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Abstract

The “Green Industry” is a large and growing segment of production agriculture. As such, cost of production information is critical to successful management decision making. The research reported in this article estimated the cost of producing selected container-grown woody ornamental plant and perennials in Plant Hardiness Zones 8 and 9.



Roger A. Hinson is Professor and Donald M. Welge endowed chair in agribusiness, in Agricultural Economics and Agribusiness at the LSU Agricultural Center. He conducts a research program in marketing, agribusiness and farm management, and has participated in multi-state research projects on problems in non-food and food horticultural crops.

Randall D. Little is Professor and Undergraduate Coordinator in the Department of Agricultural Economics at Mississippi State University. His research responsibilities include livestock and horticultural production economics. He teaches Introduction to Quantitative Economics and the Economics of Food and Fiber Production.

Ken Hood is Extension Professor in the Department of Agricultural Economics at Mississippi State University. Dr. Hood’s area of responsibility includes development of economic feasibility studies for new or expanding agribusiness enterprises, business plan development, and product marketing. Dr. Hood teaches Agribusiness Firm Management and is co-advisor for the MSU student chapter of National Agri-Marketing Association (NAMA).

Allen Owings is a Professor of Horticulture with the LSU AgCenter. He oversees statewide extension service programming for the nursery and landscape industry in Louisiana. In addition, he carries a research appointment where he evaluates new ornamental plant material for Gulf Coast landscapes. He also serves as director of research and education for the Louisiana Nursery and Landscape Association.

Richard Harkess is a Professor in the Department of Plant and Soil Sciences at Mississippi State University. He works in the general area of floriculture and ornamental plant production, but has specific interest in the areas of flowering physiology, environmental effects on growth and development, and native plants.

John Black joined the USDA/NASS Oklahoma field office in September 2009. As an Agricultural Statistician Black coordinates surveys, develops training material, and analysis of survey data for Oklahoma agriculture. Black has been actively involved with a wide range production agriculture, livestock, aquaculture, and horticulture for over 25 years as a County Extension Agent, Research Associate, and USDA Agricultural Statistician.

This paper and the budgets discussed are the result of cooperative efforts of the LSU AgCenter Experiment Station, Experiment Stations at Auburn University, the University of Arkansas, the University of Georgia, Mississippi State University, and the University of Tennessee, and the Southern Region Risk Management Education Center (SRRME). SRRME is administered by Texas Cooperative Extension of the Texas A&M University System with funds provided by USDA Cooperative State Research, Education and Extension Service’s Agricultural Risk Management Education Competitive Grants Program.

Estimating the Cost of Producing Selected Ornamental Crops in Plant Hardiness Zones 8 and 9

By Roger A. Hinson, Randall D. Little, Ken E. Hood, Allen Owings, Richard Harkess, and John Black

Introduction

Production and marketing of ornamental plants is often called the “green industry.” Farm level sales from this industry have increased faster than most other segments of agriculture over the past 20 years. According to the 2007 National Gardening Survey, 71 percent of U.S. households, about 82 million households, participated in one or more types of do-it-yourself indoor and outdoor lawn and garden activities in 2007 (National Gardening Association 2008). The most popular lawn and garden activities reported included lawn care, flower gardening, indoor houseplants, and landscaping. The average amount spent per household on lawn and garden activities was \$428 in 2007. Lawn and garden retail sales totaled \$35.1 billion in 2007. The economy has a strong impact on ornamental plant sales, but even in difficult economic periods consumers seem to view these products as affordable luxuries and the industry is seen as less vulnerable to economic factors. A national economic impact study for 2004 shows the “green industry” provided about \$147.8 billion in output, nearly two million jobs, about \$26 billion in sales and \$18.1 billion in value added (Hall et al., 2005).

The specific objective of the research reported in this article was to estimate the cost of producing selected container-grown woody ornamental plant and perennials in Plant Hardiness Zones 8 and 9. The container crops selected are commonly produced and popular choices for consumers in the Southern U.S. Much of the discussion in this article focuses on the development of the assumptions and parameters reflected in the enterprise budgets. It is not the intent of the article to analyze potential profitability, but rather to provide the details of estimating costs of production, information foundational to such analysis.

Zones 8 and 9 are on or close to the Gulf of Mexico and the lower Atlantic, from southern Texas stretching across southern Louisiana, Mississippi, Alabama, Georgia, and North Carolina, and throughout South Carolina and Florida (Figure 1). The warm weather and short winters in these hardiness zones provide a long growing season that has encouraged growers to adopt and expand ornamental plant production.

Woody ornamental plants (shrubs and trees) are produced on farms referred to as nurseries, while flowering and foliage plants usually are produced in greenhouses. The Cost of Production (COP) budgets discussed here are for outdoor plant production in above-ground plastic containers. Procedures and underlying assumptions used in generating production cost budgets for container-grown ornamental plants are documented and explained. Enterprise budgets are planning tools that present estimates of production costs and returns based on a firm’s resource base, the current and/or expected economic environment, and the management practices typical of an area. As such, budgets are an important component of a grower’s information base at several levels, including choices involving risk, crop mix, expansion, and pricing and price negotiations. Spreadsheet-based COP estimates are available (see Hinson et al., 2008).

Plants selected for budget creation were chosen to represent groups of plants where similar production practices, inputs, and labor rates are appropriate. The budgets were based on producing common cultivars of:

- Indica azalea (*Rhododendron indicum*; example cultivars – “Formosa” “G.G. Gerbing”)
- Crape myrtle (*Lagerstroemia indica x fauriei*; example cultivars – “Natchez”, “Tuscarora”)
- Liriope (*Liriope muscari*; example cultivar – “Big Blue”)
- Southern live oak (*Quercus virginiana*)
- Lantana (*Lantana camara*; example cultivar – “New Gold”)
- Fig (*Ficus carica*; example cultivars – “Celeste,” “LSU Purple”).

Previous Work

Perry et al. (1990) estimated COP budgets for field-grown woody ornamentals for climatic zone 9. Results were presented as capital requirements, production activities and inputs, and costs, for 20- and 40-acre production nurseries. Budgets were created for individual plants as representatives of a group of similarly managed plants. Budgets for azalea, narrowleaf evergreen (Juniper), broadleaved evergreen (Euonymus), deciduous shrub (Forsythia), and deciduous tree (red maple and pecan) were included. For each plant, the 1) sequence of operations required for production of the plant; 2) machinery and equipment requirements for the activities; 3) operating inputs along with rates and costs; and 4) labor required were estimated. The overall COP process was placed in the context of a complete nursery operation, and these plant groups were the basis for analysis. More recently, McNeil incorporated a similar approach but used a spreadsheet to calculate production costs and produce reports, similar to Perry et al.’s for woody ornamentals in containers in hardiness zones 5 and 6.

COP budgets were estimated for field-grown woody ornamentals for hardiness zones 5 and 6 for slow- and rapid-growing evergreens, deciduous shrubs, shade trees and ornamental trees produced on 50 and 200 acre nurseries (Taylor et al., 1986). As with Perry et al.'s work, plants were grouped by similarity of production activities and management practices in the nursery. The research above followed a general procedure that can be traced to work by Badenhop (1979) and Badenhop and Phillips (1983).

Methods

Due to the detailed nature of cost computations for enterprise budgets, the Mississippi State Budget Generator (MSBG, version 6.0) was utilized. MSBG provides a standard format for crop and livestock budgets. Its computational procedures are widely accepted and the procedure can be updated easily for budgeting or for considering alternative farm situations. MSBG consists of a computer program which specifies a system of computational procedures for calculating costs and returns. A copy of MSBG can be downloaded from the website of the Department of Agricultural Economics at Mississippi State University (<http://www.agecon.msstate.edu/what/farm/generator/>). Files required to run these budgets are available from the website.

MSBG has multiple functions, but in this application individual enterprise budgets were generated. As a base for analysis, a nursery operation of 10 acres in plant production and 10 acres of service area such as buildings, roads, and loading area was assumed. Hinson (1987) used the 10-acre threshold to represent many "smaller" container nurseries that comprise the bulk of the industry in terms of number of producers. Hinson (1987) found that general size to be useful as a guide for potential new growers contemplating entry into the industry. Extension horticulturalists in Mississippi and Louisiana confirmed this is still a reasonable starting size and useful to other users, such as lenders evaluating startups. Growers were assumed to be landowners, managers, and laborers. They were also assumed to be experienced producers who generally follow University/Extension recommended production practices.

To prepare a budget, the user must specify what activities occur, when they occur, the machinery or equipment used, and the operating inputs included. Economic engineering was chosen to approach this problem, based on the idea that a planning budget can be prepared with acceptable precision through consultation with knowledgeable individuals and experts in the industry. These budgets were prepared

based on the knowledge and experience of Extension horticulturalists and agricultural economists from participating states. Through this process, a set of activities and associated inputs that represent a general production situation in hardiness zones 8 and 9 was identified. Specifically, production practices, inputs, input rates, machines used, and machinery performance rates were specified by Extension Specialists Allen Owings (LSU AgCenter) and Richard Harkess (MSU horticulturalist).

The production assumptions were verified for correspondence to real production situations by presenting the budgets and their supporting assumptions to a panel of growers from the central gulf coast region at a meeting in Mobile, Alabama. The panel provided feedback on production activities and inputs. The feedback guided modifications to help ensure the applicability of the work. Later, preliminary copies of the budgets were distributed in the winter of 2008 to project participants for use in extension meetings with growers. No suggestions for revisions were received from growers' review of the budgets. The activities and crop protection product rates used in this research reflect those typical in zones 8 and 9. The prices included are appropriate to commercial production and were collected from specialized suppliers serving the industry in 2007.

The budgets represent a logical system of production currently in use by producers. However, many other combinations of activities, products, and performance rates are possible, each with its own cost estimates. Once a basic budget is created, it can be easily altered to represent other general situations or tailored to represent a specific farming operation.

Data Files

Several data files, including powered equipment, implements, other durable equipment, and operating inputs are created. The user specifies and is responsible for selection and appropriateness of data used to prepare a budget, such as interest rates, performance rates, and input prices. A conservative approach in making decisions about values in the data files is appropriate. For example, new machinery and equipment prices were assumed. Thus, fixed costs are higher because interest on investment charges and depreciation are calculated based on the purchase price. Some growers may feel that their costs are lower because they purchased "used" rather than new machinery or they might be using older, depreciated machinery. These arguments are reasonable, but assuming new machinery is appropriate for planning or for establishing benchmark cost estimates. Individual

producers can adapt the budgets to more closely reflect their individual production situations.

The 12-month Budgeting Period

The budget period in MSBG is limited to a 12-month period that can begin and/or end in any month. Production cycles that last more than one year must be constructed as a series of single year budgets. For this reason, the one- and three-gallon Azalea, the three-gallon Crape Myrtle, and the seven-gallon Live Oak were calculated as a “production” phase budget that included planting and growing activities, and a “harvest” budget that usually included a fall harvest, winter maintenance, and spring harvest. The crop cycles budgeted were about 18 months long, beginning with planting in October, continuing to a small harvest in the following fall season, and continuing with winter maintenance activities and major harvest through the next March. For example, Azalea budgets might begin in October, 2008 and finish with harvest activities in 2010. Other budgets had different budget periods depending on the production cycle.

Assumptions

Capital

While most growers use their own capital to fund long term investment and operating expenses, interest charges for working capital and for investment in machinery and equipment were included to reflect the opportunity costs of using owned capital. Allocated costs and interest charges for investment in land and improvements were not included.

Labor

Growers and their family members provide some of the labor force in typical nurseries. Additional labor was assumed to be hired by the hour as required to complete activities in a timely manner. Hired employees usually were a combination of full time and part time. All hours required for production activities were charged to the enterprise. Labor for general work was charged at \$9.60 per hour, which includes a \$7.50 per hour basic wage rate plus additional costs (27.65%) for social security, Medicare, and worker’s compensation (6.2%, 1.45%, 20%, respectively). Manager labor was charged at \$15.30 per hour, which includes a basic wage rate of \$12.00 per hour plus additional costs (27.65%) for social security, Medicare, and workers compensation (6.2%, 1.45%, 20%, respectively). The higher wage rate was charged for managers because of the relatively higher skills required (Salassi and Dileberto, 2008).

Machinery

Machinery size affects operating and overhead costs. The assumed operation size, 10 acres of production space, comprises the bulk of agricultural activities and guides the choice of machinery items and their size. Generally, nursery activities do not involve heavy agricultural work such as soil tilling. Some combination of diesel tractors in the 20 to 35 horsepower range, and one tractor of about 50 hp, would be found on the nursery. Specialized pieces of equipment include wagons, machines to assist in potting, an air-blast sprayer unit, and irrigation. These machines are purchased and used through their productive life, with salvage values and “repair and maintenance” percentages reflecting this assumption. It was also assumed that each enterprise considered was part of an ongoing production facility and machinery and equipment costs are spread across other enterprises. Machine costs on a per hour and per acre basis are reported in Hinson et al.

Irrigation

Overhead irrigation is the standard water delivery system for small containers (7 gallons or less) in commercial ornamental production. The water source was assumed to be a well of about 200 feet (obviously, this varies by location). Power was supplied by a five hp electric pump, with emergency backup provided by a tractor power take-off. Water was pumped directly onto the crop or into a pond, depending on need and well capacity. Custom installation of the irrigation system, including service to the field and layout in the field, was assumed. Appropriate filters and underground piping from the well to the head of the field were included. Installation and material costs, including lateral lines, risers, heads, and other miscellaneous expenses, totaled about \$51,500, or about \$5,150 per acre. The system was specified and priced by a commercial firm with extensive experience in selling and installing irrigation systems for a variety of agricultural applications, including nurseries.

The irrigation system was designed to serve the nursery at the seasonal rates specified in Table 1. Pumping costs were included in the budget by season. For example, in the one-gallon Azalea budget, an operation in October represents irrigation for the fall season, with a total of 29-acre inches of water applied over a 60-day period. Cost per acre inch was \$3.82 (Table 2).

The irrigation system and costs used here were specified by an experienced provider of agricultural systems. Other irrigation designs are also appropriate for container nurseries.

Planting

Liners were assumed to be purchased rather than grown on-site. This is a common practice among the nurseries reflected in this study. For example, Azalea liners in rose pots were \$0.50 each. For some crops, two liners per pot were used. A gallon-sized liner was used for seven-gallon container products. The planting activity was assumed to occur in a central facility, not in the field. Transplanting was assisted by a two cubic yard capacity mixing machine and a potting machine with operating capacity of 3,000 containers per hour. The potting rate assumed, given the potting machine, was 2,250 containers per hour for the one-gallon container size, requiring a team of approximately eight persons to supply and operate the machine. The production rate was slower for three-gallon containers (1,500 per hour). The seven-gallon container was hand-potted (117 per hour).

Liners were delivered to the nursery, placed in greenhouse or other storage areas, and then moved to the potting area. After potting, cans were moved to the growing area using a utility vehicle (UV) towing three wagons, with a capacity of about 400 one-gallon containers per trip. The team at the potting machine loaded cans onto the wagons. A round trip was assumed to take 15 minutes. A crew in the field, assisted by a conveyor, unloaded the wagons into a “can-tight” arrangement on the bed. These placement rates varied by container size, as specified in the budgets.

Weed Control

Weed control was established with a ground cover and supplemented with complete-cover application of glyphosate before the production cycle started. Regular applications of herbicide were applied to growing plants, either with a cyclone-style spreader or a spreader mounted on a UV. Applications of branded products at the recommended dosage per acre and number of applications per year were assumed to control expected problems. Inclusion of specific products does not imply their endorsement.

Disease and Insect Control

Appropriately labeled fungicides and insecticides, intended to protect against a typical set of pests and diseases, were included in the budget. Inclusion of these products does not imply their endorsement.

Fertilization

Controlled-release fertilizers that satisfied typical nutrient requirements were applied twice during the production cycle. Fertilizer, micronutrients, and lime were added to pine bark to create

the growing medium. In the field, fertilizer was applied directly to pots on a schedule determined by the expected slow-release specifications of the product. Inclusion of these products does not imply their endorsement.

Frost Protection

Frost protection is needed for some crops and areas, in some years. Twelve rolls are required to cover an acre. This product is expected to last three years, so an expense of four rolls each year was included. In the budget, frost protection activities were included to reflect costs of frost protection. “Frost ON/off” indicates moving the blanket to the field, covering the crop, and removing when appropriate. “Frost on/OFF” indicates uncovering the crop and moving the blankets back to storage. Weather conditions could make more covering/uncovering activities necessary.

Harvest

Harvest was, essentially, a reversal of taking plants to the field. Plants were picked up, placed on the conveyor, and loaded onto the wagon described above. Each load consisted of about 300 plants and each round trip took about 15 minutes. Plants were stationed to be accessible to the loading dock. Transportation from the nursery was assumed by standard 40-foot trailers. A crew of nine used a conveyor to load the trailer. It was assumed to take five hours to load.

Land

Because this is an enterprise budget, some expense items that are part of general farm operations were not included. Land is an input that might be controlled by ownership, lease, or some other arrangement. Because of the extensive variation in land value across the production region, a land cost was not included. Users of this information should determine and include an appropriate cost for land, even if only to highlight the opportunity cost of the resource.

Selling or Marketing Costs

Selling, delivery expenses, and office and administrative costs were not included. It was assumed that the grower/manager executes sales and general administrative activities outside the production activities specified in these budgets.

Results and Conclusions

A summary of results by crop and container size is presented in Table 3. Summary tables for each budgeted situation, in terms of prices, input costs, and resource use, are presented in Tables 4 through 10.

Differences were in the performance rates, using the potting machine, for example, and length of the production period. Specific activities of the production cycle are reported in Hinson et al., including estimated resource use and costs for field operations and detailed information about the timing of production operations and input use, machinery and performance rates, and direct and fixed costs for power units and equipment.

Lantana and Liriope had the lowest cost estimates because production was completed in a single growing season and somewhat less intensive use of crop protection products was needed. In contrast, one-gallon Azaleas took about 18 months to produce, requiring more production activities. The three-gallon container sizes – Azalea, Crape Myrtle, and Fig – had production periods similar to the one-gallon azalea, but multiple liners per container usually were planted to produce a fuller final product. In addition, the activities of planting, moving to production beds, and harvest were slower. These factors led to higher costs. Finally, the seven-gallon Live Oak tree had the highest cost of production among the crops studied. This was the result of the liner size (one-gallon) and the labor intensive hand-planting process.

Enterprise budgets are useful planning tools for risk analysis. First, these cost estimates provide a reference point or a management control. Growers can compare their operation's efficiency and cost structure to this standard. While the comparison can be done by hand calculation, it can also be done by modifying MSBG's files to reflect the production situation on a specific operation, then developing a budget based on those parameters. If an individual operation's costs exceed the standard budget, then the entire operation and/or its individual activities might be evaluated to identify where processes and costs might be improved.

As a pricing application, suppose this series of operations, machinery, and inputs for the one-gallon azalea seems appropriate for a grower, however that grower estimates his per unit cost at \$1.50. If a typical wholesale price for the plant is \$1.60, this grower might conclude the crop is profitable. However, the \$1.83 cost estimate developed in this analysis suggests a need for further analysis. The grower may have missed key cost components and thus might be "living off depreciation" of machinery and other investments, and not generating an income stream sufficient for capital replacement. Or, the grower's estimate of labor cost might not account for all labor contributed by grower (family), while this budget charges an opportunity cost to all labor.

This article presents detailed enterprise budgets information for selected ornamental crops. Enterprise budgets provide a convenient platform for organizing and summarizing expected costs and returns for production activities to aid management decision making. Additional detail about necessary production activities and equipment requirements is important. Users know what is presented and why and can thus make valid comparisons among management scenarios. They can also easily modify COP estimates, using software or on paper, to craft budgets for specific situations. COP information is foundational to economic analysis of production practices, marketing strategies, and financing alternatives. Budgets are a key component of comprehensive risk management and should be used in conjunction with other management tools to identify and manage risk.

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Figure 1. USDA plant hardiness zone map, 1990

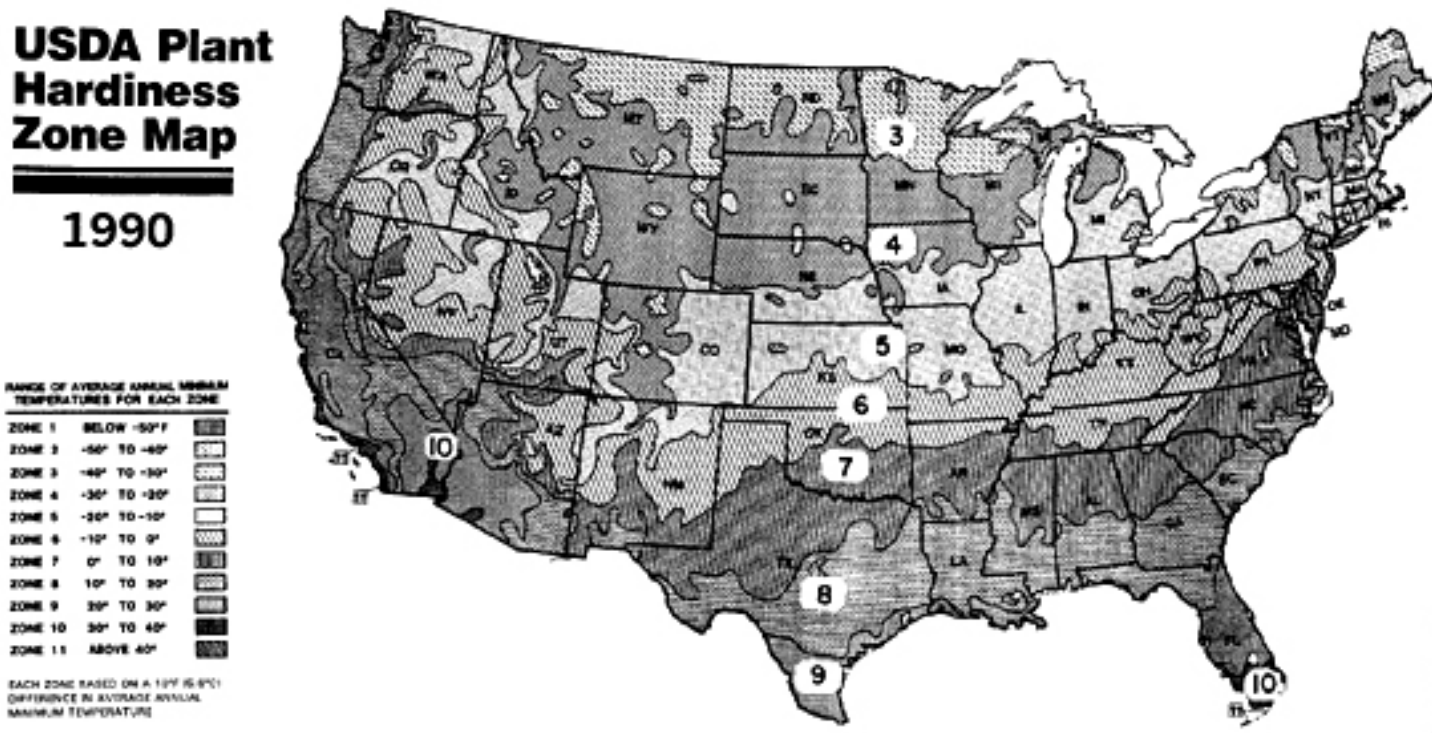


Table 1. Water requirements and calculation of pumping hours in USDA hardiness zones 8 and 9 for eight ornamental plant budgets, 2008

	Seasons		
	Summer (June 1 to Sept 30)	Spring (March 1 to May 31) and Fall (Oct 1 to Nov 30)	Winter (Dec 1 to Feb 28)
Total days in the season	120	150	90
Irrigation days	110	120	60
Gallons per day per acre	20,000	15,000	7,500
Total gallons	2,200,000	1,800,000	450,000
Pumping rate per hour	25,000	25,000	25,000
Hours per acre	88	72	18

Source: LSU ornamental plants specialist

Table 2. Calculation of irrigation costs per acre inch in USDA hardiness zones 8 and 9, for eight ornamental plant budgets, 2008

Item		Annual costs
Production area irrigation materials and installation	\$4,272.00	
Depreciation, straight line over 10 years	\$427.22	
Repair and maintenance, 50% annually	\$213.61	
subtotal		\$640.83
Providing water to the field	\$754.00	
Depreciation, straight line method over 20 years	\$37.70	
Repair and maintenance, 10% annually	\$7.54	
subtotal		\$45.24
Well, 6", total drilling costs estimated \$6,000	\$600.00	
Depreciation, straight line method over 10 years	\$20.00	
Repair and maintenance, 10% annually	\$4.00	
subtotal		\$24.00
Pump, 5 hp electric, total cost \$1,240	\$124.00	
Depreciation, straight line method over 20 years	\$6.00	
Repair and maintenance, 10% annually	\$1.20	
Electricity, 5 kilowatts/hour	\$0.40	
subtotal		\$7.20
ANNUAL REPAIR AND MAINTENANCE COSTS		\$226.35
ANNUAL DEPRECIATION		\$490.92
TOTAL IRRIGATION SYSTEM COSTS/ YEAR		\$717.27
IRRIGATION SYSTEM COSTS PER ACRE INCH (188 inches)		\$3.82

Source: LSU agricultural engineers and a commercial irrigation firm

Table 3. Summary of estimated costs per acre for selected container-grown ornamental plants, 2008

Crop	Cost by season, \$/Acre			Cost /plant (\$)	Cost @ 5% loss (\$/plant)
	Production season	Harvest season	Total cost		
Azalea, 1 gallon	44,695	7,569	52,264	1.74	1.83
Azalea, 3 gallon	45,480	5,683	51,163	3.79	3.99
Crape Myrtle, 3 gallon	47,717	5,721	53,438	3.96	4.16
Live Oak, 7 gallon	39,918	5,318	45,236	6.46	6.79
Fig, 3 gallon	na	na	41,333	3.06	3.21
Lantana, 1 gallon	na	na	41,793	1.38	1.45
Liriope, 1 gallon	na	na	37,103	1.24	1.3

Table 4A. Estimated resource use and costs for field operations, per acre, one-gallon Azalea in container, 30,000 plants per acre, production season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE (dollars)	QUANTITY	AMOUNT (dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	482.5000	4,632.00
HERBICIDES				
Ronstar	50 lbs	90.00	8.0000	720.00
FUNGICIDES				
Mancozeb	pt	8.66	25.0000	216.50
Thiophanate methyl	oz	0.60	48.0000	28.80
FERTILIZERS				
Dolomitic lime	lbs	0.14	600.0000	84.00
Micronutrients	lbs	1.33	225.0000	299.25
Osmocote 14-14-14	50 lbs	65.00	18.0000	1,170.00
Osmocote 19-5-11	50 lbs	60.00	36.0000	2,160.00
INSECTICIDES				
Horticultural oil	gal	30.00	5.2500	157.50
Acephate 75 WP	lbs	7.83	7.0000	54.81
OTHER				
Pumping Cost/ac/inch	inch	3.92	164.0000	642.88
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
Tractor per hour	hr	28.14	3.0000	84.42
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
PLANTING				
Pine bark	cu yard	15.00	150.0000	2,250.00
1 gal containers	1000	250.00	30.0000	7,500.00
Liner Azalea	1000	500.00	30.0000	15,000.00
OPERATOR LABOR				
Tractors	hr	15.30	15.2500	233.33
HIRED LABOR				
Implements	hr	9.60	3.0000	28.80
Tractors	hr	9.60	23.0000	220.80
Self-Propelled	hr	9.60	95.4000	915.84
DIESEL FUEL				
Tractors	gal	2.93	84.2474	246.84
Self-Propelled	gal	2.93	38.5906	113.07
ELECTRICITY				
Self-Propelled	kWh	0.15	238.0000	35.70
GASOLINE				
Self-Propelled	gal	2.33	4.8000	11.18
REPAIR & MAINTENANCE				
Implements	acre	38.89	1.0000	38.89
Tractors	acre	34.27	1.0000	34.27
Self-Propelled	acre	188.23	1.0000	188.23
INTEREST ON OP. CAPITAL				
Interest	acre	3,120.29	1.0000	3,120.29
TOTAL DIRECT EXPENSES				\$43,875.40
FIXED EXPENSES				
Implements	acre	113.30	1.0000	113.30
Tractors	acre	103.53	1.0000	103.53
Self-Propelled	acre	602.75	1.0000	602.75
TOTAL FIXED EXPENSES				819.58
TOTAL SPECIFIED EXPENSES				\$44,694.98

Table 4B. Estimated resource use and costs for field operations, per acre, one-gallon Azalea in container, 30,000 plants per acre, harvest season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	314.0000	3,014.40
HERBICIDES				
Ronstar	50 lbs	90.00	2.0000	180.00
FUNGICIDES				
Thiophanate methyl	oz	0.60	32.0000	19.20
INSECTICIDES				
Horticultural oil	gal	30.00	1.5000	45.00
Acephate 75 WP	lbs	7.83	2.0000	15.66
OTHER				
Pumping Cost/ac/inch	inch	3.92	62.0000	243.04
PRODUCTION				
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
HARVEST				
Product Tag	1000	49.95	30.0000	1,498.50
OPERATOR LABOR				
Tractors	hr	15.30	2.5000	38.25
HIRED LABOR				
Tractors	hr	9.60	38.0000	364.80
Self-Propelled	hr	9.60	21.2000	203.52
DIESEL FUEL				
Tractors	gal	2.93	80.6472	236.30
Self-Propelled	gal	2.93	12.4000	36.33
ELECTRICITY				
Self-Propelled	kWh	0.15	240.0000	36.00
GASOLINE				
Self-Propelled	gal	2.33	1.8000	4.19
REPAIR & MAINTENANCE				
Implements	acre	24.67	1.0000	24.67
Tractors	acre	43.20	1.0000	43.20
Self-Propelled	acre	41.69	1.0000	41.69
INTEREST ON OP. CAPITAL				
Interest	acre	153.02	1.0000	153.02
TOTAL DIRECT EXPENSES				\$7,305.77
FIXED EXPENSES				
Implements	acre	76.25	1.0000	76.25
Tractors	acre	73.45	1.0000	73.45
Self-Propelled	acre	113.35	1.0000	113.35
TOTAL FIXED EXPENSES				\$263.05
TOTAL SPECIFIED EXPENSES				\$7,568.82

Table 5A. Estimated resource use and costs for field operations, per acre, three-gallon Azalea in container, 13,500 plants per acre, production season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	452.0000	4,339.20
HERBICIDES				
Ronstar	50 lbs	90.00	8.0000	720.00
FUNGICIDES				
Mancozeb	pt	8.66	25.0000	216.50
Thiophanate methyl	oz	0.60	48.0000	28.80
FERTILIZERS				
Dolomitic lime	lbs	0.14	772.0000	108.08
Micronutrients	lbs	1.33	290.0000	385.70
Osmocote 14-14-14	50 lbs	65.00	23.0000	1,495.00
Osmocote 19-5-11	50 lbs	60.00	36.0000	2,160.00
INSECTICIDES				
Horticultural oil	gal	30.00	5.2500	157.50
Acephate 75 WP	lbs	7.83	7.0000	54.81
OTHER				
Pumping Cost/ac/inch	inch	3.92	164.0000	642.88
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
Tractor per hour	hr	28.14	3.0000	84.42
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
PLANTING				
Pine bark	cu yard	15.00	193.0000	2,895.00
1 gal containers	1000	650.00	13.5000	8,775.00
Liner Azalea	1000	500.00	27.0000	13,500.00
OPERATOR LABOR				
Tractors	hr	15.30	3.2500	49.73
Self-Propelled	hr	15.30	8.5000	130.05
HIRED LABOR				
Implements	hr	9.60	3.0000	28.80
Tractors	hr	9.60	44.7000	429.12
Self-Propelled	hr	9.60	28.9000	277.44
DIESEL FUEL				
Tractors	gal	2.93	91.7642	268.87
Self-Propelled	gal	2.93	38.5906	113.07
ELECTRICITY				
Self-Propelled	kWh	0.15	190.0000	28.50
GASOLINE				
Self-Propelled	gal	2.33	4.8000	11.18
REPAIR & MAINTENANCE				
Implements	acre	39.52	1.0000	39.52
Tractors	acre	51.00	1.0000	51.00
Self-Propelled	acre	156.33	1.0000	156.33
INTEREST ON OP. CAPITAL				
Interest	acre	3,944.18	1.0000	3,944.18
TOTAL DIRECT EXPENSES				\$44,778.68
FIXED EXPENSES				
Implements	acre	115.53	1.0000	115.53
Tractors	acre	87.74	1.0000	87.74
Self-Propelled	acre	497.67	1.0000	497.67
TOTAL FIXED EXPENSES				700.94
TOTAL SPECIFIED EXPENSES				\$45,479.62

Table 5B. Estimated resource use and costs for field operations, per acre, three-gallon Azalea in container, 13,500 plants per acre, harvest season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	208.0000	1,996.80
HERBICIDES				
Ronstar	50 lbs	90.00	2.0000	180.00
FUNGICIDES				
Thiophanate methyl	oz	0.60	32.0000	19.20
INSECTICIDES				
Horticultural oil	gal	30.00	1.5000	45.00
Acephate 75 WP	lbs	7.83	2.0000	15.66
OTHER				
Pumping Cost/ac/inch	inch	3.92	62.0000	243.04
PRODUCTION				
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
HARVEST				
Product Tag	1000	49.95	13.5750	678.07
OPERATOR LABOR				
Tractors	hr	15.30	2.5000	38.25
HIRED LABOR				
Tractors	hr	9.60	37.4000	359.04
Self-Propelled	hr	9.60	21.2000	203.52
DIESEL FUEL				
Tractors	gal	2.93	79.4472	232.78
Self-Propelled	gal	2.93	12.4000	36.33
ELECTRICITY				
Self-Propelled	kWh	0.15	240.0000	36.00
GASOLINE				
Self-Propelled	gal	2.33	1.8000	4.19
REPAIR & MAINTENANCE				
Implements	acre	24.55	1.0000	24.55
Tractors	acre	42.54	1.0000	42.54
Self-Propelled	acre	41.69	1.0000	41.69
INTEREST ON OP. CAPITAL				
Interest	acre	117.09	1.0000	117.09
TOTAL DIRECT EXPENSES				\$5,421.76
FIXED EXPENSES				
Implements	acre	75.81	1.0000	75.81
Tractors	acre	72.47	1.0000	72.47
Self-Propelled	acre	113.35	1.0000	113.35
TOTAL FIXED EXPENSES				\$261.63
TOTAL SPECIFIED EXPENSES				\$5,683.39

Table 6A. Estimated resource use and costs for field operations, per acre, three-gallon Crape Myrtle in container, 13,500 plants per acre, production season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	606.5000	5,822.40
HERBICIDES				
Ronstar	50 lbs	90.00	8.0000	720.00
FUNGICIDES				
Mancozeb	pt	8.66	25.0000	216.50
Thiophanate methyl	oz	0.60	48.0000	28.80
FERTILIZERS				
Dolomitic lime	lbs	0.14	772.0000	108.08
Micronutrients	lbs	1.33	290.0000	385.70
Osmocote 14-14-14	50 lbs	65.00	23.0000	1,495.00
Osmocote 19-5-11	50 lbs	60.00	36.0000	2,160.00
INSECTICIDES				
Horticultural oil	gal	30.00	5.2500	157.50
Acephate 75 WP	lbs	7.83	7.0000	54.81
OTHER				
Pumping Cost/ac/inch	inch	3.92	164.0000	642.88
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
Tractor per hour	hr	28.14	3.0000	84.42
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
Stakes, rebar	100	50.00	27.0000	1,350.00
Tie ribbon/string	roll	10.00	30.0000	300.00
PLANTING				
Pine bark	cu yard	15.00	193.0000	2,895.00
1 gal containers	1000	650.00	13.5000	8,775.00
Liner Crape Myrtle	1000	500.00	27.0000	13,500.00
OPERATOR LABOR				
Tractors	hr	15.30	3.2500	49.73
Self-Propelled	hr	15.30	8.5000	130.05
HIRED LABOR				
Implements	hr	9.60	3.0000	28.80
Tractors	hr	9.60	34.7000	333.12
Self-Propelled	hr	9.60	30.9000	296.64
DIESEL FUEL				
Tractors	gal	2.93	76.7642	224.92
Self-Propelled	gal	2.93	38.5906	113.07
ELECTRICITY				
Self-Propelled	kWh	0.15	190.0000	28.50
GASOLINE				
Self-Propelled	gal	2.33	6.0000	13.98
REPAIR & MAINTENANCE				
Implements	acre	38.83	1.0000	38.83
Tractors	acre	40.02	1.0000	40.02
Self-Propelled	acre	157.83	1.0000	157.83
INTEREST ON OP. CAPITAL				
Interest	acre	3,184.41	1.0000	3,184.41
TOTAL DIRECT EXPENSES				\$47,023.98
FIXED EXPENSES				
Implements	acre	113.08	1.0000	113.08
Tractors	acre	71.24	1.0000	71.24
Self-Propelled	acre	508.85	1.0000	508.85
TOTAL FIXED EXPENSES				693.17
TOTAL SPECIFIED EXPENSES				\$47,717.15

Table 6B. Estimated resource use and costs for field operations, per acre, three-gallon Grape Myrtle in container, 13,500 plants per acre, harvest season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	208.0000	1,996.80
HERBICIDES				
Ronstar	50 lbs	90.00	2.0000	180.00
FUNGICIDES				
Thiophanate methyl	oz	0.60	32.0000	19.20
INSECTICIDES				
Horticultural oil	gal	30.00	1.5000	45.00
Acephate 75 WP	lbs	7.83	2.0000	15.66
OTHER				
Pumping Cost/ac/inch	inch	3.92	62.0000	243.04
PRODUCTION				
Frost prot. Blanket	roll	277.00	4.0000	1,108.00
HARVEST				
Product Tag	1000	49.95	13.5750	678.07
OPERATOR LABOR				
Tractors	hr	15.30	2.5000	38.25
HIRED LABOR				
Tractors	hr	9.60	37.4000	359.04
Self-Propelled	hr	9.60	21.2000	203.52
DIESEL FUEL				
Tractors	gal	2.93	79.4472	232.78
Self-Propelled	gal	2.93	12.4000	36.33
ELECTRICITY				
Self-Propelled	kWh	0.15	240.0000	36.00
GASOLINE				
Self-Propelled	gal	2.33	1.8000	4.19
REPAIR & MAINTENANCE				
Implements	acre	24.55	1.0000	24.55
Tractors	acre	42.54	1.0000	42.54
Self-Propelled	acre	41.69	1.0000	41.69
INTEREST ON OP. CAPITAL				
Interest	acre	158.99	1.0000	158.99
TOTAL DIRECT EXPENSES				\$5,463.66
FIXED EXPENSES				
Implements	acre	75.81	1.0000	75.81
Tractors	acre	72.47	1.0000	72.47
Self-Propelled	acre	113.35	1.0000	113.35
TOTAL FIXED EXPENSES				\$261.63
TOTAL SPECIFIED EXPENSES				\$5,725.29

Table 7A. Estimated resource use and costs for field operations, per acre, seven-gallon Live Oak in container, 7,000 plants per acre, production season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE (dollars)	QUANTITY	AMOUNT (dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	233.5000	2,241.60
HERBICIDES				
Ronstar	50 lbs	90.00	8.0000	720.00
FUNGICIDES				
Mancozeb	pt	8.66	12.5000	108.25
Thiophanate methyl	oz	0.60	16.0000	9.60
FERTILIZERS				
Dolomitic lime	lbs	0.14	800.0000	112.00
Micronutrients	lbs	1.33	300.0000	399.00
Osmocote 14-14-14	50 lbs	65.00	36.0000	2,340.00
Osmocote 19-5-11	50 lbs	60.00	30.0000	1,800.00
INSECTICIDES				
Horticultural oil	gal	30.00	2.2500	67.50
Acephate 75 WP	lbs	7.83	3.0000	23.49
OTHER				
Pumping Cost/ac/inch	inch	3.92	164.0000	642.88
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
Tractor per hour	hr	28.14	12.0000	337.68
Stakes, rebar	100	50.00	35.0000	1,750.00
PLANTING				
Pine bark	cu yard	15.00	200.0000	3,000.00
7 gal containers	1000	700.00	7.0000	4,900.00
Liner - Live Oak	each	2.00	7,000.0000	14,000.00
OPERATOR LABOR				
Tractors	hr	15.30	8.7500	133.88
HIRED LABOR				
Implements	hr	9.60	1.5000	14.40
Tractors	hr	9.60	54.5000	523.20
Self-Propelled	hr	9.60	29.9000	287.04
DIESEL FUEL				
Tractors	gal	2.93	131.5190	385.35
Self-Propelled	gal	2.93	38.5906	113.07
ELECTRICITY				
Self-Propelled	kWh	0.15	105.0000	15.75
GASOLINE				
Self-Propelled	gal	2.33	5.4000	12.58
REPAIR & MAINTENANCE				
Implements	acre	26.37	1.0000	26.37
Tractors	acre	65.01	1.0000	65.01
Self-Propelled	acre	100.41	1.0000	100.41
INTEREST ON OP. CAPITAL				
Interest	acre	2,712.65	1.0000	2,712.65
TOTAL DIRECT EXPENSES				\$39,421.71
FIXED EXPENSES				
Implements	acre	81.97	1.0000	81.97
Tractors	acre	127.54	1.0000	127.54
Self-Propelled	acre	317.17	1.0000	317.17
TOTAL FIXED EXPENSES				526.68
TOTAL SPECIFIED EXPENSES				\$39,948.39

Table 7B. Estimated resource use and costs for field operations, per acre, seven-gallon Live Oak in container, 7,000 plants per acre, harvest season budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	262.0000	2,515.20
HERBICIDES				
Ronstar	50 lbs	90.00	2.0000	180.00
FUNGICIDES				
Thiophanate methyl	oz	0.60	16.0000	9.60
INSECTICIDES				
Horticultural oil	gal	30.00	0.7500	22.50
Acephate 75 WP	lbs	7.83	1.0000	7.83
OTHER				
Pumping Cost/ac/inch	inch	3.92	62.0000	243.04
HARVEST				
Product Tag	1000	49.95	8.0000	399.60
OPERATOR LABOR				
Tractors	hr	15.30	0.2500	3.83
HIRED LABOR				
Tractors	hr	9.60	71.0000	681.60
Self-Propelled	hr	9.60	21.2000	203.52
DIESEL FUEL				
Tractors	gal	2.93	142.1434	416.48
Self-Propelled	gal	2.93	12.4000	36.33
ELECTRICITY				
Self-Propelled	kWh	0.15	240.0000	36.00
GASOLINE				
Self-Propelled	gal	2.33	1.8000	4.19
REPAIR & MAINTENANCE				
Implements	acre	22.97	1.0000	22.97
Tractors	acre	78.11	1.0000	78.11
Self-Propelled	acre	41.69	1.0000	41.69
INTEREST ON OP. CAPITAL				
Interest	acre	108.10	1.0000	108.10
TOTAL DIRECT EXPENSES				\$5,010.59
FIXED EXPENSES				
Implements	acre	75.94	1.0000	75.94
Tractors	acre	118.21	1.0000	118.21
Self-Propelled	acre	113.35	1.0000	113.35
TOTAL FIXED EXPENSES				\$307.50
TOTAL SPECIFIED EXPENSES				\$5,318.09

Table 8. Estimated resource use and costs for field operations, per acre, three-gallon Fig in container, 13,500 plants per acre, production and harvest budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	742.5000	7,128.00
HERBICIDES				
Ronstar	50 lbs	90.00	3.0000	270.00
FUNGICIDES				
Mancozeb	pt	8.66	12.5000	108.25
Thiophanate methyl	oz	0.60	16.0000	9.60
FERTILIZERS				
Dolomitic lime	lbs	0.14	772.0000	108.08
Micronutrients	lbs	1.33	290.0000	385.70
Osmocote 19-5-11	50 lbs	60.00	36.0000	2,160.00
INSECTICIDES				
Horticultural oil	gal	30.00	2.2500	67.50
Acephate 75 WP	lbs	7.83	3.0000	23.49
OTHER				
Pumping Cost/ac/inch	inch	3.92	127.0000	497.84
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
Stakes, rebar	100	50.00	27.0000	1,350.00
PLANTING				
Pine bark	cu yard	15.00	193.0000	2,895.00
3 gal containers	1000	650.00	13.5000	8,775.00
Liner - Fig	1000	750.00	13.5000	10,125.00
HARVEST				
Product Tag	1000	49.95	13.5000	674.33
OPERATOR LABOR				
Tractors	hr	15.30	2.5000	38.25
Self-Propelled	hr	15.30	8.5000	130.05
HIRED LABOR				
Implements	hr	9.60	2.2500	21.60
Tractors	hr	9.60	48.9000	469.44
Self-Propelled	hr	9.60	30.2000	289.92
DIESEL FUEL				
Tractors	gal	2.93	103.7340	303.94
Self-Propelled	gal	2.93	31.1906	91.39
ELECTRICITY				
Self-Propelled	kWh	0.15	310.0000	46.50
GASOLINE				
Self-Propelled	gal	2.33	4.2000	9.79
REPAIR & MAINTENANCE				
Implements	acre	16.13	1.0000	16.13
Tractors	acre	55.16	1.0000	55.16
Self-Propelled	acre	156.17	1.0000	156.17
INTEREST ON OP. CAPITAL				
Interest	acre	1,914.37	1.0000	1,914.37
TOTAL DIRECT EXPENSES				\$40,700.49
FIXED EXPENSES				
Implements	acre	50.43	1.0000	50.43
Tractors	acre	91.43	1.0000	91.43
Self-Propelled	acre	490.77	1.0000	490.77
TOTAL FIXED EXPENSES				632.63
TOTAL SPECIFIED EXPENSES				\$41,333.12

Table 9. Estimated resource use and costs for field operations, per acre, one-gallon Lantana in container, 30,000 plants per acre, production and harvest budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE (dollars)	QUANTITY	AMOUNT (dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	685.5000	6,580.80
HERBICIDES				
Ronstar	50 lbs	90.00	1.5000	135.00
FUNGICIDES				
Kocide DF	lbs	5.20	6.2500	32.50
Thiophanate methyl	oz	0.60	16.0000	9.60
FERTILIZERS				
Dolomitic lime	lbs	0.14	600.0000	84.00
Micronutrients	lbs	1.33	225.0000	299.25
Osmocote 14-14-14	50 lbs	65.00	30.0000	1,950.00
INSECTICIDES				
Horticultural oil	gal	30.00	1.5000	45.00
Acephate 75 WP	lbs	7.83	2.0000	15.66
OTHER				
Pumping Cost/ac/inch	inch	3.92	39.0000	152.88
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
PLANTING				
Pine bark	cu yard	15.00	150.0000	2,250.00
1 gal containers	1000	250.00	30.0000	7,500.00
Liner - Lantana	1000	500.00	30.0000	15,000.00
HARVEST				
Product Tag	1000	49.95	30.0000	1,498.50
OPERATOR LABOR				
Tractors	hr	15.30	8.5000	130.05
HIRED LABOR				
Implements	hr	9.60	1.5000	14.40
Tractors	hr	9.60	40.5000	388.80
Self-Propelled	hr	9.60	84.9000	815.04
DIESEL FUEL				
Tractors	gal	2.93	86.9340	254.72
Self-Propelled	gal	2.93	13.5906	39.82
ELECTRICITY				
Self-Propelled	kWh	0.15	358.0000	53.70
GASOLINE				
Tractors	gal	2.33	3.6000	8.39
Self-Propelled	gal	2.33	2.4000	5.59
REPAIR & MAINTENANCE				
Implements	acre	15.05	1.0000	15.05
Tractors	acre	51.79	1.0000	51.79
Self-Propelled	acre	161.17	1.0000	161.17
INTEREST ON OP. CAPITAL				
Interest	acre	1,042.49	1.0000	1,042.49
TOTAL DIRECT EXPENSES				\$41,114.20
FIXED EXPENSES				
Implements	acre	47.46	1.0000	47.46
Tractors	acre	116.00	1.0000	116.00
Self-Propelled	acre	514.89	1.0000	514.89
TOTAL FIXED EXPENSES				678.35
TOTAL SPECIFIED EXPENSES				\$41,792.55

Table 10. Estimated resource use and costs for field operations, per acre, one-gallon Liriope in container, 30,000 plants per acre, production and harvest budget, overhead irrigation, purchased liner, USDA plant hardiness zones 8 and 9, 2008

ITEM	UNIT	PRICE	QUANTITY	AMOUNT
		(dollars)		(dollars)
DIRECT EXPENSES				
LABOR				
Labor	hour	9.60	504.5000	4,843.20
HERBICIDES				
Ronstar	50 lbs	90.00	3.0000	270.00
FUNGICIDES				
Mancozeb	pt	8.66	12.5000	108.25
Thiophanate methyl	oz	0.60	16.0000	9.60
FERTILIZERS				
Dolomitic lime	lbs	0.14	600.0000	84.00
Micronutrients	lbs	1.33	225.0000	299.25
Osmocote 14-14-14	50 lbs	65.00	30.0000	1,950.00
INSECTICIDES				
Horticultural oil	gal	30.00	2.2500	67.50
Acephate 75 WP	lbs	7.83	3.0000	23.49
OTHER				
Pumping Cost/ac/inch	inch	3.92	127.0000	497.84
PRODUCTION				
Ground Cover Cloth	roll	215.00	12.0000	2,580.00
PLANTING				
Pine bark	cu yard	15.00	150.0000	2,250.00
1 gal containers	1000	250.00	30.0000	7,500.00
Liner - Liriope	1000	350.00	30.0000	10,500.00
HARVEST				
Product Tag	1000	49.95	30.0000	1,498.50
OPERATOR LABOR				
Tractors	hr	15.30	2.5000	38.25
HIRED LABOR				
Implements	hr	9.60	2.2500	21.60
Tractors	hr	9.60	49.5000	475.20
Self-Propelled	hr	9.60	94.7000	909.12
DIESEL FUEL				
Tractors	gal	2.93	104.9340	307.46
Self-Propelled	gal	2.93	31.1906	91.39
ELECTRICITY				
Self-Propelled	kWh	0.15	358.0000	53.70
GASOLINE				
Self-Propelled	gal	2.33	3.0000	6.99
REPAIR & MAINTENANCE				
Implements	acre	16.25	1.0000	16.25
Tractors	acre	55.82	1.0000	55.82
Self-Propelled	acre	186.67	1.0000	186.67
INTEREST ON OP. CAPITAL				
Interest	acre	1,731.78	1.0000	1,731.78
TOTAL DIRECT EXPENSES				\$36,375.86
FIXED EXPENSES				
Implements	acre	47.46	1.0000	47.46
Tractors	acre	116.00	1.0000	116.00
Self-Propelled	acre	514.89	1.0000	514.89
TOTAL FIXED EXPENSES				678.35
TOTAL SPECIFIED EXPENSES				\$37,054.21