$$

Break-even price - The sales price required to cover

$$\text{Price} = \frac{\text{cost per unit of production}}{\text{yield per unit of production}} = \frac{\$\ 9{,}969.38}{1404} = \$\ 7.10$$

Sensitivity analysis allows a look at returns at different price quantity points.

Fish

Income above variable costs at differnet prices and yield levels (1 unit)

| | $ 2.00 | $ 2.25 | $ 2.50 | $ 2.75 | $ 3.00 |
|---|---|---|---|---|---|
| 7,705 | $ (6,282) | $ (4,356) | $ (2,430) | $ (503) | $ 1,423 |
| 8,561 | $ (4,570) | $ (2,430) | $ (289) | $ 1,851 | $ 3,991 |
| 9,513 | $ (2,667) | $ (289) | $ 2,089 | $ 4,467 | $ 6,845 |
| 10,464 | $ (765) | $ 1,851 | $ 4,467 | $ 7,083 | $ 9,699 |
| 11,510 | $ 1,328 | $ 4,205 | $ 7,083 | $ 9,961 | $ 12,838 |

Lettuce

Income above variable costs at differnet prices and yield levels (1 unit)

| | $ 18.00 | $ 19.00 | $ 20.00 | $ 21.00 | $ 22.00 |
|---|---|---|---|---|---|
| 1,123 | $ 10,248 | $ 11,371 | $ 12,495 | $ 13,618 | $ 14,741 |
| 1,264 | $ 12,775 | $ 14,039 | $ 15,303 | $ 16,566 | $ 17,830 |
| 1,404 | $ 15,303 | $ 16,707 | $ 18,111 | $ 19,515 | $ 20,919 |
| 1,544 | $ 17,830 | $ 19,374 | $ 20,919 | $ 22,463 | $ 24,007 |
| 1,685 | $ 20,357 | $ 22,042 | $ 23,727 | $ 25,411 | $ 27,096 |