

world markets. The question is whether U.S. government trade policies and negotiations place enough emphasis on citrus to provide adequate opportunities to compete in international markets.

General Economic Policies

That Florida citrus is influenced by the world economy is well documented. International markets, world-wide economic conditions, and the programs and policies of foreign governments all serve to define the competitive environment for citrus. Not only do U.S. economic policies affect production and consumption directly through impacts on costs, employment, income and inflation, but also through links to the world economy and international markets. U.S. fiscal and monetary policies affect the value of the dollar and exchange rates, which, in turn, affect the import-export balances in goods and services as well financial markets (2).

The interconnection of world markets and the effect of U.S. economic policies play a leading role in production and marketing of citrus. For example, even though the United States exports a relatively small quantity of orange juice to Europe, the currency exchange rates between the U.S. dollar and European currencies affect the level of Brazilian orange juice imports into the United States. This is because Brazil prices orange juice in U.S. dollars. The strong rise in the value of the dollar between 1983 and 1986 in conjunction with a rise in Brazilian orange juice prices combined to nearly quadruple the price of Brazilian orange juice to European consumers. The ensuing decline in quantity demanded resulted in increased Brazilian im-

ports into the United States, thus depressing prices to U.S. producers.

Export markets for U.S. fresh grapefruit also serve as examples of the indirect impacts of U.S. economic policies. Variations in exchange rates have been demonstrated to have varying impacts on the demand structure for U.S. fresh grapefruit among export markets (3). These examples serve to indicate the extensive nature of the impacts of U.S. economic policies on the citrus industry.

Concluding Comment

International citrus markets can be best described as dynamic. International competition and trade issues are destined to have a major influence on the Florida citrus industry in the next decade. Export market growth will be influenced by industry marketing efforts, currency exchange rate environment and trade liberalization. As international markets and competition become more important to the citrus industry, the impact of government programs and policies on the economic welfare of the industry will become more pronounced.

Literature Cited

1. Fairchild, G. F. 1985. The Caribbean Basin Initiative and the Florida Citrus Industry. Working Paper 85-13. Econ. Res. Dept., Fla. Dept. Citrus, Gainesville, FL.
2. Fairchild, G. F. 1988. The Impact of U.S. Government Policies on the Import, Export and Distribution of Citrus. *J. Food Dist. Res.* 19(19):1-98.
3. Lee, J. and G. F. Fairchild. 1988. Exchange Rates and Foreign Demand for U.S. Fresh Grapefruit. *Agribusiness* 4(3):261-270.

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STATEWIDE CITRUS MANAGER SURVEY RESULTS

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Abstract. A major extension program was undertaken for Florida citrus in 1987. This was part of an IFAS-wide effort to formulate specific, goal-oriented major programs in departmental extension endeavors. The major program delineated for the Fruit Crops Department was FL08—Citrus Management in Florida. This comprehensive program would attempt to refine management practices in 5 major areas— young tree care, pest management, water management, cold

protection, and business management. A survey was made to delineate problems, establish priorities, and provide benchmark data against which program effectiveness could later be evaluated. A sample of 3,560 producers from 23 counties were selected from several mailing lists. A total of 2,383 forms were returned which contained 1,277 complete and valid documents. Respondents were fairly equally divided among each major program area and between bedded and nonbedded groves. Results of individual surveys will be detailed by each program area.

Extension work in IFAS Fruit Crops at the University of Florida has always been programmatic. Such efforts are far more efficient than noneffective scattering of resources over several crops in many areas. Programs are planned at the departmental level in conjunction with extension agents with major responsibilities in fruit crops. Statewide extension faculty, both in Fruit Crops and in supporting discipline departments, meet with agents periodically to assess needs and plan major program endeavors. Agents, in turn, are kept up-to-date on important problems as a result of their involvement with local advisory committees. This committee involvement assures a continuum which extends from producers through agents to departments and centers in the IFAS system.

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Competition from imports and rising production costs have fueled anxieties about the future of the Florida citrus industry. While Florida enjoys many advantages including high productivity and proximity to major markets, production costs are high and an import-glutted market could result in substantially reduced returns to producers. Therefore, the extension team decided to focus attention on achieving greater efficiencies in citrus management practices.

A comprehensive program was delineated in 1987 as part of a statewide extension effort known as FOCUS '91. This statewide effort was an attempt to focus many individual programs on areas that would make a difference during the 4-yr period of 1987-91. The Fruit Crops Department's commitment to the total effort was designated FL08—Citrus Management in Florida. This program attempts to refine management practices in young tree care, pest management, business management, cold protection, and water management.

A major survey was undertaken as a first step in the extension program. It was felt that this could help delineate problems, establish priorities, and provide benchmark data against which program effectiveness could later be evaluated. Previous survey work (2) coordinated by the senior author showed that this technique was useful in determining problem areas and in establishing priorities.

Materials and Methods

The total program involved 5 major areas—young tree care, pest management, water management, cold protection, and business management. Since each area was a major study in itself, a separate survey was conducted for each. However, since most cold protection is now done with water, it was decided to merge water management and cold protection into one survey, making a total of 4. Breaking out the surveys by subject matter simplified collection of the data and allowed the use of simpler survey documents, assuring better quality responses. The data from the individual surveys could be combined later if necessary to provide a complete picture.

A representative cross section of the Florida citrus industry was sought in the sampling procedure. A master list was compiled from local extension mailing lists and a list of growers obtained from the Florida Department of Citrus. A sample of 3,560 producers were selected from the master list. Twenty-three counties were represented in the sample. A total of 2,383 survey forms were returned for processing and evaluation. Only 1,277 of the surveys were complete and valid, the majority of those disqualified representing growers with less than 10 acres or those who did not fill out forms completely and properly.

Instrument development. The Total Design Method of gathering survey information as developed by Dillman (1) was used to guide the survey process. The instruments consisted of several questions and multi-item scales and were cooperatively developed by state and county extension faculty with assistance from the Extension Program Evaluation and Organizational Development Unit. The items and scales were reviewed for validity during the developmental process.

The first item was designed to screen out respondents with less than 10 acres of commercial citrus since this ex-

tension program was geared for commercial producers. Respondents meeting the 10-acre criterion were asked for the amount of acreage owned and their role in management of that acreage. Other items and scales assessed the causes and severity of specific problems and utilization of specific care and management practices.

Mailing and return process. The survey form and all follow-up correspondence were sent from the Extension Program Evaluation Unit in Gainesville. Separate mailings were made in the following order: a prenotification postcard informing each individual of the forthcoming survey; the questionnaire and cover letter with postage-paid business reply envelope; an immediate follow-up reminder card (to all survey recipients); a follow-up letter, another survey form, and business reply envelope to those not responding in 10 days; and a final follow-up card to those still not heard from after 20 days. Identification numbers were assigned to all individuals surveyed. These numbers were placed on questionnaires to allow follow-up of non-respondents. Confidentiality of response was assured in the cover letter.

The distribution of survey respondents in the 4 program areas is shown in Table 1.

Results and Discussion

The detailed information obtained through the survey will be extremely useful in guiding future citrus extension and research. Summaries presented below of the more important data are categorized by subject matter of the individual surveys.

Young citrus tree care. Resetting in groves is an annual job for 52% of those surveyed. This is essentially the same as results obtained from a survey conducted 4 yr earlier (2) where 51% of respondents planted resets every year. The remainder of growers surveyed in 1987 were almost evenly divided between those replanting every other year (15%), those replanting every 3 yr (12%), and those following some other plan (14%) for resetting.

Death of resets after planting is always a concern and the survey found 47% of respondents lost 1 to 2% of resets each year, 26% lost between 3 to 5%, 16% lost between 6 to 10%, and 8% of those surveyed lost over 10% of their trees. Only 2% of the growers reported they lost no resets. The high mortality rate is cause for concern.

Fertilization practices were analyzed by the survey, and a great disparity was found in fertilizer rates between those applying dry fertilizers and those who applied liquids. Although the survey did not obtain specific data on amounts of N, P₂O₅, and K₂O applied per year for each method of fertilization, it did show that rates increased with tree age when dry materials were used. Conversely, more fertilizer was applied to trees in the first year of growth and less in years 2 and 3 when liquid fertilizers were used. This is

Table 1. Distribution of survey respondents by program area.

Program area	Number of respondents	Counties represented
Young tree care	293	21
Pest management	312	21
Water and cold protection	341	22
Business management	331	22

Table 2. Growers' perception of problems in young citrus tree care.

Problem area	Severity of problem by % of respondents			
	Serious	Moderate	Not a problem	Uncertain
Cold protection	43	44	12	1
Weed control	26	56	17	1
Foot rot	15	47	33	5
Irrigation	13	35	51	1
Insects	7	59	32	2
Sprouting	7	57	35	1
Fertilization	4	26	70	0
Poor planting	4	17	73	5
Nematodes	2	24	59	15

probably a result of frequent irrigation with water containing soluble fertilizer during the first year when much water is needed to ensure tree survival. After establishment, irrigation (and fertilization) levels were likely reduced. Further studies are needed to explain this unusual situation.

Growers were asked to rank their major problems in young tree care. A list of 9 major problems was presented; and growers were asked to rate the problems as serious, moderate, not a problem, or uncertain. The data obtained are found in Table 2. More growers (43%) described cold protection as their most serious problem followed by weed control (26%). Most growers (87% and 82%, respectively) considered cold protection and weed control to be among their most serious problems.

Pest management. This part of the survey contained responses from 308 growers, two-thirds of which categorized their primary grove operation as growing oranges for processing. Fifty-seven percent of the respondents representing 67% of the acreage were producers whose groves were mostly bedded.

Respondents were asked to rate the seriousness of a number of pests. Table 3 details the answers and reveals some interesting information. Rust mites were rated the most serious insect/mite problem, which is somewhat surprising in light of the fact that most of the acreage is producing oranges for processing where rust mite should not be a serious problem. The position of second most serious insect/mite problem was accorded to ants, once considered to be a very minor pest. Disease problems were headed by greasy spot as expected. Much concern was expressed over foot rot and blight which was also unsurprising. Melanose was also of considerable concern. Like the rust mite data, this was surprising since over three-fourths of the acreage

Table 3. Growers' perception of problems in pest management.

Pest problem	Severity of problem by % of respondents			
	Serious	Moderate	Not a problem	Uncertain
Rust mites	22	62	12	4
Greasy spot	20	54	20	6
Ants	17	54	27	2
Foot rot	15	58	22	5
Blight	15	29	41	15
Melanose	8	59	27	6
Spider mites	5	63	26	6
Scale insects	4	59	34	3
Tristeza	6	24	49	21
Scab	3	24	65	8
Root weevils	5	20	50	25

was reported to be processing oranges. Tristeza and scab were not perceived to be very serious but this is because the former is rootstock-dependent and the latter is scion-dependent.

Regarding pest management practices, 78% of those surveyed use regular pest inspections for making decisions regarding control. Amazingly, 19% said they used no inspection and 3% were uncertain. Equipment used for pest control was predominantly ground sprayers (90%), while fixed-wing aircraft and helicopters represented 11% and 4%, respectively. (Since the total exceeds 100%, some growers obviously use more than one method.) Spraying effectiveness is impacted by many factors, and respondents felt the 2 most important were poor timing (33%) and adverse weather (38%). Inadequate coverage (15%) was also mentioned as a major problem in effective spraying.

Weed control is accomplished usually through either mechanical or chemical means or a combination of the two. Ninety-four percent of those surveyed used herbicides for part of their weed management program. Of that number, 78% used strip herbicide application with mowing and disking, 9% used trunk-to-trunk herbicidal weed control, and the remainder used other mechanical/chemical combinations.

Decisions on pest management programs are made utilizing 3 factors. These factors, and the percent of respondents who reported using them, were pest population level (58%), previous experience (45%), and expected damage (14%). Three percent mentioned other factors. Obviously, many used more than one factor in making their decisions.

Water management and cold protection. Responses for this subset of survey data were obtained from 343 growers. Of the acreage represented, nearly three-fourths (74%) were bedded groves. The total acreage supervised by respondents was 158,845 acres. When grove operations were classified by their predominant crop, 71% of the respondents representing 75% of the acreage specified their major emphasis was in growing oranges for processing.

Only 12% of those surveyed said they had no irrigation system. Over three-fourths of those with systems got water from a deep well (78%), the remainder fairly equally divided between shallow wells, surface water, or some combination of sources. Irrigation methods were quite varied, and the most popular system (number of acres) was micro-sprinkler (39%), followed by drip (25%) and flood or seepage (24%). Other types were less than 5% each. Details can be found in Table 4.

Factors used to determine when to irrigate were surveyed and the results were quite interesting. Nonscientific methods are used most and the use of accurate indicators

Table 4. Irrigation use by system type.

System ²	Percent of land surveyed using system
Microsprinkler	39
Drip	25
Flood (seepage)	24
Volume gun	4
Permanent overhead	4
Permanent undertree	1
Uncertain	3

²Thirty-eight percent of respondents reported using more than one system.

Table 5. Factors influencing decisions on irrigation timing.

Factors ²	Percent of respondents using this factor
Tree wilt	49
Soil looks/feels dry	47
Days since last rain	47
Accounting method	8
Soil moisture instrument	7
Other scheduling methods	5
Other (unspecified)	7
Uncertain	2

²More than one factor used by most respondents.

of soil moisture were a small minority. The 3 principal factors respondents used to determine when to irrigate were tree wilt (49%), soil looks or feels dry (47%), and number of days since last rain (47%). Details are shown in Table 5.

Cold protection is often accomplished with water, and this was confirmed by the survey data which found that 81% of the acreage surveyed used water for cold protection. Eleven percent of the acreage was heated by burning petroleum, wind machines were used on 6% of the acreage, and owners of 12% of the acreage did not freeze protect. Obviously, many respondents used combinations of 2 or more techniques since the total exceeds 100%. Where irrigation was used for cold protection, microsprinklers were used by 92% of respondents. Less used were drip irrigation and flood, used by 18 and 25% of respondents, respectively.

Weather information is essential for effective deployment of cold protection. Such information is available from several sources, but the majority (63%) of those surveyed cited the National Weather Service as their primary source of information. Details on other sources are found in Table 6.

Business management. Oranges grown for processing dominated (68% of the acreage) the enterprise mix of respondents to this part of the survey. A total of 167,021 acres were reported by participants with over two-thirds (60%) of the acreage reported as nonbedded. Farms surveyed ranged in size from 10 acres to 15,000 acres with approximately 50% of the acreage included in a 10 to 60 acre category. Of the remainder, 21% are 61 to 180 acres, 16% are 181 to 600 acres and 14% are over 600 acres.

Growers were asked in this portion of the survey to evaluate and rank several problems in the care and management of groves. The most serious problems were felt to be cold protection and weed control. Producers with bedded groves were more concerned with weed control while other growers were more likely troubled by cold. This is no doubt due to the geographic location of respondents since most bedded groves are in southern portions of the

Table 6. Weather information sources used by respondents.

Weather Source ²	Percent of respondents using
National Weather Service	63
Radio/TV	37
Extension office	14
Private consultant	8
Other	7

²Several respondents reported using more than one source.

Table 7. Rating of problems in citrus care.

Problem	Rank of severity by percent of respondents			
	Serious	Moderate	Not a problem	Uncertain
Cold protection	37	49	11	3
Weed control	26	57	17	0
Foot rot	15	50	29	6
Irrigation	14	39	46	1
Insect pests	11	67	21	1
Nematodes	6	32	49	13
Sprouting	4	46	47	3
Fertilization	2	25	71	2
Planting techniques	2	18	74	6

state. Foot rot, irrigation, and insect pests followed as serious to moderate problems, and nematodes and sprouting were considered less serious. Fertilization and planting techniques were considered by most not to be a problem. Complete details can be found in Table 7.

Respondents were asked if they kept an inventory of their trees. Only 61% did, and larger growers (600+ acres) were more likely to have an inventory (83%) than were smaller growers (56%) with 10 to 60 acres. Of the 61% taking inventories, 66% used tree counts, 18% a formal grove map, and 16% used both methods. Inventories were updated annually by 62% of those surveyed, every second year by 22%, and at intervals greater than 2 yr by 16%.

Major management problems were assessed in one of the questions. Details are found in Table 8. More growers identified pest management and cold protection as problems (49% and 50%, respectively) than any others. Government regulations and labor were not far behind with 39% each. Selection of cost-effective chemicals came in at 33%, while water, equipment, and environmental concerns came in at 26%, 25%, and 22%, respectively.

Information sources to assist with production and management decisions were evaluated. The most frequently noted sources were fertilizer/pesticide representatives (55%) and other growers/managers (48%). IFAS personnel were used by 45% of respondents, IFAS publications by 42%, and industry meetings by 37%. If the 3 previous items are combined, IFAS programs rank quite high as information sources, as it should. Table 9 details the particulars of this part of the survey.

A list of various marketing and marketing information problems was presented to survey respondents. They were

Table 8. Major production/management problems.

Problem ²	Percent of respondents listing the problem
Cold protection	50
Pest management (weeds, insects, & diseases)	49
Government regulations	39
Labor	39
Selection of cost-effective materials	33
Water management	26
Equipment costs/maintenance	25
Environmental concerns	22
Rootstocks/scion selection	19
Marketing and marketing information	18
Urban encroachment	18
Harvesting	15
Fertilization and liming	13

²Most respondents listed several problems.

Table 9. Primary information sources for production/management decisions.

Information source ^z	Percent of respondents using source
Fertilizer/pesticide representatives	55
Other growers/managers	48
IFAS personnel	45
IFAS publications	42
Meetings and seminars	37
Consultants/caretakers	33
Popular/trade magazines	32
Cooperatives	9

^zMost respondents mentioned more than one source.

asked to select those which constituted a primary problem to them. Foreign competition was the problem most often mentioned with 43% of respondents concerned. Production costs versus expected prices was mentioned by 39% of respondents, while current season outlook information and long-term outlook information was noted by 38% and 36%, respectively. Import tariffs (27%) and government regulation (24%) also were areas of concern. Details are found in Table 10.

Conclusions

This paper has summarized a substantial undertaking designed to help IFAS Fruit Crops Department effectively support county extension program needs. A comprehensive survey has been used to document the needs of the Florida citrus industry and the results will be used to give direction to the total citrus extension effort. Data collected in individual surveys will be published later in trade magazines by the faculty involved in data collection and

Table 10. Primary marketing problems.

Problem source ^z	Percent respondents listing the problem
Foreign competition	43
Production costs vs. returns	39
Current season outlook information	38
Long term outlook information	36
Maintaining U.S. tariffs	27
Government regulations	24
Processed vs. fresh decision	23
Cash vs. participation decision	19
Out-of-state processing/reprocessing	16
Cultivar planting decisions	14
Sources of marketing information	12
Knowledge of Dept. of Citrus programs	9

^zMost respondents mentioned more than one source.

analysis. The material gleaned from this survey will be used by IFAS state and county faculty in future programmatic efforts with the state's citrus industry. This will ensure that programs are directed to areas of greatest need and not scattered ineffectively over a broad range of subject matter. A subsequent re-evaluation will be conducted to assess the value of the extension programs which were formulated as a result of information collected through this survey.

Literature Cited

1. Dillman, D. A. 1978. Mail and telephone surveys. The total design method. John Wiley and Sons.
2. Jackson, L. K., W. R. Summerhill, and J. J. Ferguson. 1986. A survey of young citrus tree care practices in Florida. Proc. Fla. State Hort. Soc. 99:44-46.