Crop Profile for South Florida Sweet Corn

Prepared by Glades Crop Care, Inc., Jupiter, Florida 33458

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This crop profile covers fresh market sweet corn crops produced south of Lake Okeechobee during the 1997-98 growing season. This area has a nine-month production cycle, and intense pest pressure occurs throughout the period. It provides nearly all the domestic sweet corn during the winter and early spring months for the U.S. This profile is the result of interviews conducted with growers in Dade and Palm Beach counties.

Crop Production

During the 1997-98 growing season, south Florida counties produced 30,900 acres of sweet corn (Table 1). This represents 55% of U.S. production and 72% of the total Florida acreage (FASS, 1997, 1998a, 1998b). Our survey covered 13,677 sweet corn production aces, or 44.3% of the regional total, having a value of $30,201,870. This acreage represents 11 farms ranging in size from 69 to 3964 acres, and having an average size of 977 acres (Table 2). The average yield for the surveyed farms was 14,628 lb per acre, with an average value of $0.16 per lb, giving a gross return of $1,264 per acre (Table 3). Production costs were estimated to be $988 per acre, leaving a net return to the farm of $1,264 per acre.

Pest management costs represent a significant outlay for south Florida sweet corn growers, totaling $188 per acre or 21.6% of the total production costs (Table 4).

Cultural Practices

Sweet corn in Dade County is produced on rocky limestone or marl soil soils (Table 5). The crop is grown on organic muck soils in Palm Beach County in the Everglades Agricultural Area (EAA) adjacent to Lake Okeechobee. Over 91% of the acreage is irrigated using a perched water table, maintained by pumping water into a series of open lateral ditches from an open “rim” ditch (Table 6). The water table is adjusted to provide adequate soil moisture in some acreage, but is regulated by the South Florida Water Management District in parts of the EAA. Irrigation in Dade County is primarily through overhead sprinkler systems. A form of drain tile called a mole drain facilitates removal of excess water in the EAA. These drains are formed by dragging a bullet-shaped cylinder across the field a few inches below the soil surface. The crop is planted on hills during the fall season to accommodate the usually heavy rainfall. During the drier winter and spring months, the crop is planted without hilling.

In the EAA corn is usually in rotation with sugarcane, rice and/or vegetables (Table 7), while rotation in Dade County is less prevalent. Rotation with rice allows growers to control many soil insects, nematodes and weeds when the fields are flooded for the rice crop. Crop rotation is less widely practiced in Dade County. Aside from the flooding involved in rice production, flooding was used in preparation for the corn crop on 6.2% of

the surveyed acreage. A small acreage is laser leveled on a cycle of 4.3 years. Cover crops are planted on a limited basis.

Seeding for the fall crop usually begins in late September and continues through mid-November. The much larger spring crop is seeded beginning in December and continuing through mid March (Table 8). Most of the fertilizer needed for the crop is applied a few days before seeding, with the phosphorus and micronutrients banded at seeding as liquid fertilizer. Split applications may be made on soils with low cation exchange capacities or where the crop is at risk of freezing. Supplemental fertilizer applications may also be needed following heavy rains. Seeds are planted at a depth of 1.5 inches with a row spacing of 30 inches, except in a few areas, where 34 to 36 inch row spacing is still being used. An optimum stand in the EAA has 20,000 to 25,000 plants per acre. In Dade County stands of 19,000 to 22,000 plants are considered acceptable. Soil insecticides or nematicides are applied at planting.

At planting, "shovel" ditches may be cut across the rows to provide surface drainage. The spacing of these ditches varies with the soil type. Crops are usually cultivated 2-3 times for soil aeration and weed control. Just before harvesting, the crop is "topped" by removing the tassels. Most harvesting is by hand, although some mechanical harvesting is used, especially where the corn is to be tipped and shrink-wrapped in tray packages. Most sweet corn is packed in the field in wooden crates at 48 ears per crate. This is followed by precooling to remove field heat and storage in large coolers prior to final shipment in refrigerated trucks. The cooling process is important in preserving a desirable sugar content for consumer satisfaction.

Pest Management

Pests and Their Impact: Survey participants were asked to list those pests that had a significant impact on their pepper crops. All growers described levels of pest activity. These pests, the frequency of occurrence and the damage produced are listed in Table 9. The acreage affected and the potential yield lost to each pest are detailed in Table 10. Methods for managing the major pests are discussed below. Management methods of all pests from our survey are listed in Table 11.

Plant Diseases: Plant diseases threaten the crop throughout the season, but are most damaging to the spring crop. The major diseases, include rust (*Puccinia sorghi* and *Puccinia polysora*) and northern corn leafblight (*Exserohilum turcicum,* formerly *Helminthosporium turcicum*) cause defoliation and damage the ears when they infect the husks. Between 90 and 100% of the acreage is affected by these diseases, although growers estimate that less than 1% of potential yield is lost. Principal control measures for both diseases include an average of 5 applications of mancozeb (Penncozeb, Elf Atochem). Alternatives to this fungicide include propiconazole (Tilt, Novartis). The use of this sterol inhibitor is limited by its higher cost and by concerns about pesticide resistance. Varieties of sweet corn with high levels of resistance to rust are being introduced, and growers have shown great interest in incorporating them into their planting schemes.

Southern corn leafblight (*Bipolaris maydis*, formerly *Helminthosporium maydis*), occurs sporadically in the spring. Seven percent of the surveyed acreage was affected by this disease, with no yield lost to it. Control measures for southern corn leafblight are similar to those for northern corn leafbllight.

Insect Pests: The most destructive insects reported in our survey were the soil infesting wireworms (*Melanotus communis* and *Conoderus falli*)and lesser cornstalk borers (*Elasmopalpus lignosellus)*, which infested 61% and 18% of the acreage, respectively, causing 2-3% plant loss primarily in the spring crop. Granular insecticides applied at planting are used to control these insects, although the rotational program including rice, which requires lengthy periods of flooding, also controls these and other insects. In areas with a history of lesser cornstalk borere activity, tefluthrin (Force, Novartis) is applied. Phorate (Thimet, American Cyanamid) is used to control wire worms. Less prevalent are cutworms (*Feltia subterranea* and *Agrotis ipsilon*), which infest 26% of the acreage and cause 1% crop loss. Chlorpyrifos (Lorsban, Dow AgroSciences) is applied as a foliar spray for cutworm control.

The major threat to the corn ears comes from fall armyworms (*Spodoptera frugiperda*) and silk flies (*Euxesta stigmatis*). These insects occur annually, but have their greatest impact in the spring crop, when they infest 90-100% of the acreage. Losses to these two pests combined total over 3%. Control efforts for reducing fall armyworm damage focus on well-timed applications of methomyl (Lannate, DuPont). Lambdacyhalothrin (Warrior, Zeneca) is applied for silkfly control. Frequent, intensive scouting is required to properly time applications for both these destructive pests, as crop damage can exceed the 5% grade limit quickly. For example, a population of fall armyworms can irreparably damage emerging ear shoots and silks virtually overnight when they leave the whorl as tassels emerge. Similarly, silk flies, which often invade fields from cull piles or other decaying plant debris, can lay eggs in the silks, which hatch into larvae that find shelter from insecticides within three days or less. Alternatives to insecticidal control inslude field sanitation to mitigate silk flies, although some parts of the EAA have such a history of silk fly problems that growers simply avoid planting there. For fall armyworms, resistant varieties containing the bio-engineered gene for the *Bacillus thuringiensis* δ endotoxin have been introduced. Growers' reaction to these varieties is favorable, and their use in expected to increase. Their resistance to fall armyworms is not complete, however, and insecticidal control measures will still be needed to avoid economic losses.

Other insects cited by survey respondents infested less than 5% of the acreage and caused less than 1% yield loss. They are not discussed here in detail, but are listed in Tables 9, 10 and 11.

Nematodes: Nematodes did not cause crop losses for any of the surveyed growers.

Weeds: The major weed species impacting south Florida sweet corn production include nutsedge (*Cyperus* spp), grasses and spiny amaranth (*Amaranthus spinosus*). Of these, spiny amaranth is the only one to cuase significant yield loss because of its tall, spreading growth habit and bothersome spines. Left uncontrolled, spiny amaranth forms a barrier to harvesting crews. Approximately 1% yield loss was attributed to the presence of spiny amaranth. Weed control involves several approaches, beginning with crop ortation.

Cultivation during the crop cycle is important for control of grasses and nutsedge. Judisious use of atrazine (Atrazine, Terra) controls these and other weeds.

Economic Impact

The impact of key pests on the sweet corn production system in particular and the entire south Florida vegetable industry is significant. Considering the major pests discussed above and the minor pests together, growers estimated average yield losses of 12% (Table 11). Such losses not only strain the economic well being of the farming community, but threaten Florida's fragile environment as well. This is especially true considering the concentration of sweet corn production in the EAA, which sits astride the headwaters of the Everglades. The potential rpoblems of fertilizer or pesticide drift or runoff from the EAA are beyond the scope of this profile, yet they are important enough to warrant national attention. Avoiding or minimizing economic losses, therefore becomes a finely tuned balancing act for IPM practitioners and farmers alike.

The economic impact of sweet corn pests is outlined in Table 12. From these figures, losses due to pests cost growers over 1700 pounds of sweet corn per acre. At the 1997-98 prices, this amounts to $$267 per acre in lost revenue. Of the surveyed 13,677 acres, the revenue loss to pests totals over $3.6 million annually. Clearly the growers are justified in their pest managmet efforts, given the magnitude of these losses.

Integrated Pest Management in south Florida Peppers

Survey participants were questioned in detail about their pest management practices. The results are presented in Table 14. These practices were categorized according to the PAMS system put forth by the USDA (NASS, 1998). The acronym, PAMS, stands for Prevention, Avoidance, Monitoring and Suppression. Pest managers are encouraged to incorporate as many prevention and avoidance practices as possible to keep pest problems from arising. When pest problems occur, they are monitored, and when thresholds are exceeded, they are suppressed using the best techniques available. The results of the pest management survey clearly show that south Florida pepper growers employ a wide range of practices to manage pests. Foremost among these are those that fall into the categories of prevention, monitoring and suppression. Avoidance practices, which involve crop scheduling and field location are difficult to implement because of high land values and marketing demands. Pest monitoring or scouting was practiced on all the pepper acreage. The scouts included several independent consulting companies, fully trained farm staff or the growers themselves.

Pest suppression, the final step of the PAMS system, was carried out in a thoughtful, well-planned manner. Pesticide applications to fall and spring plantings are detailed in Tables 15 and 16, respectively. Active ingredients identified for regulatory action under the Food Quality Protection Act (FQPA) appear in **boldface**.

Literature Cited

Florida Agricultural Statistics Service. 1997. Vegetables: Fall Acreage (Oct., Nov., Dec.). October 10, 1997. Found at http://www.nass.usda.gov/fl/rtoc.htm

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Florida Agricultural Statistics Service. 1998b. Vegetables: Spring Acreage (Apr., May, Jun., Jul.). April 13, 1998. Found at http://www.nass.usda.gov/fl/rtoc.htm

National Agricultural Statistics Service. 1998. Pest Management Practices, 1997 Summary. August 1998. Sp Cr 1(98). 33 pp.

Table 1. Sweet corn production and value for the 1997-98 south Florida growing season.

	Acres Planted	Acres Harvested	Yield per Acre (lb)	Value per lb	Total Value
US Total	56600	[z]	[z]	[z]	[z]
Florida Total	42700	41300	14448	$0.18	$106,696,072
Regional Total	30900	[z]	[z]	[z]	[z]
Included in Survey	13677	13280	14628	$0.16	$30,201,870
US Total	24.2%	[z]	[z]	[z]	[z]
Florida Total	32.0%	32.2%	101.3%	87.0%	28.3%
Regional Total	44.3%	[z]	[z]	[z]	[z]
Included in Survey	100.0%	100.0%	100.0%	100.0%	100.0%

[z] These data not available

Table 2. Sweet corn acreage planted and harvested for the fresh market during the 1997-98 growing season in south Florida.

Farm Code	Crop	Acres Planted	Acres Harvested	Production region
1D	Sweet Corn	152	152	Dade County
1G	Sweet Corn	1000	1000	Dade County
1Hf	Sweet Corn	250	250	Everglades Agricultural Area
1Hs	Sweet Corn	450	450	Everglades Agricultural Area
1Jf	Sweet Corn	450	450	Everglades Agricultural Area
1Js	Sweet Corn	2300	2300	Everglades Agricultural Area
1Kf	Sweet Corn	69	69	Everglades Agricultural Area
1Ks	Sweet Corn	636	636	Everglades Agricultural Area
1Ls	Sweet Corn	1670	1670	Everglades Agricultural Area
1Ms	Sweet Corn	1603	1603	Everglades Agricultural Area
1Ns	Sweet Corn	3964	3577	Everglades Agricultural Area
1P	Sweet Corn	209	199	Everglades Agricultural Area
1Qs	Sweet Corn	174	174	Everglades Agricultural Area
1Rs	Sweet Corn	750	750	Everglades Agricultural Area
Total Acreage		13677	13280	

Average Farm Size		977		
Percent			97.1%	

Table 3. South Florida sweet corn yields and returns for the 1997-98 season.

Farm Code	Acres Harvested	Yield (lb/A)	Estimated market price ($/lb)	Gross Return per Acre	Estimated annual production cost ($/A)	Estimated return per acre
1D	152	17934	$0.15	$2,776	$1,300	$1,476
1G	1000	11760	$0.19	$2,240	$3,100	($860)
1Hf	250	9450	$0.12	$1,125	$1,250	($125)
1Hs	450	13650	$0.14	$1,950	$1,250	$700
1Jf	450	12600	$0.17	$2,100	$900	$1,200
1Js	2300	18312	$0.14	$2,616	$900	$1,716
1Kf	69	10752	$0.19	$2,048	$791	$1,257
1Ks	636	16170	$0.15	$2,391	$508	$1,883
1Ls	1670	16170	$0.15	$2,391	$508	$1,883
1Ms	1603	16170	$0.15	$2,391	$508	$1,883
1Ns	3577	16002	$0.16	$2,549	$592	$1,957
1P	199	11970	$0.19	$2,280	$1,200	$1,080
1Qs	174	17976	$0.13	$2,397	$368	$2,029
1Rs	750	15876	$0.14	$2,268	$650	$1,618
Average	13280	14628	$0.16	$2,251	$988	$1,264

Table 4. Cost of pest management in south Florida sweet corn (1997-98)

Farm Code	Annual production cost ($/A)	Average estimated pesticide cost ($/A)	Average estimated cost per acre for other IPM inputs	Total Pest Management Cost	Pest management share of total production costs
			Crop Consultants		
1D	$1,300	$400	$40	$440	33.9%
1G	$3,100	$275	$40	$315	10.2%
1Hf	$1,250	$190	$19	$209	16.7%
1Hs	$1,250	$165	$19	$184	14.7%
1Jf	$900	$150	$14	$164	18.2%
1Js	$900	$125	$14	$139	15.4%

1Kf	$791	$165	$17	$182	23.0%
1Ks	$508	$118	$17	$135	26.5%
1Ls	$508	$118	$17	$135	26.5%
1Ms	$508	$118	$17	$135	26.5%
1Ns	$592	$115	$13	$128	21.7%
1P	$1,200	$190	$19	$209	17.4%
1Qs	$368	$69	$37	$106	28.9%
1Rs	$650	$130	$20	$150	23.1%
Average	$988	$166	$22	$188	21.6%

Table 5. Soil types where sweet corn is grown in south Florida (1997-98)

Soil type	Acreage	Percent of total
Marl	900	6.6%
Muck	12117	88.6%
Rock	252	1.8%
Sandy Muck	199	1.5%
Torrey Muck (contains clay)	209	1.5%
Total	13677	100.0%

Table 6. Irrigation practices used in growing south Florida sweet corn crops (1997-98)

Irrigation type	Acreage	Percent of total
Perched WT Open	12525	91.6%
Overhead Volume Gun	252	1.8%
Overhead "Valley"	900	6.6%
Total	13677	100.0%

Table 7. Land preparation practices used between growing seasons in south Florida sweet corn crops (1997-98)

Land Preparation Practice	Acreage	Percent of total
Disking	13677	100.0%
Cover Crop	400	2.9%
Cover Crop Type	Sorghum	
Laser level	350	2.6%

Laser level cycle (years)	4.3	
Flooding	850	6.2%
Flooding duration (weeks)	7.5	
Rotation	12677	92.7%
Cane /Rice	7847	57.4%
Cane/Rice/Vegetables	4678	34.2%
Vegetables	152	1.1%
Rotation Cycle (years)	5.2	

Table 8. Planting date details for south Florida sweet corn crops (1997-98)

Average beginning fall planting date	09/23/97
Duration of fall planting where planting break is observed (weeks)	5.5
Average end of planting where planting break is observed	11/10/97
Average beginning spring planting date	01/03/98
Duration of spring planting where planting break is observed (weeks)	9.9
average end of spring planting where planting break is observed	03/13/98
Average length of planting break where planting break is observed (weeks)	9.4
Duration of planting where planting break is not observed (weeks)	10.9
Average end of planting where planting break is not observed	01/05/98
Includes farms where only spring crops are planted	4888

Table 9. South Florida sweet corn pests: Frequency of occurrence and type of damage produced (1997-98)

Pest	Frequency					
		Defoliation	Fruit Damage	Plant Loss	Loss of vigor	Harvest Impediment
Diseases						
Northern Corn Leafblight	Annual (Spring)	+	+			
Rust	Annual (Spring)	+	+			
Southern Corn Leafblight	Sporadic (Spring)	+	+			
Insects						
Aphids	Occasional (Spring)				+	
Corn Earworm	Sporadic (Spring)		+			

Cutworms	Occasional (Winter, Spring)	+		+		
Fall Armyworms	Annual		+			
Lesser Cornstalk Borer	Annual (Spring)			+		
Scarab Beetles	Sporadic (Spring)		+			
Silk Fly	Annual (Spring)		+			
Southern Corn Rootworm	Sporadic (Winter, Spring)					
Wire Worms	Occasional (Spring)			+		
Nematodes						
Weeds						
Broadleaves	Annual				+	
Fall Panicum	Sporadic				+	
Grasses	Sporadic				+	
Nutsedge	Annual				+	
Purslane	Sporadic (Spring)				+	
Spiny Amaranth	Annual (Spring)				+	+

Table 10. Pest problems occurring in south Florida sweet corn crops. Estimates of long-term (5-year) acreage affected and yield losses.

Pest	Acreage where control problems occur	Percentage of total acreage	Average grower's estimate of lost potential yield
Diseases			
Northern Corn Leafblight	12175	89.0%	0.1%
Rust	13525	98.9%	0.4%
Southern Corn Leafblight	1000	7.3%	0.0%
Insects			
Aphids	398	2.9%	0.0%
Corn Earworm	750	5.5%	0.4%
Cutworms	3609	26.4%	1.0%
Fall Armyworms	13525	98.9%	1.5%
Lesser Cornstalk Borer	2402	17.6%	2.4%

Scarab Beetles	150	1.1%	0.1%
Silk Fly	12846	93.9%	1.9%
Southern Corn Rootworm	500	3.7%	0.2%
Wire Worms	8373	61.2%	2.9%
Nematodes	0	0.0%	0.0%
Weeds			
Broadleaves	4152	30.4%	0.0%
Fall Panicum	900	6.6%	0.0%
Grasses	7428	54.3%	0.1%
Nutsedge	12142	88.8%	0.1%
Purslane	750	5.5%	0.0%
Spiny Amaranth	8178	59.8%	0.9%
			11.9%

Table 11. Pest management methods for south Florida sweet corn, 1997-98. **Boldface** indicates active ingredients on the FQPA target list.

Pest	Primary control practice (chemical name)	Trade name	Formulation	% of crop treated	Type of application	Average application rate (lb AI/A)	Average # of applications	Typical preharvest interval (days)
Diseases								
Northern Corn Leafblight	Mancozeb	Penncozeb 75DF	75% DF	88.8%	Foliar spray	1.1	5	7
Rust	Mancozeb	Penncozeb 75DF	75% DF	88.8%	Foliar spray	1.1	5	7
Southern Corn Leafblight	Mancozeb	Penncozeb 75DF	75% DF	88.8%	Foliar spray	1.1	5	7
Insects								
Aphids	Lambdacyhalothrin	Warrior	1 lb AI/gal EC	87.1%	Foliar spray	0.0	4	1
Chafer	Lambdacyhalothrin	Warrior	1 lb AI/gal EC	87.1%	Foliar spray	0.0	4	1
Corn Earworm	Methomyl	Lannate SP	90% SP	98.2%	Foliar spray	0.3	7	2
Cutworms	Chlorpyrifos	Lorsban 4E	4 lb AI/gal EC	78.6%	Foliar spray	1.0	2	65 (cutworms), 7 (fall armyworms)
Fall Armyworms	Methomyl	Lannate SP	90% SP	98.2%	Foliar spray, granules in whorl	0.3	7	50 (granules), 2 (foliar)
Lesser Cornstalk Borer	Tefluthrin	Force 3G	3% G	7.8%	Banded at planting	0.1	1	80
Silk Fly	Lambdacyhalothrin	Warrior	1 lb AI/gal EC	87.1%	Foliar spray	0.0	4	1
Southern Corn Rootworm	Tefluthrin	Force 3G	3% G	7.8%	Banded at planting	0.1	1	80
Wire Worms	Phorate	Thimet 20G	20% G	84.1%	Banded at planting	1.3	1	80
Nematodes	Flooding, Crop rotation							
Weeds								
Broadleaves	Atrazine	Atrazine	90% DF	49.3%	Post-plant	1.0	1	65

		90DF			broadcast spray			
Fall Panicum	Cultivation							
Grasses	Cultivation							
Nutsedge	Cultivation							
Purslane	Atrazine	Atrazine 90DF	90% DF	49.3%	Post-plant broadcast spray	1.0	1	65
Spiny Amaranth	Atrazine	Atrazine 90DF	90% DF	49.3%	Post-plant broadcast spray	1.0	1	65

Table 12. Estimated economic impact of pest activity in south Florida sweet corn crops.

Total % loss per acre	11.9%
Average marketable yield per acre from Table ###	14628
Potential yield (Avg. yield*(1+Total % loss)	16363
Difference (lost yield per acre)	1735
Average gross return per acre from Table ####	$2,251
Potential gross return per acre (Avg. gross return *(1+ Total % loss)	$2,519
Difference (Lost return in $/A)	$267
Total $$$ loss in survey area (lost return *13676.6)	$3,653,123