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Growth Performance and Economic Potential of ‘*Veinte Cohol*’: A Short-Cycle Banana Cultivar Produced in the Coastal Plain of Georgia

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Researchers have been conducting trials on the potential of banana production at various locations in Savannah, Georgia since 2003. In 2009, new banana research was initiated at the University of Georgia, College of Agricultural and Environmental Sciences, Tifton Campus. This research has identified several cultivars with cold hardiness capabilities and a short-cycle cultivar, ‘*Veinte Cohol*’ that has potential to become a specialty commercial crop in addition to several other fruits that are produced in the state. This paper addresses the growth performance and productive cycle of the *Veinte Cohol* cultivar and its economic potential as a commercial crop.

The ‘*Veinte cohool*’ banana cultivar belongs to the family *Eumusa* since it is edible (Fonsah et al. 2010; Wallace, Krewer, and Fonsah 2007a, 2007b). The *Eumusa* banana family originated from two wild species, *Musa acuminata* and *M. balbisiana*. According to the taxonomic banana cultivar scoring characteristics, *Veinte Cohool* could well belong to the *Musa acuminata* subspecies because of the pseudostem color, petiole canal shape, downward-looking peduncle pedicels, bract shape, and dull purple color (Figure 1) (Simmonds and Shepherd 1955; Stover and Simmonds 1987).

Several studies have demonstrated that *Veinte Cohool* is actually a short-cycle banana suitable for food/fruit production in climate zone 8A, the Southeast region of the United States (Fonsah et al. 2010 Wallace, Krewer, and Fonsah 2007a, 2007b). However, no study has investigated the growth performance and financial viability of the crop. This paper therefore addresses the growth performance and productive cycle of the *Veinte Cohool* cultivar and its economic potential as a commercial crop in Georgia in particular and the Southeast region of the U.S. in general.

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Material and Methods

The *Veinte Cohool* banana cultivars used in this research were obtained from three different sources: the International Network for the Improvement of Banana and Plantain (INIBAP) Germplasm in Belgium; the United State Department of Agriculture (USDA) Germplasm in Puerto Rico; and Savannah, GA (suckers from plants originating in Homestead, Florida). The experimental design, data collection, and analysis are described in Fonsah et al. (2010).

Results

Growth/Vegetative Performance

Our research on the vegetative morphology and physiology revealed that the average *Veinte Cohool* plant height was 1.54 m and the average pseudostem (trunk) circumference was 34.2 cm. Average suckers per plant was 4.8. The average number of leaves was 14.6 per plant, with average width of 54.4 cm and average length 1.28 m (Table 1). Our investigation of some of the pomological characteristics revealed an average hand-class of 6.7, average number of fingers per bunch of 98.1, and 3.6 kg average bunch weight (Table 1). The *Veinte Cohool* pseudostem has patches of a dark brownish color. *Veinte Cohool* is not cold tolerant and would not survive under any temperature below 32°F.

Financial Performance

A risk-rated enterprise budget economic model was used to determine financial viability of *Veinte*



Figure 1. Growth Performance and Taxonomic Characteristics of *Veinte Cohol* Banana Cultivar Research Trial in South Georgia Coastal Plain, Tifton, 2010.

Table 1. Vegetative Performance of *Veinte Cohol* Banana Cultivar in the Coastal Plain Research Plot, Tifton, Georgia.

Cultivar	Plant height (m)	Pseudo-stem circum (cm)	# of leaves	Leaf width (cm)	Leaf length (m)	Hand class	# of fingers	Bunch weight (kg)	# of suckers
1. VC/BG/TC ^a	1.18	30	15	58	1.07	8	108	3.8	5
2. VC/PR/TC ^b	1.59	37	12	57	1.3	7	97	4.1	5
3. VC/PR/TC	1.36	29	15	54	1.1	6	88	4.3	3
4. VC/BG/TC	1.56	34	13	51	1.3	6	110	3.3	3
5. VC/BG/TC	1.49	35	15	49	1.2	6	81	3.9	7
6. VC/BG/TC	1.79	38	15	56	1.3	6	111	4.2	4
7. VC/PR/TC	1.51	32	16	50	1.04	7	91	2.3	6
8. VC/PR/TC	1.64	35	17	56	1.08	7	95	2.3	4
9. VC/GA/FL ^c	1.59	34	13	58	1.12	6	99	3.5	6
10. VC/GA/FL	1.69	38	15	55	1.28	8	101	4.3	5
Total	15.41	342	146	544	11.79	67	981	35.9	48
Average	1.54	34.2	14.6	54.4	1.179	6.7	98.1	3.6	4.8

^a*Veinte Cohol* tissue culture plants from Belgium.

^b*Veinte Cohol* tissue culture plant from Puerto Rico.

^c*Veinte Cohol* sucker from Georgia with parent plant originating from Florida.

Cohol bananas produced in Georgia. Although the average yield in our studies was 3.6 kg (~8 lbs.), other studies in Georgia have reported yields of up to 6.8 kg (15 lbs.) (Wallace, Krewer, and Fonsah 2007b; Duque 2008). Our risk-rated model with five risk-rated alternatives (best, optimistic, median, pessimistic, and worst) is discussed in Fonsah et al. (2008), Fonsah, Krewer, Harrison, and Bruorton (2007), and Fonsah and Hudgins (2007) (Table 2).

We used the worst yield of 7000 lbs./ac and the best yield of 11,000 lbs./ac in our studies. Ethnic and niche market banana prices in the Atlanta Farmers Market range from \$1.29/lb. to \$1.99/lb. depending on the cultivars. In our estimation, we used the worst-case scenario of \$0.50/lb. and the best-case scenario of \$1.50/lb. to determine profitability (Fonsah, Krewer, Harrison, and Bruorton 2007).

Pre-Harvest Variable Cost

Table 3 shows that the pre-harvest variable cost of producing *Veinte Cohol* in Georgia was \$4,935/ac. The most expensive cost components were fertilizers, plants, and bagging operation. Fertility was based on soil test and it is recommended for any grower. Some of these costs could be reduced or increased substantially, but that depends on many factors including the experience of the farmer.

Marketing and Harvesting Costs

The total harvesting and marketing cost was \$1,173. We assumed 1000 bunches/ac in our calculation, with a five percent field loss; we therefore harvested 950 bunches. Custom packing was 950 bunches times an average of nine lbs./bunch divided by ten lbs./box. The total of pre-harvesting variable cost plus harvesting and marketing costs is \$6,101 (Table 4).

Fixed Costs

Fixed costs included a tractor for land preparation (which most farmers in Georgia already have); overhead and management based on 15 percent pre-harvest variable cost; and irrigation installation material, including a well. The total fixed cost was \$1,218, and the total budgeted cost of production per acre was \$7,327 (Table 5).

Break-Even Analysis (BE)

Break-even analysis is used by financial analysts and economists to determine the maximum expenditure needed per operation in an enterprise in order to remain sustainable. The result shows that the pre-harvesting break-even cost (BE) is \$0.55/lb., while the harvesting and marketing BE is \$0.13/lb. The fixed BE is \$0.14 and the total budgeted BE per pound is \$0.82. The result further tells us that as long as we can produce 7,327 lbs./ac we will not be losing any money (Table 6).

Risk-Rated Returns Over Total Costs

In our risk-rated return studies, best and optimistic returns were obtained seven percent, 16 percent, and 31 percent of the time whereas pessimistic and worst returns were obtained 31 percent, 16 percent, and 7 percent of the time. The expected return was \$1,673/ac and was obtained 69 percent of the time, with an 88 percent chance of making profit. Additional revenue of \$10,000 was accrued from sales of suckers at the rate of \$10 each and \$1,000 from the sales of male flowers. Suckers normally sell for between \$15 and \$22 each in nurseries, male flowers sell for \$3–\$5 each in Atlanta farmers markets, and leaves sell for \$2/bundle. Our study shows that an average of 4.8 suckers can be produced by *Veinte Cohol* plant (Table 1). Additional revenue of \$100

Table 2. Risk-Rated Yields and Prices of “*Veinte Cohol*” Bananas Produced in Georgia.

Description	Best	Optimistic	Median	Pessimistic	Worst
Yield (lbs.)	11000	10000	9000	8000	7000
Price per lb. (\$)	1.50	1.25	1.00	0.75	0.50

Table 3. Pre-Harvest Variable Costs of Producing "Veinte Cohol" Bananas in Georgia.

Item	Application	Unit	Quantity	Price	\$Amt/ac
Fertilizers					
Fertilizer (N – urea)	5/yr.	Ibs.	2800.00	0.24	672.00
Potash (K20)	5/yr.	Ibs.	5500.00	0.30	1650.00
Lime	1/yr.	Ton	1.50	27.00	40.50
Fertilizer (10-10-10)	5/yr	lbs	800.00	0.24	192.00
Labor	6/yr	Hrs	12.00	8.00	96.00
TC plants	1/yr	Thou	1000.00	1.50	1500.00
Labor	6/yr	Hrs.	6.00	8.00	48.00
Tractor (land prep)	1/yr	Acre	3.00	12.00	36.00
Labor	1/yr	Hrs	3.00	9.00	27.00
Weed control	3/yr	Acre	1.00	37.20	37.20
DE leafing	3/yr	Acre	3.00	8.00	24.00
Sucker pruning	3/yr	Acre	3.00	8.00	24.00
Bagging operation	1/yr	Plants	1000.00	0.15	150.00
Equipment (tractor, mower, & maint.)	4/yr	Hrs	4.00	10.00	40.00
Irrigation		Acre	1.00	75.69	75.69
Interest on operation costs		\$	4612.39	0.07	322.87
Total pre-harvest variable costs					4935.26

Table 4. Marketing and Harvesting Costs of 'Veinte Cohol' Bananas in Georgia.

Operations	Unit	Quantity	Price	\$Amt/ac
Harvesting	Bunches	950.00	0.20	190.00
Custom packing including packaging materials	Boxes	855.00	1.00	855.00
Cooling, handling, & brokerage	Boxes	855.00	0.15	128.25
Total harvesting & marketing costs				1173.25
Total variable costs				6108.51

Table 5. Fixed Costs of Producing 'Veinte Cohol' Bananas in Georgia

Items	Unit	Quantity	Price	\$Amt/ac
Tractor & equipment	Acre	1.00	136.60	136.60
Overhead & management	\$	4935.26	0.15	740.29
Irrigation	Acre	1.00	341.35	341.35
Total fixed costs				1218.24
Total budgeted cost per acre				7326.74

was obtained from the sales of leaves. Total net return was \$12,773 (Table 7).

Price and Yield Sensitivity Analysis

Sensitivity analysis is used to determine uncertainties and errors that might exist in making business decisions (Ragsdale 2007; Fonsah and Chidebelu 1995). It also helps to address “what if” questions in business decision making. For instance, although our result depicts that at \$1/lb. the expected return is \$1,673, what if the price dropped to \$0.75/lb.? Our sensitivity analysis clearly illustrate that the

expected returns at \$0.75/lb. will be -\$577 with an 84 percent chance of making a profit. However, if the yields increase to 10,000 lbs. the net returns 30 percent of the time would be \$3,361 (Table 8).

Conclusion

The *Musa Veinte Cohol* cultivar is a short-cycle banana that, based on research findings, can be successfully produced in Georgia and the Southeast region 8A of the United States. Several studies have investigated its growth performance and food/fruit production capabilities in this climate but none has

Table 6. Breakeven (BE) Analysis for *Veinte Cohol* banana fruit production in Georgia.

Items	Amount
BE Pre-harvest variable cost per lb.	\$0.55
BE Harvesting & marketing cost per lb.	\$0.13
BE Fixed costs per lb.	\$0.14
BE Total budgeted cost per lb.	\$0.82
BE Yield per lb. (lb.).	7,327

Table 7. Risk-Rated Returns Over Total Costs of Producing ‘*Veinte Cohol*’ Bananas in Georgia.

	Best	Optimistic	Expected	Pessimistic	Worst
Returns (\$)	6,510	5,304	4,098	1,673	-727
Chances (%)	7	16	31	69	1
Chances (%)	93	84	69	31	7
Chance for profit =	88%				
Additional revenue					
Sales of suckers ^a (\$)					10,000
Sales of male flowers ^b (\$)					1,000
Sales of leaves ^c (\$)					100
Net returns per Acre (\$)					12,773

^aAssuming 1 sucker/plant x 1,000 plants = 1,000 suckers @ \$10/sucker.

^bAssuming 1,000 male flowers @ \$1.0 each.

^cAssuming 100 bundles @ \$1.0 each.

investigated its economic impact. This study has demonstrated its financial viability and capabilities as a specialty commercial crop especially for niche and ethnic markets. The *Veinte Cohol* banana cultivar could be an excellent addition to small and limited-resource farmers, part-time farmers, master gardeners, ornamental landscapers, and ornamental nursery owners, with profit margin ranges from \$1,600 to \$12,000 per acre.

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Table 8. Price and Yield Sensitivity Analysis Over Total Costs of Producing *Veinte Cohol* Bananas in Georgia.

	Best	Optimistic	Median	Pessimistic	Worst	Chance of profit		
Yield (lbs.)	12,000	11,000	10,000	9,000	8,000	7,000	6,000	
% chance	7	16	30		-30	-0.16	-7	
Price								
\$0.50	\$5,912	\$4,275	\$2,638	-\$2,827	\$244	-\$514	-\$1,271	45%
\$0.75	\$6,190	\$4,775	\$3,361	-\$577	\$973	-\$10	-\$975	84%
\$1.00	\$6,510	\$5,304	\$4,098	\$1,673	\$1,684	\$479	-\$727	88%
\$1.25	\$6,901	\$5,880	\$4,858	\$3,923	\$2,389	\$941	-\$507	90%
\$1.50	\$7,454	\$6,563	\$5,672	\$6,173	\$3,079	\$1,377	-\$326	90%