

# Growing ornamental aquatic plants as a business in the Northeastern United States



Gef Flimlin  
Rutgers Cooperative Extension, Toms River NJ

Robert Pomeroy  
University of Connecticut-Avery Point/Connecticut Sea Grant

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## Introduction

Water gardening is a burgeoning business that has a long track record of growth. Although the market has matured, compared to models of European markets the US water gardening market still has a long way to go. There are still great opportunities to be had in supplying plants for the water gardening industry, but one has to plan and develop a marketing plan with care to be successful in today's market. This report details plans for entering the market and growing at a specified rate by adding products and services to maintain the early customer base and to encourage a growing base.

## Basic concept

The increase in the installation of backyard ornamental fishponds has created a need to supply aquatic plants that the homeowner can use decoratively in and around their ponds. Some garden centers that have included ornamental aquatic plant selections in their inventory along with formed ponds, fish, and the hardware necessary to create this kind of feature. This business feasibility study is focused on the ornamental aquatic plants that are integral to the beauty and health of a well-managed pond system from the plant producer or grower's side of the business.



The concept of this Business Feasibility Study is to design a small commercial aquatic plant culture system that can be replicated to expand production to other like-minded growers, all marketing product similarly or cooperatively to address larger customer's supply needs. We believe that this kind of farming operation could be successful in most of the northeast region and that it would not be unrealistic to see at least 20 of them become viable in the region within 5 years.

## Farm Design

Several levels of involvement are possible in this potential endeavor. These include the hobby or small startup, a one or two person operation; the medium growth size for two people plus some outside labor; and a larger size operation, which would employ several people.

As with most aquaculture operations, it is best to start small, learn the basics of the species that are being grown, understand the market, and build the business accordingly. Therefore, most the focus of this report will be on examining a small start-up business because that concept would be the best way to grow the entire ornamental aquatic plant industry in the region. The concept would be to wean the plant distributors that supply the garden center market from purchasing all their plants from Florida and Texas to encourage them to buy them from local growers in the Northeast instead. Initially the northeast growers will have to rely on southern states for seedlings; but over time, they might be able to maintain a year round inventory to produce their own seedlings through propagation. However, the facts of hard northeastern winters, high fuel costs and shorter growing season will probably still keep southern seedling producers in the picture.

### ***Hobby/Starter farm***

This operation would consist of one 14' x 100' hoop house (owned or rented) with two raceways, and the house would be unheated. It would start operation in the early spring with the purchase of about 900 starter plants in year 1. This purchase would be an investment of about \$2200 for the plants and pots. After the plants have grown, they could be marketed locally to about 5 to 10 small customers within a 25-mile radius of the hoop house. The growers would propagate part of production and keep leftovers in inventory. This might necessitate some heat for the next winter. It could easily grow into a medium sized farm easily.



### ***Medium sized farm***

The second scenario would employ two 14' x 100' hoop houses, one heated with twin walled plastic, one unheated, single wall plastic. Both houses would have ventilation (fans and louvered vents). Each house would have two raceways. The growers would purchase about \$4000 worth of starter plants (1600 at \$2.50 average), They would grow and split the plants for the first two months of late winter/early spring. They would market aggressively to local garden centers and landscapers. Whatever is leftover in the fall would be propagated for stock for the next spring.

### ***Larger Investment Operation***

The third type of operation would not necessarily be a start up operation but one that people could eventually grow into after working through the two previous scenarios over a few years. There would be one 100' x 30' double walled plastic greenhouse with roll up sides, heat and ventilation. It would hold four raceways. There would also be two 14' x 100' single walled plastic hoop houses with roll up sides and two raceways each. The growers would purchase about \$6000 worth of plants (2400 plants at \$2.50 average). This operation would require outside labor for production and possibly sales help for larger scale marketing. This scenario will not be analyzed in this bulletin.



### ***Greenhouse and raceway configurations***

Each greenhouse would be set up to make the most of the room available. The 14' wide house has enough room for two raceways. Since the raceways are raised to save the workers significant back strain from lifting the water soaked flats of plants, it is a good idea to purchasing or build a greenhouse where the side of the house is straight up to about 4 feet before the hoop travels over. This will reduce interference by the plants with the roof of the house.

It is important to make sure during the warmest season that the greenhouse doesn't be come oppressively hot. When the temperatures get too high, the plants may suffer and the water in the raceways will evaporate quickly. Large exhaust fans in one end can pull air from vents located in the other end to keep air flowing. The other inexpensive option is to roll up the sides part of the way and allow for a good exchange of air. If left totally closed, the plants will likely suffer from too much heat.



If the heater has an automatic temperature sensor, it is advisable to leave the thermostat at bench level about half way down the greenhouse. This would represent the average temperature of the house. This temperature will vary with the species being produced and time of year.

The raceways are constructed of 1/2' exterior grade plywood with 2"x4" sides. These 2x4s should be extended 6" past the end of the plywood to link each section together with the next one. The raceway section is supported from underneath by a 2x4 frame and legs set at a comfortable height (28" to 32" would be sufficient). The 4' wide raceways can be moved away from the greenhouse walls by a foot or so, still leaving enough room to work from the middle of the greenhouse. The wood does not necessarily need to be treated since it doesn't really get wet.



The floor of the greenhouse can be covered with plastic mesh groundcover such as is used in many greenhouses. This will keep the operation clean and will allow water to flow through. (This ground cover also allows for easy sweeping of the floor which may get littered with cuttings of dead leaves or weeds picked from the plant pots.) The ground ought to be very level to keep the water moving correctly in the raceways. Since the raceway needs only be an inch or so of water, an un-level raceway will not work.

The raceway should be lined with a good quality rubber liner that comes up over the sides of the raceway and is tacked or stapled in place. The type of rubber liner is commonly called EPDM, but there may be other rubberized liners available. Its common use is for roofing on flat-topped buildings, but it is also used for ornamental ponds. It should hold up for easily 5 years in the raceways.

Other types of pond liners that are stronger than ordinary plastic, such nylon mesh sandwiched between two layers of heavy plastic could also prove to be quite serviceable as raceway liners, but may be expensive. A rubber liner that is not necessarily for fishponds is appropriate since the plants won't mind the difference. The fishpond liner is coated with talcum powder while the others have crushed mica that won't affect the plants at all, but might cause problems with fish gills initially.



At the end of the raceway, a plastic stock tank (a tank for watering livestock) is positioned under the edge of the liner hanging off the raceway. A 2x4 is placed on its side under the liner to create a small dam that will set the water level in the raceway. A simple piece of window screen laid across the end of the raceway will reduce plant material from getting into the tank.



A circulation pump is placed in the tank and tied into a 1/2" irrigation pipe that is tacked onto the side of the raceway leading back to the far end of the raceway. The water is lifted, carried to the top of the raceway, and then dropped to recirculate past the plants back to the tank where it is again pumped around again. A pump with 90 gallons per hour would be fine.

## Head house

Each scenario should consider the addition of a head house constructed or placed at the end of the hoop house or greenhouse. This space will provide an appropriate location for storage of pots, soil, fertilizer, etc. as well as a place to propagate plants, pack for shipping, and work on other tasks. It will also keep greenhouse space solely for plant production and not for office work. Prefabricated sheds or garages can be placed at the end of the greenhouse to serve this purpose. When the weather is hot, the head house can also provide a cooler place to propagate plants.

## Plant selection

Initial selection of plants would be hardy varieties to help ensure grower success. Marginal plants work best but tropicals can be added if they can be sold in the first year since the tropicals will need heat to be over-wintered in the Northeast. Growers should look to purchase seedlings from suppliers in Florida, Texas, Virginia or Maryland.

Each grower would cultivate about 20 to 40 varieties selected from the most popular by market demand. A list of some of these plants will be in Appendix 1.

The first delivery from the seedling supplier should be ordered to come in Mid-March in plug form (6 to 12" tall plants). About two dozen of each variety is an appropriate amount to start with for the small-scale grower. Once the seedlings are acclimated from shipping and have been held in plug trays, they will be planted into 4" pots.

The second delivery may be ordered for May 1 delivery in a similar form. Once potted, they should be placed in a flat that will hold 12 to 15 plants, and put into the raceway. It may be fine to only run one raceway until the plants are larger and need to be split or put into larger pots necessitating the use of the second raceway. Plant deliveries can be moved back

or forward as the seasons change or depending on the location in the region.



Planting media can be a mix of topsoil, clay, peat moss and sand in equal parts and can be enhanced with time-release fertilizer (eg. Osmocote, Nutricote). Fertilizer tabs available from good pond suppliers can also be purchased in bulk (1000 per box) and stuck into the pots. Fertilization will make for better looking plants when ready for market. Growers could also use rock wool or aquatic planting material.



## Grower's Selling Process

### *Time of Market*

In the Northeast, the main sales period for the aquatic plant market in the garden centers will be from about early May until Mid-July.

Growers may make two deliveries per customer during that time depending on the retail location, amount of nice weather for the spring (rainy weekends will dampen sales), and relative size of backyard ponds in the area.

It is appropriate to fax or email availability lists with prices to customers to remind them to look at their supply and hint at re-orders. Some floating plants such as water hyacinths and parrots feather can be quick sellers and can often need restocking more frequently than other species.



After 4 to 6 weeks from the seedling delivery, most varieties in the 4" pots will be ready for market. They will be tall enough and full enough for Garden Centers to receive them. They should not be overgrown in either height or fullness since they will continue to grow in the garden center display. This size will allow the customer to replot them in a group of plants for the pond or simply replot to a larger container understanding that the plants will eventually grow larger and expand.

### *Overstocked varieties*

After the initial one or two sales and deliveries, a portion of the overstocked or larger plants in the greenhouse should be moved into 6" or 8" pots for sales to landscapers, or split to increase inventory. Some scheduled plant



management about every 2 weeks such as removing dead parts of the plants or picking weeds is always appropriate so that these things don't get out of hand. Be sure to remove all pruned plant debris from the greenhouse since it may attract unwanted insects.



### Plant Propagation

Profit can be made in the aquatic plant growing business through plant propagation. When the original plant seedlings arrive and are planted in 4" pots, they should be allowed to grow for about 6 weeks. At that point some can be sold, but some should be allowed to grow larger.

In another 4 to 6 weeks, the plants will be ready to be split into two plants. A simple cutting of the plant will allow the grower to wind up with two 4" pots of the same variety. The propagation may vary a bit from species to species, but on some plants the splitting method will be fairly easy to see. While some plants can simply be split down the middle, others will send off a smaller shoot that can be separated from the starting plant and repotted. This will leave one large plant and one small one, instead of two of equal size.

Late in the season, that large plant may even be cut down to the level of the potting medium. Over the winter it will sprout up two or more seedlings. Hands-on experience with these

plants is the best teacher, and growers should not hesitate to chop some plants all the way down to the soil layer for the winter. Remember that they are hardy plants that can withstand similar conditions in nature. Life in the greenhouse will always be less severe than in nature.



During the fall season purchasing root cuttings for winter propagation for spring flowering is an option. This will allow for stock to be ready for early distribution and also possibly allow for another spring propagation, doubling the inventory.

### Plant Stock Management

In the grower's first year, just one purchase of seedlings will probably suffice. This will allow for some sales and for some plants left for



propagation. However, if sales or sales projections are brisk, a second seedling purchase can be done about 6 to 8 weeks after the first delivery. If these plants aren't sold during the summer, they can be held over and propagated. Dividing and cutting back to starter size will encourage growth for spring sales.

Growers should plan to retain 20 to 30% of plant inventory for propagation stock each year. Both marginals and tropicals can be split, but tropicals will need heat in the Northeast winters to survive. If the greenhouse is well heated, then the marginals will do better too. This heating system will eventually impact profits. If the number of tropicals is small, it might be wiser to try to set up a holding system in your basement with some lighting instead of the expense of heating the greenhouse over the winter, especially the farther north the greenhouse is located. The marginals kept over winter in the greenhouse will look pretty bad, but when the sun starts to shine longer in the spring and the greenhouse gets some better warmth, they will come back to life. This is why they are considered hardy plants. A kerosene heater run at night when outside temperatures go below freezing may be sufficient to keep the raceways from icing up and damaging the plants badly.

In the second year, a second and third delivery of seedlings may be accepted, as will the inclusion of some more tropical varieties. At



this point the grower ought to have a good group of clients to whom these plants will be readily marketable. The Budget and Cash flow section will show the actual process of purchasing seedlings, propagating, and selling plants in an orderly dated fashion.

### **Pesticide Treatment**

Periodically, plants will attract some insects. It is important that the grower treat the plants in the greenhouse so that those pests don't travel with the plants to the customers who may be selling other types of plants that risk an infestation. To prevent this, the grower ought to keep a keen eye for insects and treat the plants that may be infested. Keeping dead material pruned from the plants (and then removed from the greenhouse) can minimize infestations. However periodic treatment or spraying, according to pesticide label recommendations, may be necessary. Growers may be able to get assistance with identification of pests and recommendations for treatment from their County Cooperative Extension Office.

Growers might also consider Pesticide Certification in states where that is needed to purchase some chemicals. Information about this certification is also available from the County Cooperative Extension Office. Some states require growers to be certified pesticide applicators.

### **Primary Markets**

Before the operation begins growers ought to prioritize the markets that they will target. It makes great sense to start small, build customer loyalty, learn what the customers' needs are, and possibly adapt growing or potting practices to meet their needs before tackling larger or significantly more customers. Building a strong customer satisfaction base and loyalty will help the business will grow.

The focus for sales can be Pond Centers, Garden Centers or Nurseries, Pond Installers,

direct to consumer, or possible catalogue or web sales. For well-established companies, plant wholesalers or co-op sales may be appropriate.



In the first year or two, the grower should probably focus on the Aquatic Garden Center and regular Garden Centers or Plant Nurseries. Some garden centers will be open to putting the plants in inventory and some will not. The reasoning can be very personal but don't be shocked if garden center managers are not interested in your beautiful plants. This business has a long way to go, and there are many centers that will be interested. Sometimes it might be beneficial to tell equipment distributors which garden centers are hesitating about taking on pond plants and hardware so that they can offer equipment packages to complete the sales package for the customers.

### **Marketing by Grower**

To begin, the grower ought to try to market directly to retailers within a drivable radius of the farm. This radius could easily be up to 25 to 30 miles. This will allow for a customer base that can be served on a bi-weekly time frame without too much effort. Deliveries ought to be made during the week since weekends

may be too busy for the centers to deal with more plants that need to be inventoried and placed in the appropriate place. A charge for delivery on small orders (\$300) could be made. This will cut down on small orders and unneeded travel, especially in times of rising gas prices.

Growers might consider constructing displays for their plants, which could be sold, rented, or given to the garden center to showcase the plants. This would be done with retailers who accept an exclusive plant contract. When new deliveries are brought, time ought to be taken to rotate stock, prune and clean up plants, and make sure that someone at the facility is keeping an eye on the display. This regular on-site retailer maintenance will inspire customers to use your service and accept fish, snails, or other offerings as you make them available with your business growing.

Once the business takes off, growers might take a booth at state landscaper, nursery, or garden/pet shop trade shows to display their plants. This is the place where wholesale orders can be taken (giving a 10% discount for early season orders). These orders can set the production schedule for the season. If the grower feels confident about the plants that are being grown, this could be done after year 1, but probably better after the second season when the business could be growing up to two greenhouses, as with the medium sized business as described above.

Catalogue and Web buyers are known to pay a percentage over regular price for drop shipping to them. This can be an added profit center when the business grows to the size that it can handle both the local delivery volume plus shipping off site. Growers should meet with a couple types of shippers to see which would best meet their needs. These might include the US Postal Service, UPS, Fedex or any of the other commonly available shippers.



### **Aquatic Plant Pricing Schedule**

There is only one reason to do aquaculture. It is to make money! Farmers grow their crops as their occupation not for the love of simply growing. It is the sale of the crop that makes the business. That is how they support their family. The same is true in aquaculture. Aquatic plant culture is a business and growers ought to take pride in their plants and the value of them.

Growing aquatic plants can be a rewarding occupation but it is most important to sell them at an appropriate price to make the effort worthwhile. Growers should visit numerous garden centers in their areas to see what kind of prices the retailers are setting for the plants that they sell. If the retailer sells a 4" plant for \$8.00, the sale price to a retailer would be \$4.00 (50 % off), allowing for a 100% markup. If the plant is sold to a landscaper, the price could be 40% off retail or about \$4.80. The landscaper will pass that cost difference along to the customer and still make money on the purchase.

In order to reduce transportation costs growers should have a minimum buying dollar amount per order or customers will buy small orders necessitating more deliveries and gas consumption. The grower's time is just as important as the retailer's, so either postpone the delivery for a week, invite the customer to

come pick up the order, or contact other customers in the general area to see if they might need to place an order too. And don't forget to charge a delivery fee.

### **Plant Business Logic**

In the first year, the focus should be to grow plants to build inventory, make some sales, but more importantly to show plants to retailers for getting orders for next year. This helps to plan for Year 2 plant purchases and growing needs. This will be a year of learning about the individual plants, how to care for them and propagate them, to see what kind of pests might visit the greenhouse and settle into the plants, to make retailer contacts which may last for years, and to feel more comfortable in selling and delivering plants and doing the accounting necessary to maintain the business.

In year two, the grower wants to increase the customer base and production capabilities, to "grow the business." Lessons and information learned in year one will be applied in year two. The business contacts from visiting retail centers will be called upon to make sales. Visiting trade shows and learning more about the scale of the entire aquatic plant business is a good way to generate ideas and make decisions about the business. In this year, another greenhouse might be added increasing the farm's production capability, customer loyalty and increased sales.



Growers can think about branding their product with a label that shows the grower's logo or data about the plants themselves. Many retailers like to have brochures that provide more in-depth information about the plants or the grower. Remember that many people are new to backyard ponds and the better educated they are, the more plants they will buy and tell their friends about.

Service is a word that is often spoken too easily and not carried out well. When the grower is in the neighborhood of one of the

customers, it makes sense to stop by and check how the plants are doing. Bring some scissors and a knife and prune the dead leaves or branches off the plants, throw a few plant fertilizer tabs into the display to give the plants a boost and maybe even get some more water in the display. Stop to talk with the garden center operator to see how sales are going and if they needed more of a specific variety or whether they would like plants in different form (larger pots or mixed groupings).

## Budget and Cash Flow Statement

### A case study of a starter/hobby farm operation that was extended to a medium size operation

A financial analysis was conducted for a starter/hobby farm, which is upgraded to medium-sized farm in year two, for ornamental aquatic plant culture in the Northeastern United States. The analysis included land and capital equipment costs, an enterprise budget, and cash flow. The analysis was done for a three-year period. In year one, there is one unheated greenhouse in operation. At the end of year one, the farm is upgraded to a medium-sized farm with the construction of a heated greenhouse. In year two and beyond, both the heated and unheated greenhouses are in operation. *It should be noted that no labor costs were included in calculations, since this*

*introduction to the aquatic plant business is considered a hobby or start up operation.*

A production profile for each year showing when new plants are purchased, when plants are sold, when propagated plants are added to inventory, and total saleable inventory are presented in Tables A, B and C. Please note that the tables are set up like a checkbook register. Readers should follow the progression of plant purchase, propagation and sales to see how the process works. Note that the dates can be flexible depending on where in the region the culture system is located.

Table A. Year 1 : One unheated greenhouse in operation.

Date	Note	Buy \$	Sold \$	Add Propagated Plants \$	Saleable Inventory \$
3/15	Buy from supplier	900			900
5/1	Split			300	1200
5/15	Sale of plants		700		500
6/1	Split			200	700
6/15	Sale of plants		200		500

8/15	Split			200	700
10/15	Split			300	1000
12/31	Carry-over to year 2				1000

Table B. Year 2 : One unheated greenhouse and one heated greenhouse in operation.  
(Medium Size Farm)

Date	Note	Buy \$	Sold \$	Add Propagated Plants \$	Saleable Inventory \$
1/15 to 2/31	Pre-order for 2000 plants from sales at local shows				1000
3/15	Buy from grower	900		400	2300
5/1	Sale of plants		2000		300
5/15	Buy from grower	1500			1800
5/15	Split			600	2400
7/1	Sale of plants		1500		900
7/15	Split			300	1200
7/30	Sale of plants		1000		200
9/15	Fall purchase	500			700
10/15	Split			400	1100
12/31	Carry-over to year 3				1100

Table C. Year 3 : One unheated greenhouse and one heated greenhouse in operation.  
(Medium Size Farm)

Date	Note	Buy	Sold	Add Propagated Plants	Saleable Inventory
1/15 to 2/31	Pre-order for 2500 plants				1100
3/15	Buy from grower/split	2000		500	3600
4/1	Split			800	4400
4/15	Sale of plants		2500		1900
5/1	Buy from grower	2000			3900
5/15	Split			600	4500
6/15	Sale of plants		2000		2500
7/15	Split			1000	3500
7/15	Sale of plants		1000		2500
9/15	Split			750	3250
12/31	Carry-over to year 4				3250

Land and capital equipment (Tables 1 and 3) are expenditures for items for the aquaculture business that are large, permanent commitments that influence the long-run flexibility and earning

power of the business and include land clearing, electrical, water, plumbing, raceways, head house and other assets.

Table 1. Summary of Land and Capital Equipment Cost – Unheated Greenhouse

Item	Cost \$	Notes/Units
Land	own	1/4 acre
Land Clearing and preparation	600	
Electrical service	500	
Water service	200	
Mesh fabric floor cover	300	
Hoop house	5500	Plastic greenhouse 14'x100', roll-up sides
Electrical wiring and lights	200	
Exhaust fans and vents	1000	
Plumbing	200	
Raceways (2)	2400	2"x4" frame, 1/2" plywood, rubber liner, recirculating water pump, float, screen, pipe, tubing, plastic tank
Head house	3000	10'x24' preconstructed wooden shed with garage door and windows
Work bench	100	
Miscellaneous tools and equipment	150	
Delivery equipment: (a) Truck <u>or</u> (b) Box trailer	3000	Own or rent
Delivery plant carts (5)	1750 (350 each)	4 shelf, 18"x3'
Total cost without land and delivery equipment	14150	

Note: Delivery equipment and delivery plant carts are optional equipment.

Table 3. Summary of Land and Capital Equipment Cost – Heated Greenhouse (Medium Size Farm)

Item	Cost \$	Notes/Units
Land	own	¼ acre
Land Clearing and preparation	600	
Electrical service	500	
Water service	200	
Mesh fabric floor cover	300	
Hoop house	5800	Plastic greenhouse 14'x100', roll-up sides, double wall
Electrical wiring and lights	200	
Plumbing	200	
Exhaust fans and vent	1000	
Oil burner and fuel tank	1000	
Circulation fan	150	
Raceways (2)	2400	Lumber, liner, water pump, float, screen, pipe, tubing, plastic tank
Miscellaneous tools and equipment	150	
Total cost without land and delivery equipment	12500	



Fixed costs (Tables 2 and 4) are incurred whether or not the business produces aquatic

plants. These include depreciation on the capital equipment, taxes and insurance.

Table 2. Summary of Fixed Costs – Unheated Greenhouse (Starter/Hobby Farm)

Item	Years of Life	New cost \$	Average investment \$	Annual depreciation \$
Electrical	15	700	350	47
Water	15	400	200	27
Exhaust fans and vents	12	1000	500	83
Hoop house	15	5800	2900	193
Raceways	7	2400	200	343
Head house	15	3000	1500	200
Work bench	10	100	50	10
Misc. tools and equipment	15	150	75	10
Total		13550	6775	913
Taxes & Ins. (Avg. Invest. X .006)				81
Total Annual Fixed Cost				994

Table 4. Summary of Fixed Costs – Heated Greenhouse (Medium Size Farm)

Item	Years of Life	New cost \$	Average investment \$	Annual depreciation \$
Electrical	15	700	350	47
Water	15	400	200	27
Hoop house	15	6100	3050	407
Raceways	7	400	1200	343
Exhaust fan and vent	12	1000	500	83
Oil burner and fuel tank	12	1000	500	83
Circulating fan	12	150	75	13
Misc. tools and equipment	15	150	75	10
Total		11900	5950	1013
Taxes and Ins. (Avg. Invest. X .006)				36

.006)				
Total Annual Fixed Cost				1049

Budgets (Tables 5, 7 and 9) are tools for business planning and profitability analysis. They provide detailed estimates of costs, returns, and resource requirements for the aquaculture enterprise. Budgets can be used to call attention to the inputs and production practices required in an enterprise. They also provide

information necessary for cash flow projections, comparison of alternative enterprises, and total farm planning.

*No labor costs were included in calculations, since this introduction to the aquatic plant business is considered a hobby or start up operation.*

Table 5. Budget – Unheated Greenhouse (Starter/Hobby Farm)  
Year 1

Item	Units	Price or Cost/unit	Quantity	Total value or cost	Value or cost per plant
Gross receipts	each	\$3.75	900	\$3375	\$3.75
Variable Costs:					
Labor	Person	7.5 hrs/week	2	15 hrs/week	
Electricity	month	25	12	300	
Water	total	50		50	
Pots	each	0.10	1000	100	
Trays	each	0.30	100	30	
Planting medium	3 cu yds	35	9 cu yds	105	
Fertilizer		65		65	
Plants	each	2.50	900	2250	
Transportation/delivery		100		100	
Miscellaneous		100		100	
Total variable cost				3100	3.44
Income above variable costs				275	
Fixed costs				994	
Total of above costs				4094	4.55
General overhead	2.8% of VC			87	
Total cost				\$4181	\$4.65
Returns to risk, management, land, labor				\$(806)	\$(0.90)

Breakeven price – variable costs: \$3.44

Breakeven price – all costs: \$4.65

Table 7. Budget – One Unheated and One Heated Greenhouses (Medium Size Farm)  
Year 2

Item	Units	Price or Cost/unit	Quantity	Total value or cost	Value or cost per plant
Gross receipts	each	\$3.75	4500	\$16875	\$3.75
Variable Costs:					
Labor	Person	12 hrs/ week	2	24 hrs/ week	
Electricity	month	75	12	900	
Water	total	100		100	
Pots	each	0.10	1700	170	
Trays	each	0.30	170	51	
Planting medium	3 cu yds	35	15 cu yds	175	
Fertilizer		200		200	
Plants	each	2.50	2900	7250	
Fuel oil	gallons	1000		1000	
Transportation/delivery		300		300	
Miscellaneous		200		200	
Total variable cost				\$10356	\$2.30
Income above variable costs				\$6529	
Fixed costs				\$2043	
Total of above costs				\$12389	\$2.75
General overhead	2.8% of VC			290	
Total cost				\$12679	\$2.82
Returns to risk, management, land, labor				\$4196	\$0.93

Breakeven price –variable costs: \$2.30

Breakeven price – all costs: \$2.82

Table 9. Budget – One Unheated and One Heated Greenhouses (Medium Size Farm)  
Year 3

Item	Units	Price or Cost/unit	Quantity	Total value or cost	Value or cost per plant
Gross receipts	each	\$3.75	5500	\$20625	\$3.75
Variable Costs:					
Labor	Person	12 hrs/ week	2	24 hrs/ week	
Electricity	month	75	12	900	
Water	total	100		100	
Pots	each	0.10	3650	365	
Trays	each	0.30	350	105	
Planting medium	3 cu yds	35	21 cu yds	245	
Fertilizer		250		250	
Plants	each	2.50	4000	10000	
Fuel oil	gallons	1000		1000	
Transportation/delivery		300		300	
Miscellaneous		200		200	
Total variable cost				\$13465	\$2.45
Income above variable costs				\$7160	
Fixed costs				\$2043	
Total of above costs				\$15508	\$2.82
General overhead	2.8% of VC			\$377	
Total cost				\$15885	\$2.89
Returns to risk, management, land, labor				\$4740	\$0.86

Breakeven price –variable costs: \$2.45

Breakeven price – all costs: \$2.89

In order to develop budgets, assumptions concerning the inputs and prices must be made. These assumptions are explained in the text. Budgets include both variable and fixed costs. Variable costs are those that increase as

the amount of aquaculture production period increases over time. These include the cost of labor, electricity, water, pots, trays, planting medium and others.

Breakeven price allows the user to quickly estimate the price necessary to recover variable costs and/or fixed costs without having management included. The breakeven price/variable cost includes only variable costs, while the breakeven price/all costs includes both variable and fixed costs.

The cash flow statement (Tables 6, 8 and 10) summarizes the cash inflows (receipts) and outflows (expenditures) of the aquaculture business over a specific time period. The cash flow statement is a projection of the amount and timing of cash expected to flow into and

out of the business during the specific time period. It allows the manager and lender to estimate: (1) the amount and time cash will be available, (2) the time and amount of any borrowed funds that might be needed, and (3) the debt repayment capacity of the business. Cash flow analysis helps determine not only the amount of debt the borrower can incur, but also the timing of repayment and the proper repayment schedule. Cash flows can be developed for different time periods (i.e., monthly, quarterly, annually).

Table 6. Cash Flow – Unheated Greenhouse (Starter/Hobby Farm)  
Year 1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Income: Plants	-	-	-	-	2625	750	-	-	-	-	-	-	3375
Var Cost Items:													
Electricity	25	25	25	25	25	25	25	25	25	25	25	25	300
Water	-	-	12.50	-	-	12.50	-	-	12.50	-	-	12.50	50
Pots	-	-	-	-	25	25	-	25	-	25	-	-	100
Trays	-	-	-	-	7.50	7.50	-	7.50	-	7.50	-	-	30
Plant medium	-	-	-	-	52.50	52.50	-	-	-	-	-	-	105
Fertilizer	-	-	65	-	-	-	-	-	-	-	-	-	65
Plants	-	-	2250	-	-	-	-	-	-	-	-	-	2250
Transport	-	-	25	-	25	25	-	-	-	25	-	-	100
Misc	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	100
Total VC:	33	33	2387	33	143	156	33	66	47	91	33	47	3100
Accum. Net cash income	(33)	(66)	(2452)	(2485)	(3)	591	558	492	445	354	321	274	274
Capital purchases	-	-	-	-	-	-	-	-	-	-	-	-	-

(Numbers may not add correctly due to rounding error)

Table 8. Cash Flow – One Unheated and One Heated Greenhouses (Medium Size Farm)  
Year 2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Income: Plants	-	-	-	-	7500	-	9375	-	-	-	-	-	16875
Var Cost Items:													
Electricity	75	75	75	75	75	75	75	75	75	75	75	75	900
Water	-	-	25	-	-	25	-	-	25	-	-	25	100
Pots	-	-	42.50	-	42.50	-	42.50	-	-	42.50	-	-	170
Trays	-	-	12.75	-	12.75	-	12.75	-	-	12.75	-	-	51

Plant medium	-	44	-	-	44	-	44	-	44	-	-	-	175
Fertilizer	-	-	200	-	-	-	-	-	-	-	-	-	200
Plants	-	-	2250	-	-	-	-	-	1250	-	-	-	7250
Fuel Oil	400	-	300	-	-	-	-	-	-	-	300	-	1000
Transport	-	-	60	-	60	-	60	60	-	60	-	-	300
Misc	16	16	16	16	16	16	16	17	16	16	17	17	200
Total VC:	491	135	2981	91	4000	116	250	152	1410	206	392	117	10346
Accum. Net cash income	(491)	(626)	(3607)	(3698)	(198)	(314)	8811	8659	7249	7043	6651	6533	6529
Capital purchases	-	-	-	-	-	-	-	-	-	-	-	-	-

(Numbers may not add correctly due to rounding error)

Table 10. Cash Flow – One Unheated and One Heated Greenhouse (Medium Size Farm)  
Year 3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Income:	-	-	-	9375	-	7500	3750	-	-	-	-	-	12375
Plants													
Var Cost Items:													
Electricity	75	75	75	75	75	75	75	75	75	75	75	75	900
Water	-	-	25	-	-	25	-	-	25	-	-	25	100
Pots	-	-	73	73	73	-	73	-	73	-	-	-	70
Trays	-	-	21	21	21	-	21	-	21	-	-	-	21
Plant medium	-	-	49	49	49	-	49	-	49	-	-	-	140
Fertilizer	-	-	250	-	-	-	-	-	-	-	-	-	100
Plants	-	-	5000	-	-	-	-	-	-	-	-	-	5000
Fuel Oil	400	-	300	-	-	-	-	-	-	-	300	-	1000
Transport	-	-	60	-	60	-	60	60	60	-	-	-	200
Misc	16	16	16	16	16	16	16	17	16	16	17	17	200
Total VC:	491	91	5869	234	5294	116	294	152	319	91	392	117	7731
Accum. Net cash income	(491)	(582)	(6451)	2690	(2604)	4780	8236	8084	7765	7674	7282	7163	7160
Capital purchases	-	-	-	-	-	-	-	-	-	-	-	-	-

(Numbers may not add correctly due to rounding error)

## Business Financials Review

The total capital cost, without land and delivery equipment, for the unheated greenhouse is \$14,150.00 (Table 1 and 2). The total capital cost, with land and delivery equipment, for adding the heated greenhouse to the business that already has an unheated greenhouse and head house is \$12,500.00 (Table 3 and 4). It is assumed that the head house attached to the unheated greenhouse will be used for both greenhouses. The delivery equipment, a truck or box trailer and five delivery plant carts are the primary difference in the cost between the heated and unheated greenhouse scenarios and

are considered to be optional equipment in the analysis. The producer may own a truck or other means of transport and may find alternate means than the delivery carts to move the plants.

The analysis for year one shows a loss of \$806 or \$0.90 per plant (Table 5). Year one is considered to be a learning year for the producer and it is common for new businesses to show a loss in year one. The quantity of plants produced is small. Even though the producer is able to cover the variable costs of producing the plants, not enough plants are produced to cover all costs.

The cash flow shows that no income is obtained until the fifth month (May) of operation (Table 6). The producer will need to prepare to have enough cash available to be able to cover these cash outflows during this period. The largest variable cost item is the purchase of new plants.

In years two and three, the producer obtains positive returns. In year two, a return of \$4196 is obtained (Table 7) and in year three, a return of \$4740 is obtained (Table 9). The producer earns \$0.93 per plant in year two and \$0.86 per plant in year three. The breakeven price, all costs, is \$2.82 in year two and \$2.89 in year three. As in year one, the largest single variable cost item is the purchase of new plants. As in year one, the cash flow shows that the producer will need to have cash reserves on hand for the first half of the year as expenses are greater than income during this period (Tables 8 and 10). In the second half of years two and three sufficient cash inflows are obtained to cover expenses.

In summary, the financial analysis for this new business shows that the operation of a starter/hobby farm for ornamental aquatic plant culture in the Northeastern United States could be profitable. Year one needs to be considered to be a learning year and it is likely that there will be small negative returns due to smaller plant production. Years two and three show increasing returns to the producer's risk, management, labor and land. The producer will need to have sufficient cash reserves on hand during the first half of each year to cover expenses.

### **Future Profit challenges for this start up business**

To reiterate, no labor costs were included in calculations, since this introduction to the aquatic plant business is considered a hobby or start up operation. Growers ought to think very seriously about adding a salary for their work as soon as they can into their business plan.

One important aspect of aquaculture is the

realization that money cannot be made in plant, fish or shellfish aquaculture by just growing the product. The product has to be sold. This may sound stupidly simplistic, but some people are better suited to growing the plants and other are better at sales, so it is imperative that somebody in operation can "sell". If plants look good, this shouldn't be hard, but somebody has to knock on the doors and plan a strategy. **Salesmanship and promotion are critical to the success of the operation and cannot be over-emphasized.**

These plans do not constitute a full plant product line since we are considering this to be a start up or hobby level operation. It contains mostly hardy plants, a few tropicals and no lillies. These types of plants can be considered for expansion later as well as the inclusion of fish, snails and tadpoles to the product line in year 3 or 4. Lilies will require a different set up than the raceways needed for the plants discussed here and will require increased capital expenses.

If the grower wants to greatly expand the production capabilities of the farm, the culture of fish can be added to the process. This can be either ornamental fish or edible fish. Realistically, the ornamental fish will probably have a greater return than the food fish for several reasons. Since all fish production systems are based on the feed that is introduced, the return per pound for ornamental fish is greater than for food fish. The other reason is that people are willing to pay more for things that they want than for things that they need. Therefore the price per pound of ornamental fish is much greater than edible fish.

Once the fish production system is operational, the effluent of this process can be pumped through the plant raceways and serve as a fertilizer. The nitrogen from the feed will be cycled through the fish, the solids removed and the nitrogen rich effluent will nourish the plants that will serve to act as a biological filter and remove the ammonia nitrogen that will be toxic to the fish.

Growers ought not to forget that as they look to add product lines that there are edible aquatic plants like taro or water cress which might be potential crops as well as some herbs that can be grown hydroponically.

The potential also exists in the fall for the cultivation in the heated greenhouses of submerged aquatic plants (e.g., annacharis) that are marketed into the winter for the aquarium market (October to March) before the first set of ornamental aquatic plants are delivered to garden centers. This will help with cash flow and income throughout the year.

### **For Further Information**

Those interested in pursuing this type of operation or are interested in a training program in aquatic plants should contact the lead author, their County Extension Agent or visit the NRAC website and visit the Extension category listed on the home page for the Cooperative Extension or Sea Grant Aquaculture Agent or Specialist in their state.

The contact information for the lead author is: Gef Flimlin, Marine Extension Agent, Rutgers Cooperative Extension, 1623 Whitesville Road, Toms River, NJ 08755, 732-349-1152, flimlin@aesop@rutgers.edu

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**In Cooperation with  
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## Appendix

### HARDY MARGINAL PLANTS

ARROW ARUM (*Peltandra virginica*)  
ARROWHEAD SAGITTARIA (*Sagittaria latifolia*)  
ARROWHEAD, DOUBLE FLOWERING (*Sagittaria japonica*)  
BULRUSH, GIANT (*Scirpus spp.*)  
CARDINAL FLOWER (*Lobelia cardinalis*)  
CATTAIL (*Typha latifolia*) CATTAIL, DWARF (*Typha minima*)  
CATTAIL, GRACEFUL (*Typha laxmannii*)  
CATTAIL, VARIEGATED (*Typha latifolia variegata*)  
CLOVER, FOUR LEAF (*Marsilea quadrifolia*)  
CLOVER, VARIEGATED (*Marsilea mutica*)  
GOLDEN CLUB (*Orontium aquaticum*)  
HOULTUYNIA CHAMELEON (*Houttuynia cordata variegata*)  
HOULTUYNIA CORDATA (*Houttuynia cordata*)  
IRIS, BLUE (*Iris versicolor*)  
IRIS, JAPANESE (*Iris kaempferi*)  
IRIS - LOUISIANA BLACK GAMECOCK  
IRIS, RED (*Iris fulva*)  
IRIS, YELLOW (*Iris pseudacorus*)  
LIZARD'S TAIL (*Saururus cernuus*)  
PARROT'S FEATHER (*Myriophyllum aquaticum*)  
PICKEREL, BLUE (*Pontederia cordata*)  
PICKEREL, WHITE (*Pontederia cordata alba*)  
PLANTAIN, RED (*Plantago major rubrifolia*)  
REED, CANDY STRIPE (*Phragmites australis* 'Candy Stripe')  
RUSH, BLUE (*Juncus glauca*)  
RUSH, COMMON (*Juncus effusus*)  
RUSH, CORKSCREW (*Juncus effusus spiralis*)  
RUSH, FLOWERING (*Butomus umbellatus*)  
RUSH, HORSETAIL (*Equisetum hyemale*)  
RUSH, HORSETAIL DWARF (*Equisetum scirpoides*)  
RUSH, VARIEGATED (*Baumea rubiginosa variegata*)  
SAGITTARIA, CRUSHED ICE (*Sagittaria graminea* 'Crushed Ice')  
SEDGE (*Carex spp.*)  
SWEETFLAG, GOLDEN (*Acorus gramineus* 'Ogon')  
SWEETFLAG, VARIEGATED (*Acorus calamus variegatus*)  
SWEETFLAG, VARIEGATED DWARF (*Acorus gramineus variegatus*)  
THALIA DEALBATA (*Thalia dealbata*)  
WATER CELERY, VARIEGATED (*Oenanthe javanica* 'Flamingo')  
WATER MINT (*Menta aquatica*)

## Appendix

### TROPICAL MARGINAL PLANTS

BLUE BELL (*Ruellia brittoniana*)  
BOG LILY (*Crinum americanum*)  
BOG LILY, RED (*Crinum 'menehune'*)  
CANNA, AUSTRALIA (*Canna var. 'Australia'*) – red  
CANNA, BENGAL TIGER (*Canna americanallis variegata*) – orange  
CANNA, BLACK KNIGHT (*Canna 'Black Knight'*) – red  
CANNA, LONGWOOD HYBRIDS ENDEAVOR (*Canna glauca 'Endeavour'*) – red  
CANNA, ORANGE KING HUMBERT (*Canna 'King Humbert'*) – orange  
LEATHER FERN (*Acrostichum danaefolium*)  
PAPYRUS, DWARF (*Cyperus haspan*)  
PAPYRUS, GIANT (*Cyperus papyrus*)  
PAPYRUS, MEXICAN (*Cyperus giganteus*)  
RADICAN, MARBLE QUEEN (*Echinodorus cordifolius*)  
SAGITTARIA, MONTEVIDENSIS (*Sagittaria montevidensis*)  
SAGITTARIA, NARROW (*Sagittaria lancifolia*)  
SNOWFLAKE, WHITE LARGE (*Nymphoides indica*)  
SPIDER LILY (*Hymenocallis liriosme*)  
SPIDER LILY, VARIEGATED (*Hymenocallis caribaea variegata*)  
TARO, BLACK MAGIC (*Colocasia esculenta 'Black Magic'*)  
TARO, GREEN (*Colocasia esculenta*)  
TARO, IMPERIAL (*Colocasia antiquorum*)  
TARO, VARIEGATED (*Alocasia amazonica 'Hilo Beauty'*)  
UMBRELLA PALM (*Cyperus alternifolius*)  
UMBRELLA PALM, DWARF (*Cyperus alternifolius 'Gracilis'*)  
UMBRELLA PALM, MEDIUM (*Cyperus spp.*)  
WATER HIBISCUS, PINK SM. FLOWER (*Hibiscus spp.*), RED (*Hibiscus coccineus*)  
WATER HIBISCUS, RED NIGHT-BLOOMING (*Hibiscus acetosella*)  
WATER HIBISCUS, WHITE LG. FLOWER (*Hibiscus moscheutos*)  
WATER POPPY (*Hydrocleys nymphoides*)  
ZEPHYR LILY (*Zephyranthes candida*)

### FLOATERS

FROG BIT (*Limnobium spongia*)  
PARROT FEATHER (*Myriophyllum aquaticum*)  
WATER HYACINTH (*Eichhornia spp.*)

**PLEASE NOTE:** All growers should check with their state department of Agriculture or Environmental Protection to see if the importation of chosen plants is permitted into their state, since some are considered invasive. Sometimes, if the plant in question is not winter hardy it may be allowed, if used in a closed pond.