



STATE OF FLORIDA
DEPARTMENT OF CITRUS

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BRIEFING MEMORANDUM FOR THE EXECUTIVE OFFICE OF THE GOVERNOR

SUBJECT: Florida State Funding of New Varieties Development Management Corporation (NVDMC)

BACKGROUND

The FDOC requested, and was granted, recurring Citrus Research Special Category funding in the amount of \$650,000 in General Revenue in order to continue the current program that evaluates and prioritizes Florida's need for new citrus varieties, including those needed for consumer market expansion, and disease and pest tolerance.

The Florida Department of Citrus (FDOC) has funded the New Varieties Development Management Corporation (NVDMC) since July 2007 when it was established to support in-state breeding of new citrus varieties for consumer market expansion and disease resistance, conducting non-biased trials, secure the rights to varieties on behalf of citrus growers, and a number of other activities which benefit the Florida citrus grower, the citrus industry and the economy of the State of Florida. The significant decline in citrus crop production over the past several years, primarily associated with the spread of HLB ("citrus greening"), has threatened the funding of the program whose mission is to support in-state breeding of new citrus varieties which may also serve to provide disease tolerance, among other attributes. The Department's traditional, statutory funding source is entirely tied to citrus production. Thus, as production has decreased, so have the funds available in the Citrus Advertising Trust Fund.

TALKING POINTS

- The NVDMC is responsible for introducing and/or facilitating the introduction of 10 new processed orange and 5 new specialty citrus varieties into the commercial sector of the Florida citrus industry since 2007.
- NVDMC varieties provide benefits back to the State through licensure and patents which serve to ensure the interests of the Florida grower are protected. Florida growers have traditionally shared in the cost of these new variety development by offering up land and costs of production.
- There have been more than 600,000 nursery propagations of specialty varieties and more than 500,000 nursery propagations of orange varieties since 2007 that are directly linked to the NVDMC programs.
- Total cumulative propagations of NVDMC tangerine/mandarin nursery stock varieties from 2008 to 2016 represented approximately 22 percent of total tangerine/mandarin nursery propagations, and total cumulative propagations of NVDMC orange nursery stock varieties from 2010 to 2016 represented approximately 2 percent of total orange nursery propagations.

Maximize consumer demand for Florida citrus products to ensure the sustainability and economic well-being of the Florida citrus grower, the citrus industry and the State of Florida.

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- The total economic impacts for the NVDMC varieties estimate additional industry output impacts of nearly \$160.5 million, including \$62.5 million from direct effects, \$16.4 million in indirect effects, and \$81.5 million in induced effects for the new varieties over a ten year period.
- The NVDMC citrus varieties would create or sustain a total of 1,180 fulltime and part-time jobs in the State during the period analyzed.
- Results of the benefit-cost analysis indicate that NVDMC will have a benefit-cost ratio of 8.17 to 1 with continued funding, a positive ratio suggesting that the program's benefits back to the State of Florida and the local communities in which the citrus industry serve outweigh the costs by a considerable margin (8.17:1).
- The results are a conservative estimate as they do not incorporate the plantings of new varieties that have not yet been propagated.

SUMMARY

Investment in new citrus varieties not only provides economic opportunity for growers and processors of the Florida citrus industry, the investment also provides significant economic benefit to the State of Florida. The economic contribution of the Florida greenhouse, nursery, and floriculture production sector on the economy in the State of Florida is approximately \$10 million dollars. More significantly, commercial citrus nursery stock is the launching point in the life of a commercial citrus tree. New citrus varieties are instrumental in promoting fresh and processed Florida citrus over the long-term.

In recent years, it has never been more critical that new citrus crop varieties not only serve to meet the dynamic nature of consumer tastes and preferences, but also to mitigate the harmful impacts of pests and diseases. NVDMC programs have served to expedite the process. Prior to the establishment of NVDMC, Florida released one new citrus variety about every 20 years, NVDMC has played a significant role in bringing more than 50 citrus varieties and selections to the field in Florida in less than 10 years. Florida citrus producers have introduced new and improved varieties of citrus to meet the challenges of various market and supply conditions over the course of more than 100 years of Florida citrus production, but providing growers with the confidence to invest for the long-term viability of the industry requires a collaborative effort.

Maximize consumer demand for Florida citrus products to ensure the sustainability and economic well-being of the Florida citrus grower, the citrus industry and the State of Florida.

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BENEFITS TO FLORIDA ASSOCIATED WITH FUNDING NEW CITRUS VARIETIES RESEARCH & DEVELOPMENT



DECEMBER 12, 2016
FLORIDA DEPARTMENT OF CITRUS
FDOCgrower.com

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Introduction

Research and development of new citrus varieties are instrumental in promoting the fresh and processed Florida citrus industry over the long-term. New citrus crop varieties not only serve to meet the dynamic nature of consumer tastes and preference, they have become a critical component to mitigating the harmful impacts of pests and diseases. Florida citrus researchers have introduced new and improved varieties of citrus to meet the challenges of various market and supply conditions over the course of more than 100 years of Florida citrus production. The Florida citrus industry, in turn, has contributed tremendous economic value back to the State of Florida and the local communities it serves.

The citrus industry in Florida is in the midst of an ongoing effort to mitigate the harmful impacts of the citrus disease, Huanglongbing (HLB) (also known as citrus greening), which can be directly linked to a substantial decline in Florida citrus production. Despite the impacts of HLB, the Florida citrus industry continues to provide significant economic contributions to the State and local communities. The infrastructure of the Florida citrus industry is well-established in key agricultural areas of Florida. Economic activities of the industry include agricultural production of citrus across 30 counties of central and south Florida, fresh fruit grading, packing and shipping to domestic and international markets, citrus processing for juice extraction, and juice packaging for bulk, industrial, and retail distribution (Hodges, et al 2014). Investment in citrus trees requires long-term financial planning, and producer confidence in commercial citrus nursery stock is highly dependent on the ongoing, long-term research effort into new varieties.

Over the last decade, the importation of new citrus varieties are linked to increased domestic consumption of fresh citrus, particularly tangerine varieties. In addition, research into new citrus varieties for the processed market are underway to provide commercial trees that will prove to be tolerant to pests and diseases, improve yields, and restore the Florida citrus industry in the long-term. Market demand for fresh and processed citrus is a key driver in promoting incentives for growers to replant for the long-run.

Purpose of Analysis

The Florida Department of Citrus (FDOC) has funded the New Varieties Development Management Corporation (NVDMC) since July 2007 when it was established to support in-state breeding of new citrus varieties for consumer market expansion and disease resistance, conducting non-biased trials, secure the rights to varieties on behalf of citrus growers, and a number of other activities which benefit the Florida citrus grower, the citrus industry and the economy of the State of Florida. The significant decline in citrus crop production over the past several years, primarily associated with the spread of HLB (“citrus greening”), has threatened the funding of the program whose mission is to support in-state breeding of new citrus varieties which are intended to promote disease resistance, among other attributes. The Department’s traditional, statutory funding source is entirely tied to citrus production. Thus, as production has decreased, so have the funds available in the Citrus Advertising Trust Fund.

In the early years of the program, new varieties were primarily marketed as fresh fruit, the area of the industry that seemed most likely to be negatively impacted by citrus disease and

pests. The fresh fruit portion of the Florida Department of Citrus fund balance had declined significantly at that time such that there was insufficient funding in the Citrus Advertising Trust Fund to support the new varieties research provided by NVDMC at a critical juncture in the fight for long-term industry survival. In recent seasons, research for new varieties has been inclusive of both processed and fresh market varieties. The goals of the NVDMC are to sustain the viability of the Florida citrus grower, to keep new varieties in Florida to provide benefits back to the State through licensure and patents, and to identify, acquire and sub-license promising varieties. Florida growers have traditionally shared in the cost of new variety development by offering up land and costs of production.

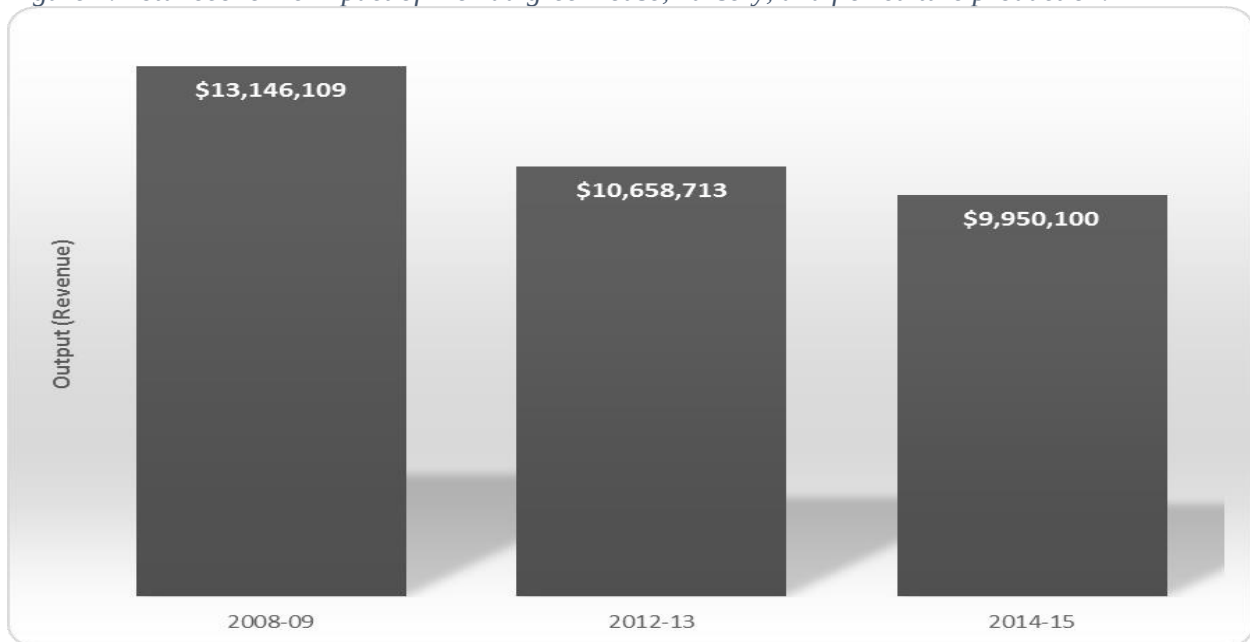
The FDOC requested, and was granted, recurring Citrus Research Special Category funding in the amount of \$650,000 in General Revenue in order to continue the current program that evaluates and prioritizes Florida's need for new citrus varieties, including those needed for consumer market expansion, and disease and pest tolerance. The funding covers administrative, research and program costs incurred.

This analysis evaluates the intended benefits to the State of Florida in investing \$650,000 of General Revenue into continuing the NVDMC programs to support in-state breeding of new citrus varieties for consumer market expansions and disease resistance.

Florida Citrus Nursery Industry

The Florida Bureau of Citrus Budwood Registration Annual Report of 2015-16 reported 54 active citrus nursery stock producers in the State of Florida nurseries engaged in citrus nursery propagations in 2016 with an estimated 88 to 97 percent of citrus nursery propagations intended for commercial use. The total economic contribution of the Florida greenhouse, nursery, and floriculture production sector on the State of Florida is approximately \$10 million dollars (Fig. 1). More significantly, commercial citrus nursery stock is the launching point in the life of a commercial citrus tree. There are approximately 64.7 million commercial citrus trees in the State of Florida, with nearly 58.3 million trees of bearing age (NASS, 2016). The number of annual citrus propagations has ranged between 4.3 million and 7.7 million in recent years. There have been more than 600,000 nursery propagations of specialty varieties and more than 500,000 nursery propagations of orange varieties since 2007 that are directly linked to the NVDMC programs.

Figure 1. Total economic impact of Florida greenhouse, nursery, and floriculture production.

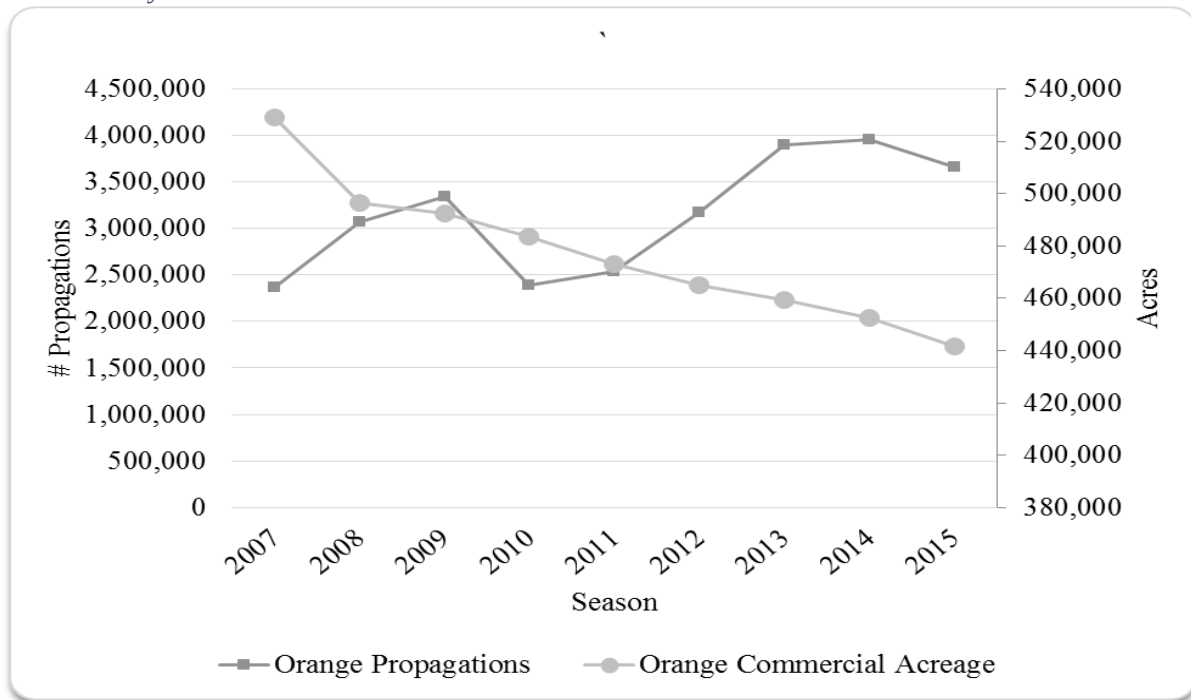


Source: Hodges, et al. *Economic Impact Analysis Program, University of Florida-IFAS, Food & Resource Economics*.

Florida orange propagations have increased in recent years, but have not matched the tree loss rate (Fig. 2). In fact, loss rates for round orange commercial trees and acreage continued the trend of exceeding the replanting rates. Despite the high demand for citrus products worldwide, the uncertainty associated with the harmful impacts of HLB on commercial groves contributed to the slow response rate of replanting efforts. At the same time, the rate of new tree plantings of orange trees have slightly outpaced the total rate of new acreage plantings between the 2013-14 and 2015-15 citrus seasons, suggesting higher tree densities (Spren and Zansler, 2016).

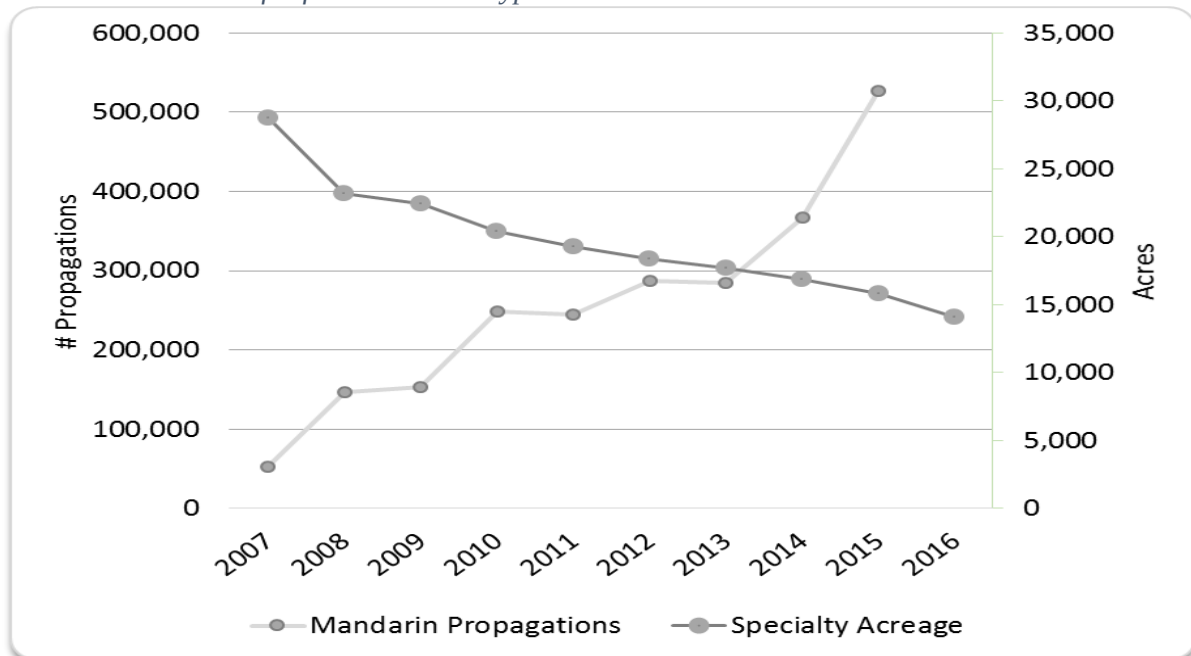
Florida specialty propagations have increased in recent years largely due to the market demand for fresh mandarin varieties (Fig. 3). The value of fresh fruit shipped from packinghouses was estimated at \$332 million for the 2014-15 season. The packinghouse wholesale margin on fresh packed fruit is \$125 million, representing the difference between what is paid by packinghouses (delivered prices) and the value of shipped fruit (F.O.B. prices). Fresh fruit packinghouses supported 1,896 jobs in 2015, and the total output or revenue impact was projected at \$296 million from fresh marketing margins (Hodges, et al., 2014).

Figure 2. Florida orange propagations have increased in recent years, but have not offset the decline in tree inventory.



Source: Florida Department of Agriculture and Consumer Services, Bureau of Citrus Budwood Registration Annual Reports, various issues.

Figure 3. Florida specialty propagations, primarily mandarin, have increased in recent years largely due to the market demand for fresh mandarin-type varieties.



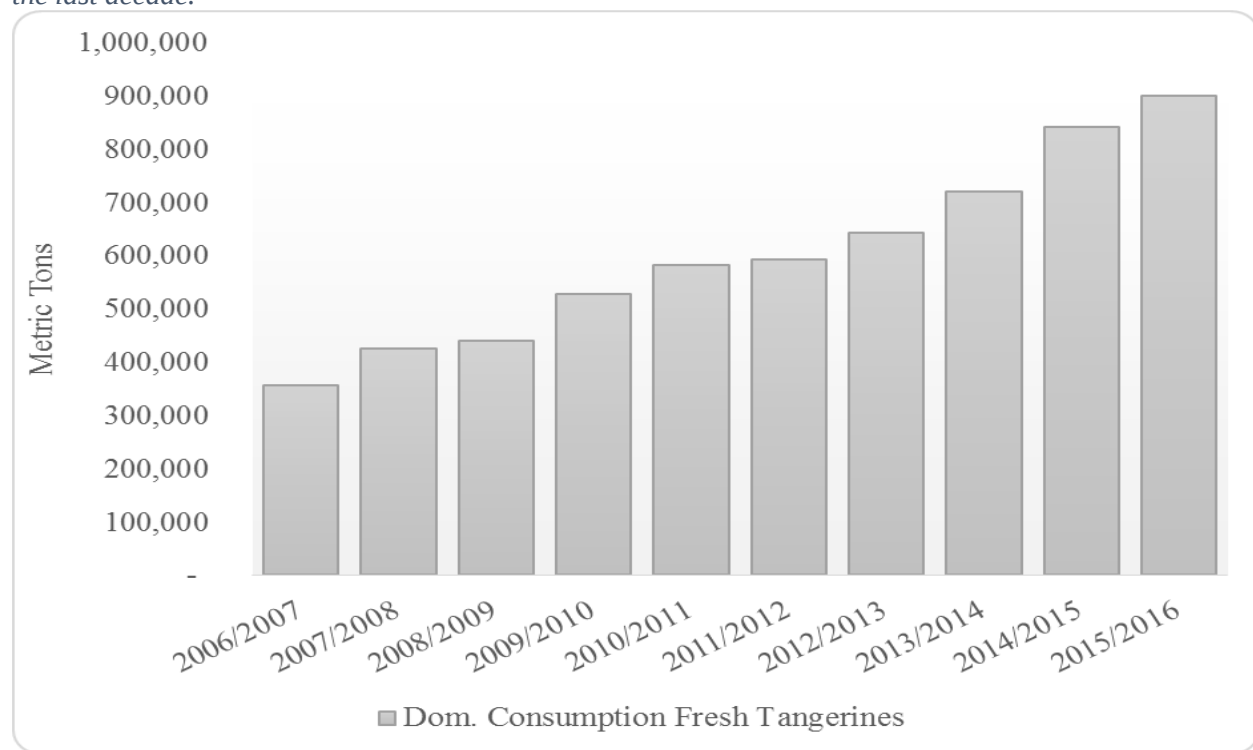
Source: Florida Department of Agriculture and Consumer Services, Bureau of Citrus Budwood Registration Annual Reports, various issues.

Fresh Specialty Citrus

Domestic consumption of fresh specialty citrus varieties is on the rise, with an average annual increase of 11 percent in domestic consumption of tangerine varieties over the last decade (Fig. 4). As a result, the United States is a net importer of fresh tangerines (Fig. 5). With high packout rates (the percent suitable for the fresh market), these easy peel citrus varieties command a premium price on the fresh market.

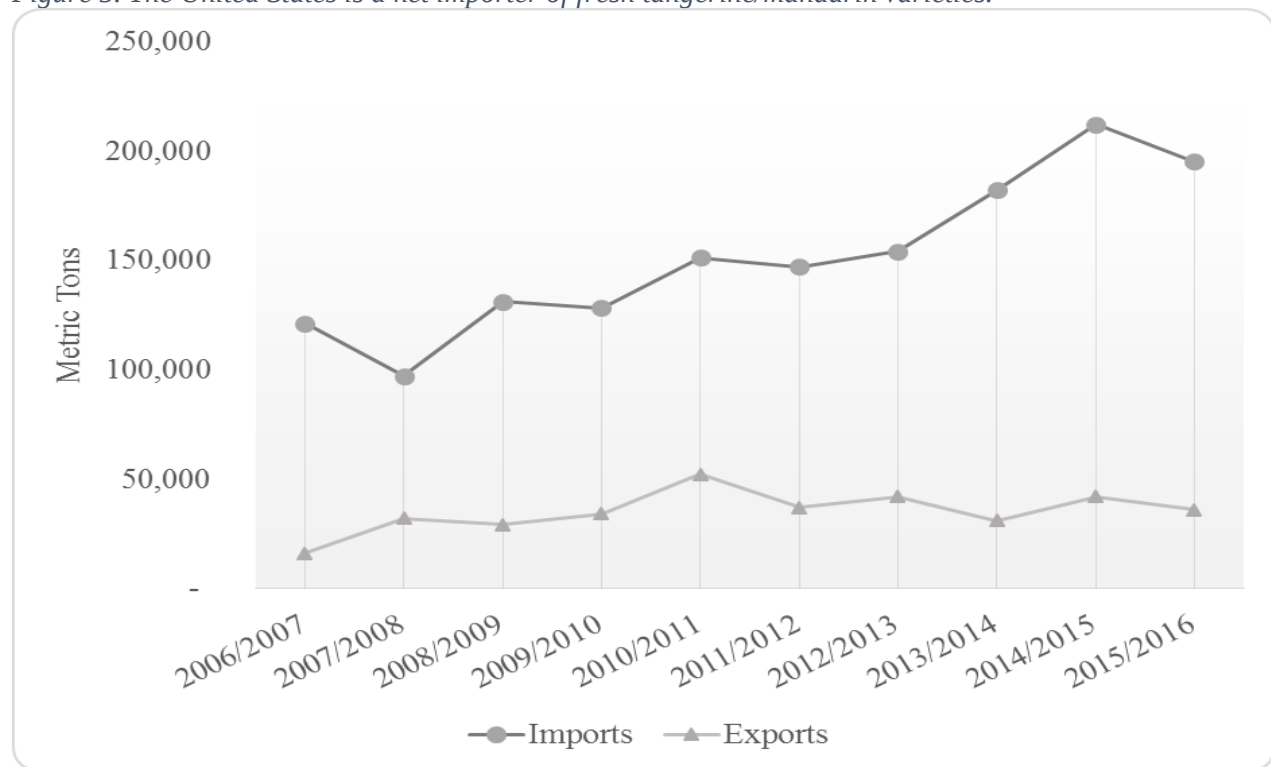
Analysis of new variety investment for specialty citrus differs from processed citrus since a portion of the crop is sold in the fresh market and eliminated fruit (fruit not suitable for the fresh market) is sent for processing. Specialty citrus may also produce higher yields per tree compared to oranges. Fresh-market specialty citrus producers also incur higher caretaking costs since external appearance is imperative for market access. Pests and diseases, such as citrus canker (*Xanthomonas axonopodis* pv. *citri*), have a higher impact on the cost of producing specialty citrus. Specialty citrus may also be planted at higher tree densities.

Figure 4. U.S. domestic consumption of fresh tangerines increased, on average, 11 percent annually over the last decade.



Source: USDA Foreign Agricultural Service. Production, Supply and Distribution Online.

Figure 5. The United States is a net importer of fresh tangerine/mandarin varieties.



Source: USDA Foreign Agricultural Service. Production, Supply and Distribution Online.

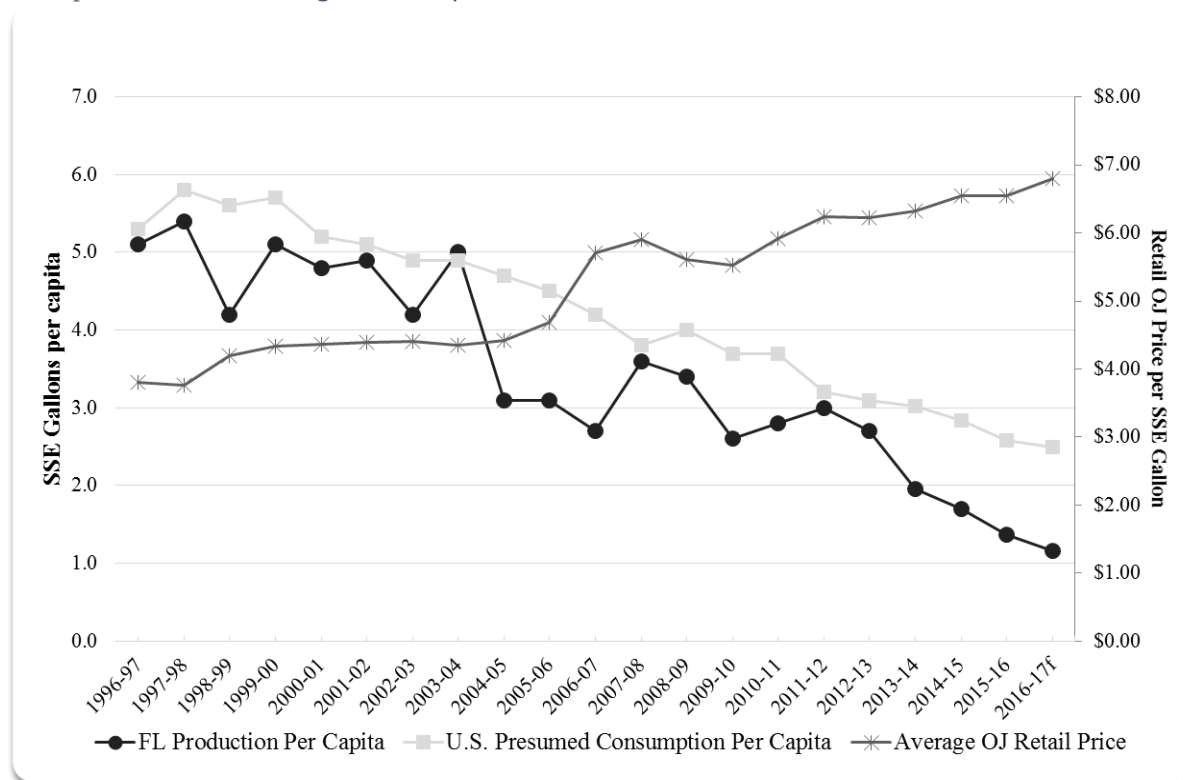
Processed Orange Varieties

The significant decline in retail volumes of orange juice purchases, as measured by FDOC customized Nielsen retail data, over the last several years has been a cause for concern for industry stakeholders. While consumption has declined considerably, it is also important to note that the rate at which world orange juice availability has declined has outpaced the decline in consumption. As retail sales volumes are declining so are levels of production. Often overlooked in media responses to decline in retail sales volume movement are supply-side factors. The relevant concern then becomes whether or not Florida production is being absorbed (e.g., purchased domestically or exported abroad) by the marketplace at much higher prices.

Figure 6 compares total Florida production of orange juice to total U.S. presumed consumption. Using data from 1996-1997 to 2015-16 and the 2016-17 forecast on Florida production of orange juice, presumed consumption, and total U.S. population. Total volumes are converted to per capita volumes based on the U.S. population estimate. Orange juice is measured in millions of single strength equivalent (SSE) gallons. Florida production of orange juice is a calculation based on juice yields as well as total boxes of oranges produced and utilized for processing. Presumed consumption is an approximate measure of market performance. U.S. presumed consumption for orange juice is a disappearance measurement calculated as season-beginning U.S. OJ inventory plus Florida production plus other U.S. production plus U.S. imports minus U.S. exports minus season-ending U.S. inventory.

With the exception of the 2003-04 season, per capita levels of presumed consumption exceeded levels of Florida production. In other words, all volumes of orange juice produced by Florida are absorbed by the market place with additional volume being supplied by imports .

Figure 6. U.S. presumed consumption per capita, Florida OJ production per capita, and average OJ retail price, 1996-97 through 2016-17f.



Benefit-Cost Analysis of Investment in New Varieties

The funding allocated by the State allows for continuity in ongoing research into new varieties that has already yielded both fresh and processed varieties suitable for market. UF/IFAS citrus breeding program at the Citrus Research and Education Center at Lake Alfred has released several new varieties over the past few years. These are both processed and fresh market varieties. The research has reached a critical stage in which research into these and other new citrus varieties must meet with consumer tastes and preferences while remaining a viable option for long-term investment. This section estimates the benefit-cost ratio (BCR) of funding NVDMC programs. The benefit-cost ratio compares the discounted benefits and discounted costs of the program by dividing the quantifiable benefits by the total quantifiable costs. A BCR of greater than 1 indicates that the benefits outweigh the costs.

FDACS, Division of Plant Industry (DPI) data on the number of number of propagations, by variety, attributed to the NVDMC since the 2007-08 season was used for this analysis. The data is reported in Table 1. Total cumulative propagations of NVDMC orange nursery stock

varieties from 2010 to 2016 represented approximately 2 percent of total orange nursery propagations over the same time period. Total cumulative propagations of NVDMC tangerine/mandarin nursery stock varieties from 2008 to 2016 represented approximately 22 percent of total tangerine/mandarin nursery propagations over the same time period (FDACS, DPI, 2016).

Estimated production from existing new varieties

This analysis assumes that 100 percent of the reported NVDMC propagations are were planted two seasons later in commercial citrus groves as these varieties were propagated solely for commercial production. Next, the commercial tree inventory for these varieties was estimated on an annual basis through the 2020-21 season, assuming a one percent death loss in the first two seasons and a three percent death loss each season thereafter. A conservative yield curve was applied to each variety to project fruit production for each season beginning in the 2011-12 season for fresh market varieties and the 2012-13 season for processed varieties. In this analysis, a 10-year investment horizon is used for both fresh and processed citrus fruit. Under current production practices, trees reach their maximum yield at age by 5 years. It is assumed that the citrus tree begins to produce a marketable crop by year 2. In this analysis, it is assumed that the land being planted was previously used for citrus production. The analysis does not predict new plantings of new varieties, and the results reflect only the trees propagated under the NVDMC programs to date. Projected fruit production for the processed market varieties, by season, are shown in Table 2. Projected fruit production for the fresh market varieties by season are shown in Table 3.

To calculate the economic impact of the production from these new varieties, the delivered-in value of the fruit was first calculated. For processed fruit, it is assumed that the on-tree value is \$10.00 per box and the cost of pick and haul is \$3.10 per box giving a delivered-in price of \$13.10 box, regardless of the specific variety. The estimate is likely to understate the value given that some varieties will have a higher value due to improved juice quality or earlier maturity. For fresh fruit, a packout rate of 70 percent is assumed across all varieties. The on-tree fresh value is assumed to be \$24.00 per box and the value of eliminated fruit is \$5.00 per box. Pick and haul is assumed to be 3.25 per box which may grossly understate pick cost if the fruit must be clipped. Delivered-in value for fresh and processed varieties across season is shown in Tables 4 and 5, respectively.

Table 1. Florida propagations of NVDMC new varieties

Variety/Cultivar	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Processed Oranges										
Florida EV1 UF B7-70							5	30	1,442	932
Florida EV2 UF SF14W-65							5	30	1,275	484
Hamlin UF N13-32							4,059	11,598	3,372	
Midsweet LS UF SF11-1-24						45	163	30		
Sweet Orange UF OLL4								2,685	63,647	15,739
Sweet Orange UF OLL8			628		382	1,839	5,382	43,846	229,389	9,920
Valencia UF B9-65					1,727	664	3,354	4,001	2,966	2,050
Valenfresh N7-3			58			44	150	1,283		
Valquarius LT UF SF14W-62								425	12,803	1,332
Valquarius UF SF14W-62			2,788	1,586	2,171	2,713	7,249	18,980	42,424	1,593
Total Oranges			3,474	1,586	4,280	5,305	20,367	82,908	357,318	32,050
Specialty										
Early Pride US 1-62-122			1,432	10,805	2,132	14,551	56,676	34,802	124,075	2,259
Bingo UF 7-6-27								387	39,754	10,533
Mandarin UF Glow 10-02								120	8,108	397
Sugar Belle UF LB8-9	828	375	3,148	4,130	2,444	3,232	3,285	15,192	76,500	8,163
Tango CGIP-168		127	1,467	13,037	34,548	7,219	43,345	46,011	35,851	563
Total Specialty	828	502	6,047	27,972	39,124	25,002	103,306	96,512	284,288	21,915

Source: FDACS, Citrus Budwood Annual Report, various issues.

Table 2. Evolution of the tree inventory of new varieties of Processed Oranges

Tree Age	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	3,474	1,586	4,280	5,305	20,367	82,908	357,318	32,050		
2		3,439	1,570	4,237	5,252	20,163	82,079	353,745	31,730	
3			3,405	1,554	4,195	5,199	19,962	81,258	350,207	31,412
4				3,303	1,508	4,069	5,043	19,363	78,820	339,701
5					3,204	1,463	3,947	4,892	18,782	76,456
6						3,108	1,419	3,829	4,745	18,219
7							3,014	1,376	3,714	4,603
8								2,924	1,335	3,602
9									2,836	1,295
10										2,751
Total Trees										478,039

Table 3. Evolution of the tree inventory of new varieties of Specialty Citrus

Tree Age	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	828	502	6,047	27,972	39,124	25,002	103,306	96,512	284,288	21,915	605,496	
2		820	497	5,987	27,692	38,733	24,752	102,273	95,547	281,445	21,696	
3			812	492	5,927	27,415	38,345	24,504	101,250	94,591	278,631	21,479
4				787	477	5,749	26,593	37,195	23,769	98,213	91,754	270,272
5					764	463	5,576	25,795	36,079	23,056	95,266	89,001
6						741	449	5,409	25,021	34,997	22,365	92,408
7							718	436	5,247	24,271	33,947	21,694
8								697	423	5,089	23,543	32,929
9									676	410	4,937	22,836
10										656	398	4,789
Total Trees												555,407

Table 4. Projected boxes produced and delivered-in value of processed oranges 2012-13 through 2020-21.

Tree Age	Yield	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
	(boxes/tree)	(total boxes)								
1	0									
2	0.25	860	393	1,059	1,313	5,041	20,520	88,436	7,932	
3	0.5		1,702	777	2,097	2,600	9,981	40,629	175,104	15,706
4	1			3,303	1,508	4,069	5,043	19,363	78,820	339,701
5	2				6,407	2,925	7,894	9,784	37,564	152,912
6	2					6,215	2,837	7,657	9,491	36,437
7	2						6,029	2,752	7,427	9,206
8	2							5,848	2,670	7,204
9	2								5,672	2,590
10	2									5,502
Delivered-in Boxes		860	2,095	5,139	11,325	20,850	52,304	174,469	324,680	569,258
Delivered-in Value		\$11,264	\$27,444	\$67,324	\$148,364	\$273,132	\$685,180	\$2,285,550	\$4,253,314	\$7,457,281

Table 5. Projected boxes produced and delivered-in value of specialty citrus, 2012-13 through 2020-21.

Tree Age	Yield	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
	(box/tree)	(boxes)									
1	0										
2	0.25	124	1,497	6,923	9,683	6,188	25,568	23,887	70,361	5,424	
3	0.5	406	246	2,963	13,708	19,173	12,252	50,625	47,296	139,315	10,739
4	1		787	477	5,749	26,593	37,195	23,769	98,213	91,754	270,272
5	2			1,527	926	11,153	51,590	72,158	46,112	190,533	178,002
6	2			-	1,481	898	10,818	50,043	69,994	44,729	184,817
7	2			-	-	1,437	871	10,494	48,541	67,894	43,387
8	2						1,394	845	10,179	47,085	65,857
9	2							1,352	820	9,873	45,672
10	2								1,311	795	9,577
Delivered-in Boxes		530	2,530	11,891	31,547	65,441	139,689	233,173	392,827	597,402	808,324
Delivered-in Fresh		11,422	\$54,518	\$256,246	\$679,836	\$1,410,261	\$3,010,295	\$5,024,872	\$8,465,422	\$12,874,017	\$17,419,383

Expected effects for Florida

The delivered-in value was applied to estimate total economic impact using the IMPLAN regional economic modeling system and associated databases (IMPLAN Group, LLC), to estimate the broad regional impacts of the industry, including economic multipliers that capture the secondary economic activity generated in other sectors by re-spending of income from the sale of Florida citrus products (Hodges, et al., 2016). Using the results shown in Tables 2-5, the additional economic contribution associated with the NVDMC varieties is estimated. The Florida citrus fruit delivered-in value for selected propagated varieties in each season are reported in Table 6.

The total economic impacts for the selected varieties are shown in Table 7. The economic impact analysis results show additional industry output impacts of nearly \$160.5 million, including \$62.5 million from direct effects, \$16.4 million in indirect effects, and \$81.5 million in induced effects for the new varieties over a ten year period.¹ The NVDMC citrus varieties would create or sustain a total of 1,180 fulltime and part-time jobs in the State during the period analyzed. Total value added impacts, estimated at nearly \$95.7 million, would represented the new varieties contribution to Gross Domestic Product of the State. Labor income impacts are expected to reach \$60.8 million over the period analyzed. The labor impacts represent earnings by employees and business owners.²

¹ From Hodges, at al., 2014: “Economic multipliers measure the total changes in an economy resulting from a given change in direct output or employment. There are three components of multipliers: direct, indirect and induced. Direct effects represent the initial change in the industry in question, indirect effects represent changes in inter-industry transactions as supplying industries respond to changes in demands from the directly affected industries, and induced effects reflect changes in local spending that result from income changes in employee and proprietor households and state/local and federal governments. Social Accounting Matrix (SAM) multipliers in IMPLAN account for capital investment, taxes, and transfer payments such as social security, welfare, retirement pensions, and savings by household. Regional models may be constructed with IMPLAN for a single county, groups of contiguous counties, or an entire state or region. In this case, the study region was defined as the state of Florida. Regional data for the model represent 2012, the most recent information available from IMPLAN based on the U.S. System of National Accounts and the Regional Economic Information System maintained by the U.S. Commerce Department. Information used in the model is specific to the state of Florida for industry output, employment, income, and trade, while national averages are used to estimate transactions between industries. The model was constructed with social accounts for households, governments (state/local, federal), and capital investment internalized. This analysis used the Regional Purchase Coefficients (RPC) version of the model for estimating trade flows to be consistent with past studies.”

² The Florida Department of Citrus wishes to extend their appreciation to Dr. Alan Hodges, Director of the UF Program in Economic Impact Analysis in the Food and Resource Economics Department at the University of Florida, for providing the economic impact analysis results associated with the estimated production from new varieties.

Table 6. Florida citrus fruit delivered-in value for selected propagated varieties for seasons 2011-12 through 2020-21.

Year	Processed fruit	Fresh fruit	Total value
2011-12		\$11,422	\$11,422
2012-13	\$11,264	\$54,518	\$65,781
2013-14	\$27,444	\$256,246	\$283,690
2014-15	\$67,324	\$679,836	\$747,160
2015-16	\$148,364	\$1,410,261	\$1,558,625
2016-17	\$273,132	\$3,010,295	\$3,283,427
2017-18	\$685,180	\$5,024,872	\$5,710,053
2018-19	\$2,285,550	\$8,465,422	\$10,750,972
2019-20	\$4,253,314	\$12,874,017	\$17,127,331
2020-21	\$7,457,281	\$17,419,383	\$24,876,663
Total	\$15,208,852	\$49,206,272	\$64,415,124

Source: Implan model for the Florida citrus industry 2012 (Implan Group LLC).

Table 7. Total economic impacts of NVDMC varieties from 2007-2021.

Impact Type	Employment (Jobs)	Labor Income	Value Added	Industry Output
Direct Effect	336	\$21,919,540	\$33,895,412	\$62,508,096
Indirect Effect	235	\$7,951,884	\$9,594,966	\$16,441,773
Induced Effect	608	\$30,973,559	\$52,163,770	\$81,532,617
Total Effect	<u>1,180</u>	<u>\$60,844,983</u>	<u>\$95,654,148</u>	<u>\$160,482,486</u>

Values in 2016 dollars. Employment represents fulltime and part-time jobs.

Source: Implan model for the Florida citrus industry 2012 (Implan Group LLC).

Benefit-Cost Ratio of investment in new varieties

The benefit-cost ratio (BCR) in this section measures the overall value to Florida in the investment into new citrus varieties using the IMPLAN results. Results of the analysis indicate that NVDMC will have a ratio of 8.17 with continued funding, a positive ratio suggesting that the program's benefits back to the State of Florida and the local communities in which the citrus industry serve outweigh the costs by a considerable margin (8.17:1). The results are a conservative estimate as they do not incorporate the plantings of new varieties that have not yet been propagated.

Table 8. IMPLAN events for fruit farming sector with Benefit-Cost Ratio

Year	Industry Sales	Event Year	Output Deflator	GDP Deflator	Deflated value 2012	Deflated value 2016	NVDMC Spend	NVDMC Spend Deflated value 2016
2006-07			0.965	0.900			231,230	246,086
2007-08			0.972	0.920			488,074	515,692
2008-09			0.979	0.940			488,404	512,350
2009-10			0.986	0.960			564,273	587,737
2010-11			0.993	0.980			485,500	502,123
2011-12	\$11,422	2012	1.000	1.000	\$11,422	\$11,730	538,818	553,366
2012-13	\$65,781	2013	1.007	1.021	\$65,324	\$67,087	590,309	602,033
2013-14	\$283,690	2014	1.014	1.042	\$279,773	\$287,327	527,581	534,345
2014-15	\$747,160	2015	1.020	1.064	\$732,510	\$752,288	500,000	503,431
2015-16	\$1,558,625	2016	1.027	1.086	\$1,517,648	\$1,558,625	650,000	650,000
2016-17	\$3,283,427	2017	1.034	1.108	\$3,175,461	\$3,261,199	500,000	496,615
2017-18	\$5,710,053	2018	1.041	1.131	\$5,485,161	\$5,633,261	500,000	493,277
2018-19	\$10,750,972	2019	1.048	1.155	\$10,258,561	\$10,535,542	500,000	489,983
2019-20	\$17,127,331	2020	1.055	1.179	\$16,234,437	\$16,672,767	500,000	486,730
2020-21	\$24,876,663	2021	1.077	1.203	\$23,098,109	\$23,721,758	500,000	476,787
Total	\$64,415,124				\$60,858,407	\$62,501,584	\$7,564,188	\$7,650,552

Benefit-Cost Ratio = 8.17

Summary

Investment in new citrus varieties not only provides economic opportunity for growers and processors of the Florida citrus industry, the investment also provides significant economic benefit to the State of Florida. The economic contribution of the Florida greenhouse, nursery, and floriculture production sector on the economy in the State of Florida is approximately \$10 million dollars. New citrus varieties are instrumental in promoting fresh and processed Florida citrus over the long-term. In recent years, it has never been more critical that new citrus crop varieties not only serve to meet the dynamic nature of consumer tastes and preference, but also to mitigate the harmful impacts of pests and diseases. Florida citrus producers have introduced new and improved varieties of citrus to meet the challenges of various market and supply conditions over the course of more than 100 years of Florida citrus production, but providing growers with the confidence to invest for the long-term viability of the industry requires a collaborative effort.

The Florida citrus industry, in turn, has contributed economic value back to the State of Florida and the local communities it serves. Maintaining the status quo in the citrus nursery industry and reducing funding for new varieties at this juncture would adversely impact replanting efforts, hinder the ability of the citrus industry to maintain and/or meet new market demand, contribute to further loss of market access, and reduce the economic contribution to the State of Florida and the local communities served by the Florida citrus industry. Total state and local tax impacts of the Florida citrus industry were \$326 million in 2014. This includes most forms of local and state taxes, such as property tax, sales tax, water management district, intangible taxes, motor fuel and vehicle taxes, and excise taxes (Hodges, et al, 2014).

This analysis measured the overall value to Florida in the investment into new citrus varieties. The results indicate that funding of NVDMC over a 15 year period would provide net benefits of nearly \$8.71 for every dollar invested. The results are based on conservative assumptions. The results show that economic contributions are measured in terms of direct, indirect, and induced benefits. The qualitative benefits of investment in new citrus varieties also include reduced production losses each season, as well as efficiencies in the costs of production.

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NEW VARIETIES

DEVELOPMENT & MANAGEMENT CORP.

An impactful Private/Public partnership since 2007

- Brings focus to the process of variety development, release and commercialization, involving a myriad of agencies and organizations
- Provides strategic and financial support to the Florida-based breeding programs
- Understanding that most promising new citrus cultivars developed locally, in other states and countries, will involve patents and licensure; offers a mechanism through which Florida can respond on behalf of the Florida Citrus grower. NVDMC serves as a central licensing mechanism for growers, nurseries and packers. This includes publicly and privately developed citrus varieties. The existence of NVDMC ensures that varieties prices will not unfairly escalate, all interested growers have an equal opportunity to participate, that the breeding programs are well supported, and variety rights are not acquired for the purpose of stifling competition.
- Brings the Florida grower to the table to help establish breeding priorities, advise on issues related to evaluation and commercialization of new citrus selections.
- Prior to the establishment of NVDMC, Florida released approx. one variety about every 20 years. NVDMC has played a significant role in bringing more than 50 citrus varieties and selections to the field in Florida. Not all of these will prove suitable for Florida's unique and challenging growing conditions, but 14 of them are already available for commercial planting and the 15th is expected to move to commercial status soon.
- NVDMC has Identified and removed barriers to successful release of new citrus cultivars. In some cases this involved addressing needed regulatory changes and other times it involved the purchase of better equipment for state agencies and bureaus. These bottleneck removals included:
 - The speeding up DPI cleanup processes from 36-60 months to 12-18 months by providing specialized training to staff and administration; buying important equipment that was not being funded by the state budget.
 - The installation of trellis systems for both USDA and IFAS breeding programs which accelerated the flowering and fruiting of new species of citrus by more than two years.
 - Leading the charge to more than triple the capacity of DPI quarantine services, providing clean plant material for trials and nursery production.
 - Hiring the necessary help for both USDA and IFAS breeding programs to catalog and evaluate the new cross breeds in a timely and accurate way.
 - Developing an industry wide new variety evaluation process for USDA and IFAS that looked at new selections when they were ready throughout the year instead of once or twice annually.
 - Involved growers, packers, marketers, along with the plant breeders to evaluate new selections instead of only plant breeders as had been the past practice.

- Worked closely with IFAS and its DSO (FFSP) to protect Florida growers with a release program designed to provide equal access to new varieties, while helping prevent overplanting of new releases thus making them long term non-profitable.
- NVDMC represents a private/public partnership in variety development and commercialization that is the envy of the world. NVDMC was held up at a World Citrus Congress as an example of how things can be done the right way – with adequate planning and support.
- The NVDMC Board of Directors is among the most diverse and active Boards in the citrus industry. It is truly a representative cross section of the industry. Board members are appointed by: Florida Citrus Mutual, Florida Citrus Packers, Indian River Citrus League, Budwood Technical Advisory Committee, FNGLA, Florida Citrus Production Managers, and Gulf Citrus Growers Association – and the Board members serve at the pleasure of these groups. Additionally, each of these groups appoint members of the Processed Orange Advisory Board, to advise the NVDMC Board, UF-IFAS, Florida Foundation Seed Producers and USDA on issues related to oranges for processing.
- NVDMC has supported the development of new breeding lines at UF and USDA, which will enable them to be much more effective and efficient in years to come.
- Although NVDMC's early work was solely focused on the development of varieties with consumer-demanded traits, it became necessary to screen for disease tolerance. As a result, much of the tolerant citrus selections available to growers (excluding rootstocks), were the result of work funded all or in part by NVDMC.
- NVDMC works very closely with all of the important segments of the industry: Grower Groups, Marketing Groups, Nurseries, Packinghouses, Processors, FDACS, USDA, The National Germplasm Repository for Citrus and Dates, Foundation Farms and individual growers. NVDMC makes more than 60 presentations each year, as a way of keeping the industry informed of the issues.
- NVDMC works closely with its international partners and colleagues to identify citrus selections for trial and possible commercialization in Florida.
- NVDMC seeks global rights to new fresh citrus selections in order to manage the introduction and commercialization in the best interest of the Florida grower. For fruit for processing, it works closely with USDA and/or UF-IFAS to meet the same objective.
- Although some commercial planting has occurred of NVDMC managed varieties, most growers are planting trial acreage. If these trials prove successful, the growers will plant much larger acreage. The five acres that are planted today are critical to the success of the program – because if that five acres works, it may result in the planting of thousands or tens of thousands of acres of citrus.