The horticulture industry must be prepared to provide the public with water conservative alternatives for their landscapes. Landscape architects, contractors and nurserymen in fact can use conservation as a selling point. Horticultural educators should be preparing and disseminating information on water conservation as well as demonstrating alternatives. Researchers should be collecting knowledge about drought tolerance of plants and efficiency of low-volume irrigation systems.

Water conservation is really just one aspect of the Integrated Landscape Management approach where energy andd resource conservation, low maintenance, food production and reduced use of pesticides can all be realized while providing beauty and a functional outdoor living environment to the residents of Florida.

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BUDGETING GARDEN COSTS FOR THE INDIVIDUAL GARDEN USING GARDBUD

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Abstract. **Countering the myth that family gardens are unprofitable, recent studies of gardening costs and returns of north Florida farmers have shown that farmer-gardeners, who have gardened using traditional methods for generations, can save money gardening and preserving their own produce. On average, and excluding family labor costs, farmers save $575 per half-acre garden by growing their own. The question remains, however, of whether other gardeners can individually save money gardening, especially on smaller urban gardens. This paper answers that question via an interactive software program, *GARDBUD*, that individual gardeners can use and adapt to calculate both the retail value of their garden produce and their costs. With *GARDBUD* and produce and cost data from two gardens in south Florida, it is shown that an individual small urban garden can be more profitable than a half-acre rural garden in south Florida.**

A recent study of farm family gardens in north Florida shows that they are profitable enterprises (2,3). On average and excluding family labor costs, family farmers in north Florida save $575 per garden by producing and preserving their own fruits and vegetables.

This study raises two further questions, however. The first is whether other gardeners who are not farmers can save money gardening on an individual basis. Because farmers garden as a survival strategy to keep down consumption costs and keep the family out of the grocery store (2), they have been gardening in Florida for three generations or more and are therefore the experts at gardening. It does not automatically follow that other individuals, especially urban gardeners, can save money gardening just because farmers do. After all, farmers often have old tractors and hand plows which are virtually costless. In addition, they plow the garden almost as an after-thought, after the corn field is plowed. Their gardens are thus minimal-input, minimal-cost, and minimal-output gardens (1,2,3).

The second question remains of whether the small 500 square foot garden, which is the typical urban garden, can be as profitable as the half-acre garden, which is the average-sized rural garden (2). South Florida gardeners claim that small gardens "give a great deal of pleasure, provide much-needed exercise, and make a surprisingly large contribution to the food needs of the gardeners." They are low cost gardens because "most of the plots are tilled entirely with hand tools: dug by spades, smoothed with rakes, and cultivated with hoes. Hose watering and hand application of fertilizer are the rule" (Stapleton, personal communication).

Methods

To answer these questions, Victor Yingst and I decided to collect garden record data from urban gardeners in Lee County, south Florida, in order to calculate the costs and returns of small urban gardens. Yingst put out a call for urban gardeners who would volunteer to participate in a record keeping project from Aug. 1984 to Feb. 1985 (4). As a result, 15 volunteers agreed to keep good garden records; and nine of them succeeded in keeping a record of every input of seed, fertilizer, manure, time, and other variable factors of production that were used on the main fall garden. In addition, they kept track of every head of lettuce and pound of produce that was the output of the garden, and noted whether it was eaten fresh, canned, or frozen. Finally, they listed every piece of garden and preservation equipment owned, and noted the year it was purchased, the initial price, and the expected years of life of the item. Forms provided for their use are presented elsewhere, for brevity (3).

In order to calculate the retail value of each garden, as described previously (2), retail prices of fresh, canned, and frozen produce were collected from several sources. Publix's Lakeland office provided price lists of canned and frozen produce during the time period of the main fall garden. Urban gardeners in south Florida consume most of the garden fresh, however. Therefore, gardeners were asked to also supply retail prices of the vegetables they produced, at the time of harvest. If they did not supply their own retail prices, we provided prices of fresh produce which were collected from two sources. The first source was a garden-marketer who normally kept very good records of the prices he received for his own produce from a local grocery store. The second source was my visit to the fresh produce section of the local Publix supermarket on 9 Jan. 1986. Prices from these two sources were combined and averaged to produce the retail prices of garden crops used by *GARDBUD*, as seen below.

GARDBUD

In order to calculate the net returns—excluding family labor costs—from a garden, one must first calculate the total retail value of all garden vegetables and fruits, and then subtract the total cash costs incurred in the garden, and then subtract the fixed (or hidden) cash costs incurred from machinery, land, and preservaton equipment (2,3). These calculations are so tedious that most gardeners avoid doing them and really do not know if they are losing money gardening. Given the recent development of interactive and user-friendly computer software packages that allow the farmer to do complicated financial analyses easily (given good records) on the microcomputer, I decided to develop an interactive program, *GARDBUD,* which allows the individual gardener to calculate the net returns from his or her own garden easily.

GARDBUD runs under MS-DOS using Lotus 1-2-3 version 1.A integrated software and is available for the IBM-PC and any compatible microcomputer. Lotus 1-2-3 is an integrated software package which combines information management capabilities, graphics, and a spreadsheet. For 1983-84 it was the number one selling software package for microcomputers. Little or no programming knowledge is required to use Lotus 1-2-3. It was chosen as the programming environment partly because it is user-friendly and popular, and partly because the individual gardener is not really interested in knowing if the small, urban garden is profitable *on average.* He or she really wants to know if his or her own garden is profitable this year. Only an interactive, user-friendly software package can give that kind of information to the individual gardener.

How to Use *GARDBUD*

The individual gardener starts *GARDBUD* by putting the Lotus system disk in drive A and *GARDBUD* in drive B. When both have started, *GARDBUD* presents a menu of choices for the gardener, like a menu in a restaurant. The first menu asks the gardener to *select* a particular garden budget file which is already on file, or *create* a new garden budget file, or *modify* an existing garden budget file, or *print* a garden budget, or *quit.*

If the gardener selects an existing garden file, another menu appears which asks the gardener to choose between:

Crop Names, which allows the gardener to enter names of new kinds of garden vegetables not already on the list (e.g., kohlrabi);

Prices/Quantities, which allows the gardener to enter prices of garden vegetables and fruits that are different from the retail prices listed by the program, as well as the quantities of garden crops produced in his or her garden, and the unit used to measure the harvest (e.g., head, bunch, pound);

Table 1. Retail value of south Florida garden crops in a 0.43-acre garden.

Commodity	Retail value (dollars)	Fresh price (dollars)	Unit	Quantity produced	% of total eaten fresh
beans, green	85.14	0.99	lb.	86.0	100.0
radishes, red	7.11	0.49	lb.	14.5	100.0
radishes, white	1.00	1.00	lb.	1.0	100.0
rappini greens	0.00	0.79	ea.		100.0
rutabagas	0.00	0.23	lb.		100.0
spinach	0.00	0.59	lb.		100.0
sprouts, alfalfa	0.00	2.11	lb.		100.0
sprouts, bean	0.00	1.58	lb.		100.0
squash, acorn	0.00	0.33	lb.		100.0
squash, butternut	0.00	0.33	lb.		100.0
squash, spaghetti	0.00	0.49	lb.		100.0
squash, yellow	0.00	0.33	lb.		100.0
squash, zuccini	0.00	0.49	lb.		100.0
other . . .	0.00				100.0
harvester beans	1.98	0.99	lb.	2.0	100.0
turnip greens	36.40	0.56	lb.	65.0	100.0
chinese cabbage	4.00	0.50	lb.	8.0	100.0
turnips	3.04	0.38	lb.	8.0	100.0
	0.00				100.0
	0.00				100.0
	0.00				100.0
Subtotal	375.47			666.0	
Fruits and nuts					
figs	0.89	0.89	lb.	1.0	100.0
lemons	0.00	0.15	ea.		100.0
lemons, Meyer	6.00	0.25	ea.	24.0	100.0
limes	0.00	0.28	ea.		100.0
limes, key	0.00	0.89	lb.		100.0
	0.00				100.0
oranges, navel	0.00	0.25	3a.		100.0
	0.00				100.0
tangelos	6.00	0.25	ea.	24.0	100.0
tangerines	4.00	0.11	ea.	36.0	100.0
other . . .	0.00				100.0
	0.00				100.0
	0.00				100.0
Subtotal—Fruits & Nuts	16.89			85	
Total returns	392.36				

Table 2. Variable costs of 0.43-acre garden.

Costs	Total (dollars)	Units	Price (dollars)	Quanity
Potting soil	0.00	garden	10.00	0
Seeds & plants	7.50	garden	7.50	1
Chemical fertilizer	16.88	lb.	0.13	135
Manure/compost	0.00	whbarrow	0.00	4
Lime/dolomite	0.00	garden		0
Insecticides	0.00	garden		0
Herbicides	0.00	garden		0
Nematicides (Vapam)	82.50	gal	7.10	12
Hired machinery	0.00	garden		0
Fuel	2.50	gal	1.25	2
Electricity	9.60	hrs	0.32	30
Hired labor	0.00	garden		0
Black plastic	33.00	ft² (2000)	33.00	1
Fish oil emulsion	0.55	garden	0.55	1
	0.00	garden		0
Subtotal	155.23	garden		
Interest	7.76	garden	15.52	
Total variable costs	162.99			
Returns above costs	229.37			
Fixed or hidden costs				
Size of garden	0.43			

Depreciation costs of equipment Item	Initial cost (dollars)	Depreciation cost (dollars)	Year bought	Expected life (years)
¾-ton pick-up	0	0.00	1964	30
Garden tractor	1,600	160.00	1979	10
New engine (tractor)	800	160.00	1984	5
Tractor attachments	200	20.00	1979	10
Rototiller	800	40.00	1976	20
Well & pump	800	40.00	1980	20
Pipes & sprinklers	300	20.00	1980	15
2 wheelbarrows	80	0.00	1969	15
Hand tools	15	0.00	1930	50
Produce refrigerator	100	10.00	1980	10
½ (16-ft freezer)	200	8.00	1969	25
Total	4,895	458.00		

Variable Costs, which asks the gardener to enter the unit price and quantity of each cash input (e.g., seed, fertilizer, manure, nematicides, fuel, electricity, hired labor, etc.) purchased during the garden season; and

Fixed Costs, which allows the gardener to enter the hidden costs of equipment and land which do not vary with how much is planted in the garden. These are commonly called the DIRTI-5 costs: depreciation, interest, repairs, taxes, and insurance. To calculate these costs, the gardener need only enter the initial cost of each item of garden or preservation equipment, the year purchased, and its expected years of life. Using formulas explained previously (2,3), *GARDBUD* calculates depreciation, total initial investment, average investment, total fixed costs (of machinery and land) per year and per garden, and finally, the net value of the garden, excluding family labor costs.

For each option from this menu, the gardener can enter information specific to his or her garden for the items highlighted in bright green; *GARDBUD* automatically calculates the numbers in light green. To get back to the main menu from any of the above menu selections, the gardener only has to push the return key.

Results

GARDBUD was used to compare the costs and net returns from two south Florida gardens. The first garden is the typical rural garden of 0.43 acres; the second garden is the typical urban garden of 500 square feet (or 0.012 acres). Both gardens were planted and maintained by retired couples with previous experience in gardening. Both couples kept good garden records. The difference in the two gardens can be seen in the data output from *GARDBUD* (Tables 1-4).

For brevity, the retail value of only the half-acre rural garden is shown in Table 1; and only a sample of garden vegetables and fruits listed by *GARDBUD* are printed in the first column of Table 1. The second to sixth columns in the table contain, respectively, the total retail value of each garden crop, the fresh price, unit of measurement, quantity produced, and percent of the crop eaten fresh. Total returns from the half-acre garden are thus $392.36, and can be compared with $230.45 of returns from the 500 square foot urban garden. The lower returns per land area from the rural garden may be due to an undiversified planting strategy by the rural gardener, who planted (and marketed) nearly $200.00 of mustard greens. In comparison, the small urban garden was more diversified and included higher-valued garden crops, such as tomatoes, on-

Table 3. Variable costs of 0.012-acre garden.

Costs	Total (dollars)	Unit	Price (dollars)	Quantity
Potting Soil	0.00	garden	10.00	0.0
Seeds & Plants	35.59	garden	35.39	1.0
Chemical Fertilizer	7.38	lbs.	0.25	29.5
Compost	0.00	ft²	0.00	64.0
Lime/Dolomite	0.00	garden		0.0
Insecticides	2.00	garden	0.50	4.0
Fungicides	0.70	garden	0.70	1.0
Nematicides (Vapam)	0.00	gal	7.10	0.0
Hired Machinery	0.00	garden		0.0
Fuel	0.00	gal	1.25	0.0
Electricity	0.00	hrs	0.32	0.0
Hired Labor	0.00	garden		0.0
Rapid-Gro Starter	1.90	garden	1.90	1.0
Stakes	8.00	garden	8.00	1.0
Horse manure	0.00	truckload	0.00	0.5
Subtotal	55.57	garden		
Interest	2.78	garden		
Total variable costs	58.34			
Returns above costs	172.10			
Fixed or hidden costs				
Size of garden	0.012			

Depreciation costs of equipment item	Initial Cost (dollars)	Depreciation Cost (dollars)	Year bought	Expected life
Railroad ties	100	10.00	1983	10
32 garden ties	75	12.50	1983	6
6 bales of peat	24	8.00	1983	3
2 yards of humus	20	3.33	1983	6
Sprinkler system	100	10.00	1983	10
Wheelbarrow	35	0.88	1955	40
Hand tools	10	1.00	1980	10
20-ft³ freezer	350	17.50	1974	20
Water bath canner	20	2.00	1979	10
Canning jars, lids	7	0.70	1983	10
Total	741	65.91		

Table 4. Total fixed costs and net returns of two gardens.

	Fixed costs (dollars) Garden size (acres)	
Item	0.43	0.012
Depreciation	458.00	65.91
Interest	244.75	37.05
Repairs	73.43	11.12
Taxes	29.37	4.45
Machinery Fixed Costs	805.55	118.52
Land Fixed Costs (Taxes):	2.25	9.60
Total fixed costs/yr	807.79	128.12
Number of gardens/yr	2	2
Number cultivated acres besides the garden	0	0
Total fixed costs for this garden:	403.90	64.06
Total returns above costs, excluding family labor	(174.52)	108.04

ions, peppers, lettuce, cucumbers, endive, broccoli, beets, beans, etc.

At the top of tables 2 and 3 are shown the variable or cash costs for the two gardens. Each gardener has entered prices paid and quantities purchased of potting soil, seeds & plants, nematicides, etc. In addition, idosyncratic cash costs, such as black plastic and fish oil emulsion for the half-acre garden and rapid-gro starter and stakes for the 500 square foot garden, are entered under electricity costs. After these are entered, *GARDBUD* automatically sums the cash costs; these are $162.99 for the half-acre garden and $58.34 for the 500 ft² garden. The smaller garden has much lower cash costs because it is only two years old and does not yet require vapam, a relatively costly input for the bigger rural garden. *GARDBUD* also calculates the gardener's returns above cash costs; these are $229.37 for the half-acre garden and $172.10 for the 500 ft² garden.

Although many gardeners think cash returns are the real returns to gardening, *GARDUD* goes on to calculate the hidden or fixed costs of gardening. Depreciation, which spreads the initial cost of a piece of equipment over its lifetime, is the biggest of these, and is shown at the bottom of Tables 2 and 3 in column 3. A comparison of the two tables shows that the rural half-acre garden has much higher depreciation costs of $458.00 per year; while the small urban garden has only $65.91 of depreciation costs per year. This is because the rural gardeners bought a garden tractor and attachments, a new tractor engine, a rototiller, a well with pump and sprinklers, hand tools, a freezer, and a produce refrigerator. The urban gardeners, however, invested only in railroad ties, peat, and humus to make their bed garden, an inexpensive sprinkler system, hand tools, and a freezer. The much smaller initial investment costs required by the smaller urban garden thus means smaller depreciation and total fixed costs per year.

This fact is more clearly seen in Table 4, the final output of *GARDBUD*. Table 4 compares the total machinery and land fixed costs of the two gardens. It shows that machinery fixed costs are $805.55 per year for the half-acre rural garden; these are $118.52 per year for the 500 ft² garden. Because two gardens per year are planted by both sets of gardeners, these costs per garden are cut in half. Land fixed costs, however, are added to machinery fixed costs; these are land taxes which are computed by multiplying the local millage rate by the size of the garden by the value of the land. Although the land value per acre of the urban garden is higher than that of the rural garden ($55,000/acre vs. $17,000/acre), the much smaller size of the urban garden means that land taxes for the urban garden are not much greater than those for the rural garden ($9.60 vs. $2.25). Total fixed costs per garden are therefore $403.90 for the rural half-acre garden, vs. $64.06 for the urban 500 ft² garden. As a result, returns above all costs, excluding family labor costs, mean a loss of $174.52 per garden for the half-acre garden vs. a gain of $108.04 for the 500 ft² garden.

Conclusion

Results thus show that small urban gardens can be more profitable than larger rural gardens in south Florida, even though the land taxes on urban gardens are in general greater. These results are suggestive rather than conclusive, of course, due to their being based on data from only one small urban and one larger rural garden. But they do show that there is a lot of individual variation in gardening costs. To analyze the cost-effectiveness of gardening, one therefore needs an individualized analysis like *GARDBUD* provides. Results also agree with earlier results (2, 3) that show that gardeners should minimize their fixed or hidden costs to garden cost-effectively. Before investing in expensive garden machinery, gardeners should use an interactive program like GARDBUD at their local Florida cooperative extension office in order to calculate their fixed costs. As Florida gardeners claim, hand tools on a small garden may help you save your shirt gardening!

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