petroleum ether and concentrated for analysis by gas chromatography using the Luke procedure for multiresidue analysis (3).

Results and Discussion

Appreciable insect populations did not appear in the plots, therefore, efficacy of the 2 insecticides could not be tested. Currnt labels for the uses of mevinphos and methamidophos on lettuce indicate that these insecticides control aphids, cutworms and lepidopterous larvae.

There was no injury or damage noticed in plants growing in treated plots during weekly observations. Total yields from plants in treated plots were not statistically different from those in nontreated control plots (Table 1).

Table 1. Yield of Chinese cabbage and endive treated with insecticides.

Treatment	Yield (lb./plot) Chinese cabbage	Endive
Methamidophos (1.0 lb. a.i./acre)[z]	31.7 a[y]	10.0 a
Mevinphos (0.5 lb. a.i./acre)	29.0 a	6.5 a
(1.0 lb. a.i./acre)	24.7 a	7.7 a
Nontreated controls	29.3 a	7.9 a

[z]Field application rate.
[y]Mean separation in columns by Duncan's multiple range test, 5% level.

The range of methamidophos and mevinphos residues detected in samples of Chinese cabbage and endive are reported in Table 2. The amount of methamidophos residue detected in Chinese cabbage was substantially less than that in endive. Residue levels of mevinphos in Chinese cabbage and endive were similar.

The preharvest interval had a significant effect in lowering the level of methamidophos residues in endive and mevinphos residues in Chinese cabbage and endive. Methamidophos residues detected in endive harvested 28 days preharvest interval were less than 25% of those in endive harvested 21 days after last application. Even though the

Table 2. Insecticide residues detected on Chinese cabbage and endive.

Treatment	Chinese cabbage Residue (ppm)[z]	Endive Residue (ppm)[z]
Methamidophos (1.0 lb. a.i./acre)[y]		
21 day PHI[x]	.01-.05	1.38-2.88
28 day PHI	<.01	0.08-0.60
Mevinphos		
1 day PHI (0.5 lb. a.i./acre)	2.50-4.10	—
2 day PHI (0.5 lb. a.i./acre)	—	2.28-3.64
3 day PHI (1.0 lb. a.i./acre)	1.50-2.65	—
4 day PHI (1.0 lb. a.i./acre)	—	0.89-1.64

[z]Range of residues determined from 4 replicated samples.
[y]Field application rate.
[x]Days between last application and harvest.

dosage rate of mevinphos was 1 lb. a.i./acre instead of 0.5 lb., the amount of detectable residues were reduced approximately 50% when harvest was delayed 2 days.

These data will be combined with data from trials in other states and information from the pesticide manufacturers and assembled by IR-4 into packages for submission to EPA. Petitions will be prepared and sent to EPA for the establishment of national tolerances. If tolerances are granted, the pesticide manufacturers will prepare labels which are approved by EPA for printing.

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AN ECONOMIC ANALYSIS OF PRODUCING AND MARKETING COLE CROPS IN NORTH AND WEST FLORIDA[1]

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Additional index words. cash expenses, fixed costs, breakeven yields, broccoli, cauliflower, net returns, market alternatives.

Abstract. **The cole group of vegetables are adaptable to many parts of Florida. Particular interest has been expressed in North and West Florida for growing broccoli** (Brassica oleracea **L. cllalica Group) and cauliflower** (Brassica olerearea **L. Botrytis Group). The climatic conditions are suitable for broccoli and cauliflower production from early October through mid-May. A sizeable investment is required to produce broccoli and cauliflower which suggests careful economic planning by prospective producers. The availability of markets and alternatives is also important to vegetable producers since profits are often dependent on the producer's ability to sell the crop. Enterprise budgets are developed in the paper to aid producers in their decision making. Per acre net returns at various yields and prices are also developed to illustrate different profit potentials. The information developed in this paper should be useful for broccoli and cauliflower producers to make production, financing, and management control plans.**

The cole group of vegetables are very adaptable in many locations of Florida where fertile soils and sufficient moisture are available. In North and West Florida particular interest has been given to broccoli and cauliflower production. Both broccoli and cauliflower have shown a fresh market increase

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in consumption. Florida growers have the potential to satisfy a large part of the Florida market during the fall, winter, and early spring months (5). Florida growers have a locational and cost advantage for supplying consumers of Florida and other southern states with these vegetables (7). North and West Florida producers also need to evaluate the markets to determine when and how they may market the crops.

Although broccoli and cauliflower are costly to produce, both can provide profits to growers in North and West Florida if markets are available and standard production methods are practiced. Information on production costs and potential markets are presented in this paper as a guide in evaluating the financial feasibility of producing these crops in North and West Florida.

Climate Suitability

Research has shown that broccoli and cauliflower production is possible from early October through mid-May by selection of location in state and cultivars (4, 6). The environmental characteristics in North and West Florida are ideal for production during this period of time. Production in Florida has also been made more reliable by the development of hybrid cultivars. At the present time many varieties of broccoli and cauliflower are available for Florida production and many additional varieties are being evaluated (5). Producers should consult their local extension agents for the most recent cultivar information.

Budgets

The expected costs of producing broccoli and cauliflower are developed in an enterprise budget format to provide a basis for forward production planning, financing, and management control. The cost estimates presented in this paper reflect data based on a commercial enterprise with sufficient size and scale to purchase the necessary capital investments for complete and timely production practices. The costs reflected in the budgets (Tables 1 and 2) assume that most of the recommended production practices are followed (1).

The pre-harvest cash costs, fixed costs, and harvest and marketing costs are included in the analysis. The cash costs and harvest and marketing costs are the variable short run expenses that may vary with the level of output. The fixed costs include depreciation, interest, repairs, taxes, and insurance. A land charge is also included and is expressed as a land rental cost (2).

The cost analysis estimates the total pre-harvest expenses to be $1,338.48 for broccoli and $1,510.73 for cauliflower. Fixed costs are estimated at $186.16 for broccoli and cauliflower. The harvest and marketing costs are estimated to be $1,182 for broccoli and $1,480.40 for cauliflower assuming 350 and 500 box yields, respectively. Total cost estimates are approximately $2,706 for broccoli and $3,177 for cauliflower.

Break-Even Prices and Returns

The break-even prices at various yields for broccoli and cauliflower are shown in Tables 3 and 4, respectively. Yields above and below the budgeted yields are also considered to account for variability of newly introduced crops. The break-even prices in the tables reflect the differences in harvest and marketing costs. For broccoli at a yield of 350 boxes/acre the break-even price is $7.73. For cauliflower at a yield of 500 boxes/acre the break-even price is $6.35.

The potential per acre net returns at various yield and price levels are shown in Tables 5 and 6 and are adjusted for the differences in harvest and marketing costs at various yields. Net returns for broccoli at a yield of 350 boxes/acre vary from −$607 to $2,193 per acre at prices of $6.00 and $14.00 per box. Net returns for cauliflower at a yield of 500 boxes/acre vary from −$677 to $3,323 per acre at prices of $5.00 and $13.00 per box, respectively.

Table 1. Estimated per acre costs of producing broccoli, North Florida, 1983.

Item	Unit	Quantity	Price ($)	Value ($)
Cash expenses, pre-harvest:				
Plants[z]	thousands	14.5	36.00	522.00
Lime, applied	ton	0.5	25.00	12.50
Fertilizer (10-10-10)	cwt.	10	7.50	75.00
Side-dress fertilizer (14-0-14)	cwt.	5	8.75	43.75
Herbicide	lb.	10	8.00	80.00
Nematicide	gal	5	9.60	48.00
Fungicide	gal	1.7	25.30	43.01
Insecticide	gal	1.25	30.80	38.50
Insecticide	gal	1.25	17.35	21.69
Insecticide	gal	0.4	26.40	10.56
Spreader-sticker	gal	0.15	26.75	4.01
Tractor (50 hp)	hr	12	3.00	36.00
Equipment	hr	12	2.10	25.20
Truck (pickup)	mile	20	0.10	2.00
Labor (transplanting, hoeing)	hr	62	3.75	232.50
Irrigation	acre	1	38.00	38.00
Land rent	acre	1	30.00	30.00
Interest on cash expenses[y]	$	1262.72	6.0%	75.76
Total pre-harvest cash expenses:				$1338.48
Pre-harvest fixed costs:				
Tractor (50 hp)	hr	12	3.38	40.56
Equipment	hr	12	7.50	90.00
Truck	mile	20	0.13	2.60
Irrigation	acre	1	53.00	53.00
Total pre-harvest fixed costs:				$186.16
Total pre-harvest costs:				$1524.64
Harvest and marketing costs:				
Containers	box	350	0.92	322.00
Labor	box	350	1.40	490.00
Ice	box	350	0.50	175.00
Brokerage fee	box	350	0.50	175.00
Miscellaneous				20.00
Total harvesting and marketing costs:				$1182.00
Total costs:				$2706.64

[z]If direct seeding is used, costs will be $88.00 per acre for seed.
[y]Based on a 12% annual interest rate which was assumed to be used for 6 months.

Marketing Alternatives

Although North and West Florida producers may satisfactorily grow broccoli and cauliflower, problems may exist in selling these products. Producers should have a marketing plan established when production decisions are made. Profit is frequently determined by the ability of vegetable producers to sell their crop. Brokers are often used as sales agents for vegetables, but they may not be willing to handle sales in North and West Florida if large quantities of broccoli and cauliflower are not available. Therefore, market alternatives available to producers will depend in part on the volume of produce to be marketed. As a general rule, the larger the volume of production, the more market alternatives available. An examination of the major market outlets and their characteristics are worthy of review (3).

Table 2. Estimated per acre costs of producing cauliflower, North Florida, 1983.

Item	Unit	Quantity	Price ($)	Value ($)
Cash expenses,				
pre-harvest:				
Plants[z]	thousands	12	36.00	432.00
Lime, applied	ton	0.5	25.00	12.50
Fertilizer (10-10-10)	cwt.	10	7.50	75.00
Side-dress fertilizer (14-0-14)	cwt.	5	8.75	43.75
Herbicide	lb.	10	8.00	80.00
Nematicide	gal	5	9.60	48.00
Fungicide	gal	1.7	25.30	43.01
Insecticide	gal	1.25	30.80	38.50
Insecticide	gal	1.25	17.35	21.69
Insecticide	gal	0.4	26.40	10.56
Spreader-sticker	gal	0.15	26.75	4.01
Tractor (50 hp)	hr	12	3.00	36.00
Equipment	hr	12	2.10	25.20
Truck (pickup)	mile	20	0.10	2.00
Rubber bands	lb.	13	5.00	65.00
Labor (transplanting, hoeing, tying)	hr	112	3.75	420.00
Irrigation	acre	1	38.00	38.00
Land rent	acre	1	30.00	30.00
Interest on cash expenses[y]	$	1425.22	6.0%	85.51
Total pre-harvest cash expenses:				$1510.73
Pre-harvest fixed costs:				
Tractor (50 hp)	hr	12	3.38	40.56
Equipment	hr	12	7.50	90.00
Truck (pickup)	mile	20	0.13	2.60
Irrigation	acre	1	53.00	53.00
Total pre-harvest fixed costs:				$186.16
Total pre-harvest costs:				$1696.89
Harvest and marketing costs:				
Containers	box	500	0.92	460.00
Labor	box	500	1.40	700.00
Cooler rent/month	ft^2	240	0.21	50.40
Brokerage fee	box	500	0.50	250.00
Miscellaneous				20.00
Total harvesting and marketing costs:				$1480.40
Total costs:				$3177.29

[z]If direct seeding is used, costs will be $170.00 per acre for seed.
[y]Based on a 12% annual interest rate which was assumed to be used for 6 months.

Table 3. Break-even broccoli prices at various yields.

Yield (boxes/acre)	Price ($/box)
500	6.41
450	6.75
400	7.18
350	7.73
300	8.47
250	9.50
200	11.04

Table 4. Break-even cauliflower prices at various yields.

Yield (boxes/acre)	Price ($/box)
800	5.03
700	5.34
600	5.77
500	6.35
400	7.29
300	8.71
200	11.66

Table 5. Net returns per acre based on varying yield and price levels for broccoli.

Yield (boxes)	Price/box $6.00	$8.00	$10.00	$12.00	$14.00
200	–1,009	–609	–209	191	591
250	–875	–375	125	625	1,125
300	–741	–141	459	1,059	1,659
350	–607	93	793	1,493	2,193
400	–473	327	1,127	1,927	2,727
450	–339	561	1,461	2,361	3,261
500	–205	795	1,795	2,795	3,795

Table 6. Net returns per acre based on varying yield and price levels for cauliflower.

Yield (boxes)	Price/box $5.00	$7.00	$9.00	$11.00	$13.00
200	–1,331	–931	–531	–131	269
300	–1,113	–513	87	687	1,287
400	–895	–95	705	1,505	2,305
500	–677	323	1,323	2,323	3,323
600	–459	741	1,941	3,141	4,341
700	–241	1,159	2,559	3,959	5,359
800	–23	1,577	3,177	4,777	6,377

State Farmers' Markets. Florida has 14 State Farmers' Markets serving specified regions. All State Farmers' Markets operate on a seasonal basis keyed to the local production period. They offer the small grower an opportunity to sell his produce in the national market by using the services of selling brokers. As the name implies, a selling broker sells the grower's produce for a set fee and returns the balance to the grower. The broker usually tries to handle both transactions within a 24-hr period. Some Farmers' Markets have brokers who handle only produce from small growers. By combining the produce from many small growers the selling broker can operate in the national market and assure the growers a market outlet during the production season. The price the grower receives will, of course, depend on the price the broker obtains from the national market, which is determined by national supply and demand conditions.

Local retail outlets. Local retail outlets are generally family owned and operated businesses which serve specific neighborhoods or small areas. The owner-operators of these outlets are usually responsible for their own purchasing. The ability of the local grower to supply such stores with fresh produce depends on the grower's ability to sell himself and his produce to the owner-operator. The owner is interested in obtaining a dependable, stable supply of good quality merchandise. The grower may be able to obtain a higher price than he would from the selling broker on the Farmers' Markets, since the need for the broker to serve as middleman is eliminated. A disadvantage of such outlets is that they may be able to handle only part of the grower's total supply and may require more of the grower's time and effort to sell all his product. Another possible difficulty of selling to such retail outlets is that local retail outlets prefer a steady supply of produce. To furnish a steady supply, the grower would have to devote considerable planning time and effort.

U-Pick. Perhaps the easiest method of direct sales to consumers, especially from the standpoint of reducing harvesting and transportation costs, is the u-pick operations. In effect, this method eliminates most harvesting costs. The grower must provide management to prevent damage to his fields and provide for fee collection, but this process remains the most direct and least complicated. Insurance, traffic control, method of charge, and regulations of pickers are all factors which the grower should also consider.

Roadside stands. A roadside stand is simply a retail business located in a producing area rather than in a consuming area. Thus, the consumer rather than the grower bears the transportation costs. Most roadside stands are seasonal.

There are several characteristics of a successful roadside stand: (a) the proximity of a large urban population center, (b) long selling season, (c) nearness to a high percentage of year-round residents, (d) large acreage available for vegetable production and (e) grower income sources other than vegetables. There is a large amount of goodwill associated with a successful roadside stand which is beneficial in attracting repeat customers.

City and local farmers' markets. City and local farmers' markets are essentially roadside stands which are located near the consumer as opposed to the producing areas. The advantage of this alternative is that since these markets are usually well established and centrally located, the grower does not have to be concerned with advertising his location or enticing consumers to travel to his stand. The disadvantage is that the grower must incur the transportation costs. Local farmers' markets are usually open daily in large urban centers and on selected days in the smaller cities and towns.

Conclusion

If recommended management practices are followed and if markets are established, broccoli and cauliflower production in North and West Florida may be profitable to producers. Being able to market the crop is the key for survival in the vegetable industry. Producers must have a market available for their production before making planting decisions. The ultimate returns on their investment will be determined by variations in costs, yields, and prices.

Producers need to evaluate their costs by enterprise budgeting and closely examine the markets before making the decision to grow broccoli and cauliflower. Careful economic planning is necessary by today's economy in determining the profit prospects for new enterprises.

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FACTORS AFFECTING THE FUNCTIONAL STABILITY OF THE GRADIENT-MULCH SYSTEM[1]

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Abstract. **Bed spacing and bed height, along with row length, field slope and level are factors that affect water control efficiency. The effect of bed spacing, bed height and the associated water table depth on water control was evaluated at the Agricultural Research & Education Center-Bradenton when rain varied from 6.8 to 27.4 inches per season (1981-1983). At the higher bed level (8 inches compared to 6), root environments were more stable and yields of tomatoes were increased during a season when rain was excessive. With a wide bed tomato culture (alternating ditch-row) yields were more per plant, but less per acre, when compared to a close row culture (7 bed land) with more plants/acre. The most stable ionic root environment was associated with the wide row culture.**

A constant water table favors the functional stability of the gradient-mulch system. Irrigation and drainage integrated with intermittent rainfall is normally used to minimize water table fluctuations. Fluctuation of the water table is a major cause of functional instability in the gradient-mulch system (2). With a constant water table, movement of moisture by seepage is upward, but when the water table fluctuates, movement of moisture is up and down and soluble nutrients move with the moisture. Thus the composition of the nutrient and moisture gradients can be altered, which, in turn, alters the functional stability of the system. Water management is the key to minimizing water table fluctuation. Irrigation and drainage procedures, in conjunction with rainfall density, must be considered as components in a water management system. Field levels and slope, in conjunction with row length and row spacing, are factors affecting irrigation and drainage efficiency (2). Irrigation and drainage can be integrated with rainfall variations to minimize water table fluctuation. A major function of management is to move the water in and out at the right time.

Materials and Methods

The effect of bed spacing and bed height on root environment stability was evaluated during the past 2 yr at the Agricultural Research and Education Center (AREC) in Bradenton. A Myakka fine sand with a slope of 0.3% was used for the experimental site. The 7-bed land with 4.5-ft row spacing and ditches spaced at 42 ft is standard at the Center. In a second treatment (single bed), beds were spaced

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