



Growing and Marketing Beets at Local Green Markets in Southeast Florida, 2007–2011

KENNETH D. SHULER*, DANIEL G. SHULER, AND DEANNA V. SHULER

Stephen's Produce LLC., 12657 158th Street N., Jupiter, FL 33478

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The growers for Stephen's Produce grew and marketed beets, *Beta vulgaris* L., ssp. *vulgaris* from 2007 to 2011 to help supply local green markets with a weekend supply of "garden fresh" produce. Planting schedules, growing and harvesting methods, yields, and sales figures will be discussed. Both 'Detroit Dark Red' and 'Red Ace Hybrid' were grown in 2007–2009. Since 2009–2010 only 'Red Ace Hybrid' has been grown. In 2010–2011, 31 weekly plantings were made beginning on 23 Aug. and ending 9 Mar. Beet seeds were direct seeded and thinned to one plant per hill. Beets were pulled, washed, bunched, and sold on 27 weekends from 6 Nov. to 8 May. An average of 12 bunches were sold each week at an average price of \$2.22 per bunch or \$26.51 per week for a total of \$716.

THE BEGINNING OF BEET SALES FOR GREEN MARKETS IN SOUTHEAST FLORIDA, 2007–2011. A very loyal customer who praised the nutritional benefits of beets had expressed interest in having a local supply of fresh beets. In response to this request, the growers for Stephen's Produce began growing beets in 2007 for sale at green markets in Southeast Florida. Regular customers of Stephen's Produce were already getting other root crops from them: red radish, Korean turnip, and Chinese radish (Shuler, et al., 2001 and 2004a), as well as Swiss chard, a crop closely related to beets (Shuler, et al., 2003b). There was no large-scale commercial production of beets in Southeast Florida. Several other vendors were already supplying the market with beets brought in from other areas. The first season of beet production in 2007–2008 served as a trial growing period, but was a marketing failure as no beets were sold. In that first season, 19 weekly plantings were made between 25 Aug. 2007 and 1 Jan. 2008. The final eight plantings, scheduled to conclude on 26 Feb. 2008, were not made. A second attempt at growing beets was begun 20 Jan. 2009 with seven weekly plantings ending 4 Mar. 2009. This attempt was successful and marketable beets were produced and sold. Equal amounts of two cultivars were planted each week in these first two seasons: 'Detroit Dark Red', medium top and 'Red Ace Hybrid' (Otis S. Twilley Seed Co., Hodges, SC). 'Red Ace Hybrid' was one of five hybrid varieties offered for sale by Twilley Seed Co. and was used exclusively for production in 2009–2011. In their 2011 seed catalog, Twilley Seed Co. described 'Red Ace Hybrid' as a 'Detroit Dark Red' type which matured about one week earlier. Johnny's Selected Seeds, another seed company offering 'Red Ace Hybrid,' described the variety as their best all-around beet, which was sweet and tender even when older. To accommodate the market schedule, the 2009–2010 season consisted of 29 weekly plantings from 30 Aug. to 3 Mar. For the 2010–2011 season, 31 plantings were made from 23 Aug. to 9 Mar.

Garden beets are grown primarily for the enlarged bulbous root. The plant is normally a biennial. Plants are usually harvested when the root is not more than 2 inches in diameter. At that stage the root is tender, but becomes harder and tougher with greater age. Beets develop best under cool conditions, so may be grown in

winter in the far south. Fresh market beets are generally harvested 55–80 d after planting and processing beets, 90–110 d after planting. The roots are typically canned, pickled, and used in soups and as a cooked vegetable. Leaves are sometimes cooked as a green pot vegetable (Markle et al., 1998). Many customers of Stephen's Produce mentioned that they often cooked or grilled their beets.

SOIL PREPARATION, IRRIGATION SETUP, AND MANAGEMENT 2007–2008. Garden soil preparation, broadcast fertilization, bed making, and irrigation setup and management for 2007–2008 were handled similar to other crops reported in previous papers (Shuler et al., 2003, 2004a, 2004b, 2005a, 2005b, 2006a, 2006b).

SOIL PREPARATION AND MANAGEMENT 2008–2011. Compost had been applied to the entire garden each summer until the summer of 2007 when it was not applied for the first time. Since 2007, the only soil amendments had been the accumulated garden debris (weeds, unused crop foliage, roots, and soil) which was spread over a small area of the garden each summer. By 2007–2008, overall garden production had declined. Until 2008 all cultivation had been limited to rototilling soil approximately 5–6 inches deep. Ca concentrations in the soil had become very high probably due to the Ca in the previously added compost and to high concentrations of Ca in the well water used for drip irrigation. Increased weed pressure had also reduced crop growth and quality. The weak crop stands and poor growth of beets in 2007–2008 mirrored the decline of other crops such as arugula, spinach, and Swiss chard. The high concentrations of Ca and increased weed pressure might have contributed to this decline in production.

Since 2008, the garden had been plowed once each spring/summer to a depth of 6–9 inches with a moldboard plow which brought up fresh soil to mix with the zone of compost/soil (one bottom 12-inch moldboard plow pulled by a 1980 Yanmar 1610 3-cylinder diesel tractor rated at 19 hp). The garden area continued to be rototilled to help mix in the broadcast fertilizer and to help level the soil before beds were made. Since 2008 a set of tractor-mounted bedding disks was used to help throw up soil for making beds. This eliminated the use of a push plow to throw up soil for bed making. However, the soil still needed to be raked up on both sides and firmed up by walking on the bed top and sides to complete the bed making process. Since 2010, the garden was disked multiple times in the spring/summer with a three-point hitch mounted 5-ft disk. Disking was used to knock down the

*Corresponding author; phone: (561) 512-5222; email: skshuler@gmail.com

beds at the end of the season as well as to break up debris after end-of-season crops and weeds had been killed with glyphosate herbicide (Roundup Ultra, Monsanto, St. Louis, MO). Disking was also done to cultivate the soil after plowing. This further reduced the need for roto-tilling.

CROP ESTABLISHMENT WITH DIRECT SEEDING. For 2007–2010, approximately 80–67 lb/acre N and K, respectively, from mixing equal amounts of KNO₃ and NH₄NO₃ was sprinkled on the bed top just before seeding. For the 2010–2011 season, NH₄SO₄ and 2MgSO₄·K₂SO₄ were used to provide the nitrogen and potassium. A 1% chlorpyrifos mole cricket bait (Micro Flo, Memphis, TN) used to control wire worms and cutworms was also sprinkled on the bed top and incorporated along with the fertilizer by using the cultivator attachment of a wheel-hoe which was pushed forward as the cultivator attachment was moved up and down. This also served to loosen up the soil where the rows would be made. Row furrows were pushed open with a hoe. Beets were planted two rows per bed with 2 to 4 seeds per hill and hills spaced approximately 2–3 inches apart. Loose soil was pulled over the furrow and an automobile tire was rolled over the plant row to firm up the soil. After rolling, the effective depth of planting was judged

to be about 0.5 inches. After approximately 14 to 21 d, hills were thinned to one plant.

Even though multiple seeds were planted per hill, plant stand was sometimes less than adequate during periods of low rainfall (resulting in low soil moisture levels in the surface germination zone). Plant stand was also less than adequate during hot weather (August and September) and periods of excessive rainfall and flooding when young seedlings were killed by damping-off. Seeds purchased in 2007 were used for each of the four seasons that beets have been grown. Seeds were stored under refrigeration when they were not being used on planting days.

GARDEN SPACE MANAGEMENT AND CROP SCHEDULING. Even though they were planted each week, beet growth was usually not very uniform and harvesting often spanned over a period of several weeks. Since the largest beets were pulled out first, more space became available for the smaller roots to continue to size up. A pre-emergence herbicide, DCPA (Dacthal W-75, AMVAC, Los Angeles, CA), had been used since fall 2007 to help control weeds in beans, peas, onions, and all of the cruciferous crops. Of the other crops planted each week, DCPA was not used on beets, cilantro, and arugula. DCPA was also not used on several

Table 1. Beet production from 0.02 acres for sale at green markets in Southeast Florida, 2010–2011.

Date planted	Linear bed ft planted	Harvest period (dates)		Days to harvest		Hills planted	Beets harvested (no.)	Beets harvested (%)	Bunches made (no.)	Beets per bunch	Beets per acre	Bunches per acre	Bunches per acre per day ^z
		First	Last	First	Last								
23Aug.	10	5Nov.	12Nov.	74	81	70	36	51%	9	4	39,204	9,801	121
28Aug.	8	5Nov.	12Nov.	69	76	62	47	76%	9	5.2	63,967	12,249	161
3Sept.	8					51							
10Sept.	6	5Nov.	19Nov.	59	70	44	23	52%	6	3.8	41,745	10,890	156
15Sept.	7	5Nov.	19Nov.	51	65	64	33	52%	10	3.3	51,348	15,560	239
21Sept.	7	20Nov.	10Dec.	60	81	60	35	58%	12	2.9	54,460	18,672	231
27Sept.	7	26Nov.	10Dec.	60	74	57	35	61%	7	5	54,460	10,892	147
3Oct.	7	4Dec.	10Dec.	62	68	70	48	69%	10	4.8	74,688	15,560	229
9Oct.	7	10Dec.	18Dec.	62	70	66	57	86%	14	4.1	88,692	21,784	311
14Oct.	7	17Dec.	18Dec.	64	65	63	60	95%	15	4	93,360	23,340	359
19Oct.	2	25Dec.	1Jan.	67	74	19	15	79%	4	3.8	81,675	21,780	294
26Oct.	2	7Jan.	8Jan.	73	74	17	14	82%	3	4.7	76,230	16,335	221
2Nov.	7	14Jan.	4Feb.	73	94	56	38	68%	12	3.2	59,128	18,672	199
9Nov.	7	15Jan.	11Feb.	67	94	61	51	84%	16	3.2	79,356	24,896	265
16Nov.	9	1Feb.	18Mar.	80	122	67	36	54%	12	3	43,560	14,520	119
23Nov.	6	11Feb.	18Mar.	80	115	42	41	98%	12	3.4	74,415	21,780	189
30Nov.	6	18Feb.	25Feb.	80	87	50	30	60%	10	3	54,460	18,150	209
7Dec.	7	25Feb.	8Apr.	80	122	58	46	79%	16	2.9	71,576	24,896	204
14Dec.	7	4Mar.	18Mar.	80	94	48	16	33%	5	3.2	24,896	7,780	83
21Dec.	7	4Mar.	8Apr.	73	108	52	41	79%	13	3.2	63,796	20,228	187
28Dec.	7	11Mar.	15Apr.	73	108	55	22	40%	7	3.1	34,232	10,892	101
4Jan.	7	11Mar.	15Apr.	66	101	49	39	80%	13	3	60,684	20,228	200
11Jan.	6	18Mar.	8Apr.	66	87	39	29	74%	9	3.2	52,635	16,335	188
18Jan.	5	18Mar.	22Apr.	59	94	37	26	70%	9	2.9	56,628	19,602	209
25Jan.	6	1Apr.	22Apr.	66	87	49	32	65%	11	2.9	58,080	19,965	229
1Feb.	7	26Mar.	30Apr.	53	88	54	19	35%	6	3.2	29,564	9,336	106
8Feb.	8	8Apr.	22Apr.	59	73	55	41	76%	14	2.9	55,801	19,054	261
15Feb.	6	15Apr.	30Apr.	59	74	40	20	50%	7	2.9	36,300	12,705	172
23Feb.	10	22Apr.	6May	58	72	67	47	70%	16	2.9	51,183	17,424	242
2Mar.	10	22Apr.	6May	51	65	75	60	80%	20	3	65,340	21,780	335
9Mar.	11	6May	7May	58	59	78	46	59%	16	2.9	45,540	15,840	268
Total	209					1,675	1,093		323				
Avg per planting	7			66	85	56	36	65%	10.8	3.4	56,951	16,828	198

^zCalculated by dividing “bunches per acre” by “days to harvest - last”.

“cut and come again” crops: Swiss chard, spinach, basil, parsley, and dandelion. For plantings made after early December when the entire garden would have been planted, there was a concerted effort to rotate the non-DCPA crops with themselves such that beets would be planted after just harvested cilantro or arugula.

GROWING THE CROP AND PEST MANAGEMENT. Weed pressure has increased dramatically over the past seven seasons because end-of-season weeds were allowed to go to seed. Since early growth of beets was relatively slow and no pre-emergence herbicide was used, beets did not compete well with weeds. From August to mid-November, whenever conditions were favorable (dry foliage and no wind), paraquat dichloride (Gramoxone Max, Syngenta Crop Protection, Inc., Greensboro, NC) was occasionally sprayed in the alleyways and on bed shoulders of planted crops and on the tops of unplanted beds to control recently emerged weeds. Beets were usually hand weeded at thinning and if time allowed, once or twice before first harvest. Where weeds were allowed to grow and compete with the crop, beets took longer to reach marketable size and some roots would often be stunted and never size up. There seemed to be an increase in stem and foliar disease when weeds were allowed to grow with the crop. Foliage from weeds contributed to reducing air movement and delayed drying from dew.

Disease control chemicals were generally not used so foliar and stem diseases were tolerated. Leaf disease symptoms included spotting and the formation of large lesions of desiccated tissue which would fall out forming a “shot-hole” appearance. Leaf spotting was common and was more prevalent under extended periods of warm, rainy weather.

Crop protective chemicals were used as described in previous reports of our garden crops (Shuler et al., 2003a, 2003b, 2004a, 2004b, 2005a, 2005b, 2006a, 2006b, 2007a, 2007b). The crop protective chemical program for insects usually provided excellent control of worms. Worms could have been a problem for beets, especially in the spring, as evidenced by the presence of egg masses on crop leaves. Scouting for pests was done at harvest and whenever pests were detected, younger plantings would be further examined and sprayed if needed.

Whiteflies and aphids were occasional pests of beets. Whenever aphids were noticed on other crops (usually during late fall, winter, and early spring), imidicloprid (Pravado 1.6 Flowable, Bayer, Research Triangle Park, NC) and pymetrozine (Fulfill, Syngenta, Greensboro, NC) would be added to the worm control chemical in a weekly rotation to provide aphid control. Whenever it was used, imidocloprid would also help control whiteflies. Control of leaf pests was important both to insure maximum growth as well as have nice looking tops since roots were sold with the attached tops.

HARVESTING AND WASHING. Whenever beet growth was fairly uniform, there were occasions when all beets from a given planting would be pulled at once. In most cases, however, growth was not very uniform and beets would be harvested over a two to four week period. On Friday mornings, beets were usually the last root crop harvested (after daikon radish and turnips). On Saturday, all crops were usually harvested after sundown. Individual plants were grasped at the stem near the root and pulled out. Any large clumps of soil were pulled off the roots and damaged leaves/stems were broken off at the root. Roots were placed in a wheel barrow and taken to a wash stand where they were sorted by size (for example, small, medium, and large), spray washed, and grouped into bunches (each bunch containing one beet from each size). The bunches were banded and bagged to keep them

from “bleeding red” onto other crops and stored in a cooler with ice until sold. Any beets left unsold at the Saturday market would be taken back home, placed in sales bags and held in a household refrigerator until time for loading for the Sunday market.

MARKETING, PRICING, AND SALES TECHNIQUES. The primary greenmarket outlets for produce from Stephen’s Produce were the Saturday market in West Palm Beach, FL (7 or 8 AM to 1 PM for 27 or 28 weeks, late October to late April) and the Sunday market in Stuart, FL, (9 AM to 1 PM for 28 to 30 weeks, late October to early May). The supply of beets from Stephen’s Produce usually did not meet the demand. For most weeks, customers at the Sunday market in Stuart would only have beets if they were pre-ordered the week before or via telephone or email before Saturday. All of the available beets were usually taken to and sold at the Saturday market in West Palm Beach. Several regular customers who came to market in the early morning often purchased beets, with many customers buying more than one bunch. It was not unusual for Stephen’s Produce to be sold out of beets

Table 2. Weekly sales of beets at greenmarkets in Southeast Florida, 2010–2011.

Market weekend	Bunches			Price per bunch (\$)	Sales (\$)
	Taken to market (no.)	Sold (no.)	Unsold (no.)		
6Nov.	5	5		\$2	\$10
13Nov.	15	15		\$2	\$30
20Nov.	12	12		\$2	\$24
27Nov.	10	10		\$2	\$20
4Dec.	10	10		\$2	\$20
11Dec.	16	16		\$2	\$32
18Dec.	21	21		\$2	\$42
26Dec. ^z	2	2		\$2	\$4
2Jan. ^z	3	3		\$2	\$6
8Jan.	5	5		\$2	\$10
15Jan.	2	2		\$2	\$4
22Jan.	6	6		\$2	\$12
29Jan.	9	9		\$2	\$18
5Feb.	7	7		\$2	\$14
12Feb.	13	13		\$2.35	\$30.50
19Feb.	10	10		\$2	\$20
26Feb.	16	16		\$2	\$32
5Mar.	13	13		\$2	\$26
12Mar.	14	14		\$1.86	\$26
19Mar.	14	14		\$2	\$28
27Mar. ^z	7	7		\$2.10	\$14.75
2Apr.	18	18		\$2.5	\$45
9Apr.	17	17		\$2.56	\$43.50
16Apr.	25	24	1	\$2.5	\$60
23Apr.	23	23		\$2.5	\$57.50
1May ^z	7	7		\$2.5	\$17.50
7May	24	24		\$2.46	\$59
Total	324	323	1		\$716
Avg per wk (27 wks)	12	12	0.04		\$26.52
Price per bunch (\$)				\$2.22	
Percent unsold			0.3%		

^zThere was no market at West Palm Beach on these dates: Christmas Day (25 Dec.), New Year’s Day (1 Jan.), Palm Beach Boat Show (27 Mar.), and Sunfest (1 May).

Table 3. Summary of beet production by Stephen's Produce for sale at green markets in Southeast Florida over a 3-year period, 2008–2011.

Season	Date of first planting	Harvest and sales season	Weeks planted (no.)	Linear bed ft		Bunches harvested (no.)	Harvest (%)	Bunches per acre (no.)	Avg days to harvest first–last	Bunches per acre per day	Total value of sales (\$)	Value per acre (\$)	Value per acre per day (\$)
				Per wk	Total								
2007–08	25 Aug.		19	7	133								
<i>No beets were harvested</i>													
2008–09	20 Jan.	27 Mar.–26 Apr.	7	6	42	40	45%	10,371	52–57	182	\$80	\$20,743	\$364
2009–10	30 Aug.	17 Oct.–25 Apr.	27	7	193	234	48%	13,203	60–72	183	\$466	\$26,292	\$365
2010–11	23 Aug.	6 Nov.–8 May	30	7	209	324	65%	16,882	66–85	199	\$716	\$37,304	\$439

^zCalculated by dividing “# bunches per acre” by “avg. days to harvest - last.”

^yCalculated by dividing “\$ per acre” by “avg. days to harvest - last.”

Table 4. Summary of beet sales for Stephen's Produce at green markets in Southeast Florida over a 3-year period, 2008–2011.

Season	Market location	Harvest and sales season	Weeks sold (no.)	Bunches taken (no.)	Bunches sold (no.)	Bunches sold per wk (no.)	Avg price per bunch (\$)	Total sales value (\$)	Sales value per wk (\$)	Bunches unsold (no.)	Unsold (% of total taken)
2008–09	WPB ^z Stuart	27 Mar.–26 Apr.	6	41	40	6.7	\$2.00	\$80.50	\$13.40	1	2.4%
2009–10 ^w	WPB ^z PBG ^y Stuart	17 Oct.–25 Apr.	24	256	256	10.7	\$2.00	\$512	\$21.33	0	0
2010–11 ^w	WPB ^z Stuart	6 Nov.–8 May	27	324	323	12	\$2.22	\$716	\$26.52	1	0.3%

^zWest Palm Beach, FL.

^yPalm Beach Gardens, FL.

after only an hour or two of sales. Customers who bought beets were usually large-volume buyers who also bought several other crops as well. West Palm Beach customers who came later in the morning after beets had been sold out, would often reserve beets a week ahead by pre-paying. The high demand for beets seemed to be related to their nutritional value as customers have become more health conscious. Also, new uses such as for grilling may have helped increase demand.

Beets were initially sold for \$2.00 per bunch with a bunch containing from 2 to 6 beets, depending on size. Since demand for the 2010–2011 season was so high, the price was finally raised near the end of the season to \$2.50 per bunch. Several bunches were usually displayed at once and replaced by fresh bunches from the storage cooler as needed.

PRODUCTION AND SALES FIGURES. Detailed production and sales figures for beets is provided for the 2010–2011 season (Tables 1–2). This was our most productive season of growing beets. The greatest number of beet bunches sold was for the 7 May 2011 weekend when 24 bunches were sold for \$2.50 per bunch or \$60 total. A summary of seasonal beet production and sales for the three seasons, 2008–2011, is provided in Tables 3 and 4.

CUSTOMER PROFILE, OBSERVATIONS, AND CUSTOMER COMMENTS. A wide range of customers purchased vegetables at the green markets. Customers included older retired couples, single men and women, young families with children, as well as winter residents from the northern U.S., Canada, and Europe. For most customers, beets were one of several items purchased with some customers buying two or more bunches. Customers would often comment on the freshness of the beets and the associated greens.

Literature Cited

Markle, G.M., J.J. Baron, and B.A. Schneider. 1998. Food and feed

- crops of the United States, 2nd edition, revised. Meister Publishing Co., Willoughby, OH. p. 47.
- Shuler, K.D., S.J. Nie, and P-A.N. Shuler. 2001. The evolution of production, harvesting, and marketing techniques for radishes from Stephen's Produce “garden fresh” vegetables at local green markets in Palm Beach County, Florida. Proc. Fla. State Hort. Soc. 114:219–224.
- Shuler, K.D., S.J. Nie, P-A.N. Shuler. 2003a. Growing and marketing spinach at local green markets in south Florida. Proc. Fla. State Hort. Soc. 116:325–331.
- Shuler, K.D., S.J. Nie, P-A.N. Shuler. 2003b. Growing and marketing Swiss chard at local green markets in south Florida. Proc. Fla. State Hort. Soc. 116:331–336.
- Shuler, K.D., S.J. Nie, P-A.N. Shuler. 2004a. Growing and marketing Chinese radishes and turnips at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 117:256–267.
- Shuler, K.D., S.J. Nie, P-A.N. Shuler. 2004b. Growing and marketing arugula at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 117:267–274.
- Shuler, K.D., S.J. Nie, D.V. Shuler, P-A.N. Shuler. 2005a. Growing and marketing cilantro and Italian parsley at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 118:330–341.
- Shuler, K.D., S.J. Nie, D.V. Shuler, P-A.N. Shuler. 2005b. Growing and marketing green onions at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 118:353–360.
- Shuler, K.D., S.J. Nie, D.V. Shuler, P-A.N. Shuler. 2006a. Growing and marketing garden cress and mache at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 119:291–296.
- Shuler, K.D., S.J. Nie, D.V. Shuler, P-A.N. Shuler. 2006b. Growing and marketing mizuna and bekana at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 119:297–302.
- Shuler, K.D., P-A.N. Shuler, S.J. Nie, D.V. Shuler. 2007a. Growing and marketing cabbage at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 120:151–154.
- Shuler, K.D., P-A.N. Shuler, S.J. Nie, D.V. Shuler. 2007b. Growing and marketing kohlrabi at local green markets in southeast Florida. Proc. Fla. State Hort. Soc. 120:204–209.