

FEELING THE SQUEEZE: CITRUS GREENING POLICY IN THE WESTERN HEMISPHERE

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ABSTRACT

After battling various citrus diseases over the centuries, the citrus industry is faced with the powerful effects of Huanglongbing (HLB), citrus greening disease. HLB has made its way to the Western Hemisphere infecting the biggest citrus producers, Florida and Brazil. The devastating effects of HLB have forced governments and citrus growers to explore policies and tactics to control the disease. This article illustrates HLB, how the disease is vectored, and how quickly it can deteriorate and shorten the lifespan of citrus trees. Along with explaining how the disease works, this article highlights governmental policies and citrus grower tactics in the United States and Brazil used to control the disease. Highlighting policies and tactics from the United States and Brazil will allow comparisons to be drawn between the two countries for the purpose of finding a HLB policy applicable to all growers affected. Policy measures taken by the state and federal governments of both the United States and Brazil impact the fight against the disease. Policies already undertaken will be explored, in addition to, suggestions offered by legal and agronomic scholars attempting to protect the interests of citrus growers and producers around the world.

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I. INTRODUCTION

The citrus industry in the Western Hemisphere is under attack. After centuries of battle with black spot disease and citrus canker,¹ citrus growers are now faced with a new, incredibly powerful opponent—Huanglongbing (HLB). HLB, commonly referred to as citrus greening disease, vectored by a tiny brown insect known as the Asian Citrus Psyllid, has now taken center stage as the biggest threat to citrus growers in the Western Hemisphere.² Most orange groves in Florida have been infected.³ Estimates show the state's citrus production steadily declining.⁴ Florida Commissioner of Agriculture, Adam Putnam, asserts Florida's citrus production is down 70% of what it was only twenty years ago.⁵ In addition to the spread of citrus greening, Hurricane Irma, which made landfall in early September 2017, has wreaked havoc on the state's groves—pulling trees out of the ground and flooding huge tracts of land.⁶

Florida is not the only region affected by citrus greening. Brazil, while more insulated from the spread of disease due to its geography, has also experienced the effects of HLB. Brazilian market indicators have shown Brazilian citrus production has reached the lowest volumes since the 1990s.⁷ With production declining and lack of effective means to eradicate HLB, policy makers at the federal and state level in the United States, as well as in Brazil, must find solutions to prevent HLB from destroying the industry.

This article illustrates citrus greening, how the disease is vectored, and how quickly it can deteriorate and shorten the lifespan of citrus trees. Along with

1. See Tim R. Gottwald et al., *Citrus Canker: The Pathogen and Its Impact*, AM. PHYTOPATHOLOGICAL SOC'Y (July 17, 2002), <https://perma.cc/8PTH-CDHN>.

2. Elizabeth Graffton-Cardwell, *Huanglongbing (HLB or Citrus Greening)*, CENTER FOR INVASIVE SPECIES RESEARCH UNIVERSITY OF CALIFORNIA, RIVERSIDE, <https://perma.cc/6EZH-QKTX> (archived Sept. 7, 2018).

3. See Greg Allen, *Time Is Running Out To Save Florida's Oranges*, NPR (Dec. 27, 2013), <https://www.npr.org/sections/thesalt/2013/12/27/257632396/time-is-running-out-to-save-floridas-oranges>.

4. MARISA L. ZANSLER, FLA. DEP'T OF CITRUS, FLORIDA CITRUS SEASON RETROSPECTIVE: 2016-17 SEASON FINAL SEASON OUTLOOK UPDATE 2 (Sept. 2017), <https://app.box.com/embed/s/2n5zfo2cur/file/282994135343>.

5. Jim Turner, *Citrus Production Continues to Decline in Florida*, ORLANDO WEEKLY (Oct. 12, 2016), <https://perma.cc/S75Z-JKF2>.

6. Julie Wernau, *Why Your Orange Juice Might Be from Brazil: Florida's Trees are Dying*, WALL STREET J. (Sept. 26, 2017), <https://www.wsj.com/articles/floridas-orange-industry-symbol-of-a-state-is-dying-1506437044>.

7. U.S. DEP'T OF AGRIC. FOREIGN AGRICULTURAL SERVICE, GAIN REPORT BR16020 (Dec. 15, 2016), <https://perma.cc/483U-9ARY>.

explaining how the disease works, this article highlights governmental policies and citrus grower tactics to control the disease in various regions in the United States (primarily California and Florida), as well as, regions in Brazil. Highlighting policies and tactics from the United States and Brazil will allow comparisons to be drawn between the two countries for the purpose of finding a citrus greening policy applicable to all growers affected.

Policy measures taken by the state and federal governments of both the United States and Brazil impact the fight against citrus greening. Policies already undertaken will be explored, in addition to, suggestions offered by legal and agronomic scholars attempting to protect the interests of citrus growers and producers around the world.

Before addressing citrus greening, it is important to understand worldwide production and consumption of citrus. The United States Department of Agriculture (USDA), Foreign Agriculture Service reports for the 2017-2018 year, reported global orange juice consumption measured around 1.7 million metric tons indicating consumption of orange juice in the United States is down.⁹ Some agronomists explain the decrease in consumption as a reaction by consumers to inflated prices of orange juice.¹⁰ This inflation is related to citrus greening's effect on orange growers.¹¹ Supply and demand dictates that if growers are unable to produce as much citrus as in the past, the retail price of orange juice will increase. While orange juice is still the number one beverage preferred by juice drinkers in the United States,¹² it stands to reason that as juice prices rise, the number of people drinking it will continue to fall.

Florida's orange production dropped 16% in 2016-2017,¹³ the lowest amount of production the state has seen since 1952-1953.¹⁴ Production is expected to drop an additional 14.2% this year.¹⁵ This decline in production translates to a 19.5% decline in the availability of orange juice.¹⁶ A decrease in the availability of orange

8. U.S. DEPT. OF AGRIC., CITRUS: WORLD MARKETS AND TRADE (Jan. 2018), <https://perma.cc/5RNF-YGWJ>.

9. *Id.* (In 2010-2011, global consumption was around 2.2 million metric tons).

10. ZANSLER, *supra* note 4, at 2.

11. *Id.*

12. Marcos Fava Neves, *A Bitter Analysis of the World's Orange Juice Market*, CITRUS INDUSTRY NEWS, <https://perma.cc/3WLD-FJVX> (archived April 14, 2018).

13. ZANSLER, *supra* note 4, at 2.

14. *Id.*

15. *Id.*

16. *Id.*

juice will likely lead to an increase in price, causing harm to growers and consumers alike.¹⁷

Brazil is experiencing similar effects of citrus greening. In 2016-2017, production in the state of São Paulo was expected to decrease 23%.¹⁸ Brazil's juice yield is down 19.5% from last season.¹⁹ Additionally, average tree productivity in Brazil is down 19.1% from last year.²⁰ Notably, Brazil has been more fortunate than Florida in its production capacity as its production has actually increased from 2016 to 2017.²¹ While production capacity has increased, average tree productivity has declined—so even with more capacity to produce, citrus greening has had an effect on Brazilian citrus production.²² Fruit coming off the tree is simply not as healthy as it has been in years past, something potentially related to citrus greening.²³ The University of Florida points out that less healthy fruit as a product of citrus greening infection can affect how the fruit looks and tastes.²⁴

California has also experienced the squeeze of citrus greening. Valencia orange production in California has steadily declined since 2008, with estimates drastically dropping for the 2016-2017 year.²⁵ These three regions, California, Florida, and Brazil, represent a significant portion of citrus producing areas in the Western Hemisphere; all three experiencing production declines attributable to citrus greening. Policy changes in all three regions are going to be vital to the survival of the industry.

As evidenced by the data above, citrus production is on the decline in Florida, Brazil, and California. Other factors may be influencing the consumption numbers for citrus in the United States and globally for example, price inflation

17. *Id.*

18. *Id.* at 3.

19. *Id.* at 4.

20. Marco Fava Neves, *What to Expect from Brazil's Next Citrus Season*, CITRUS INDUSTRY NEWS, <http://citrusindustry.net/2016/09/06/expect-brazils-next-citrus-season/> (last visited June 8, 2018).

21. U.S. DEPT. OF AGRIC., CITRUS: WORLD MARKETS AND TRADE (Jul. 2018), <https://perma.cc/GQ2F-CLR4>.

22. *Id.*

23. *Watery Crop Dilutes Brazil Orange Juice*, ARK. DEMOCRAT – GAZETTE (Feb. 15, 2017).

24. CITRUS GREENING FAQ, UNIV. FLA. INST. OF FOOD & AGRIC., <https://perma.cc/7ELG-539S> (archived April 14, 2018).

25. 2016-17 CALIFORNIA VALENCIA ORANGE OBJECTIVE MEASUREMENT REPORT, CAL. DEP'T. OF FOOD & AGRIC. (Mar. 8, 2017) <https://www.cacitrusmutual.com/wp-content/uploads/2015/11/16-17-CA-Valencia-Orange-Objective-Measurement-Report.pdf>.

and dietary changes away from sugar-loaded juice.²⁶ Citrus greening is playing a major role in afflicting a global industry.

II. THE DISEASE

Citrus greening is a disease vectored by the Southeast Asian Citrus Psyllid.²⁷ Huanglongbing, the formal name for citrus greening, has been responsible for the destruction of citrus industries in Asia and Africa.²⁸ While first reported in Brazil in 1942,²⁹ the disease was not reported in Florida until 1998³⁰ and California in 2008.³¹ An adult psyllid can transfer the disease in as little time as fifteen minutes.³² In the time it takes to peel and eat an orange, a tree can become infected. Once infected, the tree will die.³³ While still productive after infection, the fruit generated is smaller, misshapen, and abnormally colored.³⁴ Most fruit grown on an infected tree will fail to reach maturity.³⁵ If maturity is reached, the fruit tends to have a bitter taste.³⁶ Root systems become infected, suppressing new growth.³⁷ The incredibly short time it takes a tree to become infected bode dire ramifications of citrus greening for the citrus industry.

Researchers at the University of Florida are attempting to find a cure for citrus greening.³⁸ While this is positive progress, researchers believe that it will be

26. Roberto A. Ferdman, *How America Fell out of Love with Orange Juice*, QUARTZ (Feb. 26, 2014), <https://perma.cc/358G-XCWE>.

27. Frank W. Mead, *Asian Citrus Psyllid*, UNIV. OF FLA. INST. OF FOOD & AGRIC. SERV. (Dec. 2014), <https://perma.cc/A2NE-Y57U>.

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

32. *Id.*

33. *Asian Citrus Psyllid and Huanglongbing*, CITRUS PEST & DISEASE PROGRAM, <https://perma.cc/Q3LM-VXAD> (archived April 10, 2018).

34. CITRUS GREENING (HUANGLONGBING), UNIV. FLA. INST. OF FOOD & AGRIC. SERV., <https://perma.cc/WYH3-ELEK> (archived April 10, 2018).

35. *Id.*

36. *Id.*

37. *Id.*

38. Currently there is no cure for citrus greening, but the Lake Alfred Citrus Research Center is actually developing a genetically modified tree immune to the effects of citrus greening by cutting out the genes in citrus trees that make them susceptible to citrus greening. Dan DeWitt, *UF Research Shows Promise in Finding Cure for Citrus Greening*, TAMPA BAY TIMES (Oct. 17, 2016), <http://www.tampabay.com/news/business/agriculture/uf-research-shows-promise-in-finding-cure-for-citrus-greening/2298398>.

years before an immune tree becomes productive.³⁹ While genetically modified trees' immunity to citrus greening is encouraging for the future, action needs to be taken now to thwart the disease.

The citrus industry plays a large part in the economies of the United States and Brazil.⁴⁰ As of 2017, there were 4,000 citrus growers in the state of Florida, and roughly 45,000 people working in the citrus industry.⁴¹ The citrus industry in Florida accounts for \$8.6 billion of economic activity for the state.⁴² Citrus growers are not all huge corporations. The number of small growers is receding,⁴³ but family run operations still exist, as growing citrus is a way of life.⁴⁴

Similar to Florida, citrus plays a valuable role in the Californian economy. California has some 3,000 citrus growers.⁴⁵ The industry estimate from 2012 valued the California citrus industry at \$2 billion.⁴⁶ In 2015, Californian farmers and ranchers received \$47.1 billion for their output.⁴⁷ In 2013, an estimated 348,900 people were employed in agriculture in the state.⁴⁸ While one of California's biggest agricultural threats in recent memory has been severe drought,⁴⁹ citrus greening has continued to take a toll and will continue to impact the industry in the state if successful preventative and/or protective action is not taken.

39. *Id.*

40. CITRUS INDUSTRY HISTORY, FLA. CITRUS MUTUAL, <https://perma.cc/3KGJ-CQBG> (archived April 14, 2018).

41. *Id.*

42. *Id.*

43. Tom Bayles, *Chapter 10: The Fading Small Grove*, SARASOTA HERALD-TRIBUNE (Dec. 16, 2008), <http://www.heraldtribune.com/news/20081216/chapter-10-the-fading-small-grove>.

44. See Susan Jacobson, *Central Florida Citrus Growers find Creative Ways to Survive Despite Deadly Greening Disease*, ORLANDO SENTINEL (Jan. 28, 2017), <http://www.orlandosentinel.com/business/os-citrus-industry-central-florida-20170127-story.html>.

45. CALIFORNIA CITRUS INDUSTRY, CAL. CITRUS MUTUAL, <https://perma.cc/9QP2-74RN> (archived April 10, 2018).

46. Evan Pondel, *Tree Disease Threatens \$2 Billion California Citrus Industry*, REUTERS, Apr. 20, 2012, <http://www.reuters.com/article/us-usa-citrus-california-idUSBRE83JIHO20120420>.

47. CALIFORNIA AGRICULTURAL PRODUCTION STATISTICS: 2016 CROP YEAR REPORT, CAL. DEP'T OF FOOD & AGRIC., <https://perma.cc/2XHJ-FJX2> (archived April 14, 2018).

48. FAST FACTS ON CALIFORNIA'S AGRICULTURAL ECONOMY, ASSEMBLY COMM. ON JOBS, ECON. DEV., & THE ECON., (2014) <http://ajed.assembly.ca.gov/sites/ajed.assembly.ca.gov/files/Fast%20Facts%20on%20California%27s%20Agricultural%20Economy.pdf>.

49. *Id.*

Brazil's contribution to the Western Hemisphere's citrus production is massive. In 2017, agriculture accounted for 10.32% of total employment in Brazil.⁵⁰ There are over 10,000 citrus producers in the state of São Paulo, which account for roughly 80% of the citrus grown in Brazil.⁵¹ Agriculture is one of Brazil's top economic industries and leads the world in orange production.⁵² Citrus greening will be severely damaging to the country's economy.

Florida, California, and Brazil represent the lion's share of citrus production in the world. The hundreds of thousands of people employed by the citrus industries in these countries and the millions of consumers they serve will be seriously impacted if the onslaught of citrus greening is not abated. Governments are employing policies that worked against citrus canker like quarantine, eradication, and cost share programs. In addition, new research is being utilized as its available incentivizing involvement in programs designed to help growers. The governments' goals are to control and eradicate citrus greening.

III. POLICIES, PAST AND PRESENT, IN GLOBAL CITRUS

As hundreds of thousands of people are employed by the citrus industry,⁵³ it makes sense to implement strong public policy measures to protect the industry. In the United States, agriculture and food policy at the federal level revolves around the Farm Bill. The Agriculture Adjustment Act of 1933 (commonly known as the Farm Bill) was New Deal Legislation put in place under President Roosevelt.⁵⁴ While the Supreme Court found the Act unconstitutional, the Court reasoned that regulation of agriculture is state issue; this bill marked the beginning of agricultural policy as it is currently approached in the United States.⁵⁵ The Farm Bill became permanent legislation in the United States with the passage of Agricultural Adjustment Act of 1938.⁵⁶ All Farm Bills are renewed every four years unless extended.

50. *Brazil Employment in Agriculture*, TRADING ECONOMICS, <http://perma.cc/8NZB-AJ3W> (archived Oct. 9, 2018).

51. Igor Utsumi, *The Brazilian Orange Industry*, BRAZIL BUSINESS (MAY, 21, 2014), <https://perma.cc/758V-AB2X>.

52. *Id.*

53. *Brazil Employment in Agriculture*, *supra* note 50.

54. Michael X. Heiligenstein, *A Brief History of the Farm Bill*, SATURDAY EVENING POST (Apr. 17, 2014), <https://perma.cc/6Q5H-BLQS>.

55. See AAA, *Agricultural Adjustment Act*, LIVING HISTORY FARM (2003), <https://perma.cc/2QYQ-74P7>.

56. Heiligenstein, *supra* note 54.

The Farm Bill, from its first version to the most recent, has always been about surplus.⁵⁷ Surplus refers to the amount of crop farmers in the United States produce that is in excess of what can be consumed in the United States. Surplus, a major issue during the Great Depression, led President Roosevelt's initiative to create the Farm Bill.⁵⁸ Farmers were growing more than the market could handle, driving prices down and seriously damaging their profits.⁵⁹ Initially, Farm Bill policies were argued to be unconstitutional takings. Although challenged in *Wickard v. Filburn*,⁶⁰ the Farm Bill and its policies of limiting the amount of production in the United States survived, solidifying the influence of the federal government over the agricultural industry in the United States.

The current Farm Bill, the Agricultural Act of 2014, focuses on crop insurance⁶¹ from which citrus is excluded from coverage.⁶² The Farm Bill also has increased focus on conservation, nutrition, and crop insurance.⁶³ Federal agricultural policy has historically centered on two topics: surplus control and conservation.⁶⁴ The current Farm Bill also includes creation of the Citrus Disease and Research Extension (CDRE) within the Specialty Crop Research Institute (SCRI) with available grants for 2017 totaling \$21.8 million.⁶⁵ The CDRE is tasked with conducting research to combat citrus greening and other citrus diseases and pests which may impact the citrus industry in the future.⁶⁶ The Tree Assistance Program is also included in this most recent Farm Bill.⁶⁷

Apart from the creation of the CDRE, the USDA has found other means of addressing the citrus industry's needs. The USDA awarded research grants totaling \$13.6 million in 2017 for the express purpose of researching citrus greening

57. *Id.*

58. *Id.*

59. *Id.*

60. See *Wickard v. Filburn*, 317 U.S. 111 (1942).

61. *Agricultural Act of 2014: Highlights and Implications*, U.S. DEP'T OF AGRIC. ECON. RESEARCH SERV., <https://perma.cc/ZV8A-9PTE> (archived April 10, 2018) [hereinafter *Agricultural Act of 2014*].

62. See *Policy*, U.S. DEP'T AGRIC. ECON. RESEARCH SERV., <https://perma.cc/9QN4-AB65> (archived April 14, 2018).

63. *Agricultural Act of 2014*, *supra* note 61.

64. See *id.*; Heiligenstein, *supra* note 54.

65. U.S. DEP'T AGRIC., EMERGENCY CITRUS DISEASE RESEARCH EXTENSION 2017 REQUEST FOR PRE-APPLICATIONS (RFPA) 2 (2017), <http://perma.cc/TK82-MJYX> [hereinafter *CITRUS DISEASE*].

66. *Id.* at 5.

67. See Ariel Singerman & Fritz Roka, *Tree Assistance Program for Florida Citrus Greening*, UNIV. OF FLA. INST. OF FOOD & AGRIC. SERV. EXTENSION (April 2015), <http://www.crec.ifas.ufl.edu/extension/economics/pdf/TAP112014.pdf>.

through the SCRI.⁶⁸ In total, the USDA has invested \$400 million toward citrus greening over the last eight years.⁶⁹ Bactericides,⁷⁰ to help improve fruit production on infected trees and developing citrus greening-resistant trees have been two of the major projects funded by the USDA.⁷¹ Citrus greening prevention and protection research will reap long-term agricultural, economic, and societal benefits. Without short-term solutions for growers, citrus production remains in doubt.

In addition to the CDRE and the SCRI, the USDA also has a Crop Protection and Pest Management Plan (CPPM) where CPPM funds agricultural research projects throughout the country.⁷² Its extension program, the Extension Implementation Program Area (EIP) brings CPPM funded research to the field.⁷³ Land-grant institutions, state-controlled institutions of higher education, or private institutions of higher education are eligible for CPPM grants.⁷⁴ Currently, there is no conclusive evidence that CPPM research grants are being used to address citrus greening.⁷⁵ However, these grants could be used effectively in that capacity. The University of Florida is a land-grant institution; its Institute of Food and Agricultural Sciences' Extension Program with its decades of applied research is well qualified to utilize such funds for citrus greening research.

The federal government has initiated a national citrus products quarantine in areas afflicted by the disease.⁷⁶ To date, the quarantine is primarily implemented in sections of California and the entire state of Florida.⁷⁷ The California quarantine may be helpful as the mountainous terrain in California may contain the disease. The mountains can act as an effective barrier in confining the disease-vectoring psyllid. Florida's flat terrain provides less protection. Historically used to prevent

68. Press Release, U.S. Dep't of Agric., USDA Invests \$13.6 Million in Citrus Greening Research (Jan. 19, 2017), <https://www.usda.gov/media/press-releases/2017/01/19/usda-invests-136-million-citrus-greening-research>.

69. *Id.*

70. *See infra* at Part IV.

71. *See infra* at Part IV.

72. *Crop Protection and Pest Management Program*, U.S. DEP'T OF AGRIC. NAT'L INST. OF FOOD & AGRIC., <https://perma.cc/25KK-XJXG> (archived April 13, 2018).

73. *Id.*

74. CITRUS DISEASE, *supra* note 65, at 11-12.

75. *Id.*

76. *See* 7 C.F.R. § 301.76-3 (2019).

77. *Quarantine Area Maps for Citrus Greening and Asian Citrus Psyllid*, USDA, <https://perma.cc/RND2-KSJY> (archived Oct. 9, 2018).

disease spread, quarantine has proven ineffective in Florida indicating that better solutions are needed.⁷⁸

The USDA's Tree Assistance Program has also transitioned into a tool to control citrus greening.⁷⁹ This program provides cost sharing mechanisms for citrus grove owners who have experienced a significantly high mortality rate in their groves.⁸⁰ While the program is not limited to citrus trees, in 2014 aid was provided to citrus growers through funds provided by the 2014, Agricultural Act.⁸¹ A grower experiencing a mortality rate greater than 15% and having an adjusted gross income of less than \$900,000, is potentially eligible for participation in the program.⁸² Growers may be eligible to receive payments from the USDA of up to 65% of the actual cost of replanting and 50% of the cost of preparing the site for planting.⁸³ Payments from the USDA are capped at \$125,000.⁸⁴ In addition to the cap, another challenge facing the grower is infection. If the new plantings are infected within six years of being planted, the grower is not eligible for payments.⁸⁵

A more innovative approach to combat the onslaught of citrus greening is the use of animals. The USDA's Animal and Plant Health Inspection Service (APHIS) has trained canine detector teams.⁸⁶ These teams inspect groves by sniffing for citrus greening symptoms that are invisible to human eyes.⁸⁷ Early detection is helpful in citrus greening management, particularly in regions where citrus greening is less common. The Florida Department of Agriculture and Consumer Services has also invested in rearing *Tamarixia radiata*, a beneficial wasp that can attack the Asian Citrus Psyllid.⁸⁸ These wasps are particularly important for psyllid management in regions where commercial agriculture and residential areas are intertwined as they lessen the need for pesticide application.⁸⁹ Its effectiveness on a large scale is not yet known.

78. See generally *Citrus Quarantine and Disease Detection Maps*, FLA. DEP'T AGRIC. & CONSUMER. SERV., <https://perma.cc/2AY8-WHDC> (archived April 10, 2018).

79. See Singerman & Roka, *supra* note 67.

80. *Id.* at 1.

81. *Id.*

82. *Id.* at 1-2.

83. *Id.* at 2.

84. *Id.*

85. *Id.*

86. Kevin Shea, *Saving Florida's Citrus Industry Through Collaboration and Innovation*, U.S. DEP'T OF AGRIC. (Aug. 4, 2016), <https://perma.cc/9X29-8CNC>.

87. *Id.* at 3.

88. *Id.*

89. *Id.* at 3-4.

APHIS created the Save Our Citrus app to aid in detecting citrus greening.⁹⁰ The app has pictorial examples of infected trees can be used to identify diseased trees. The app is also of help in identifying homeowner infected plantings.⁹¹ Once a diseased tree is identified, the app provides a mechanism to report by phone and engage in conversation with USDA citrus experts who can provide advice in addressing the disease.⁹² For growers and homeowners with a few trees, it is a valuable source of information while providing data to the USDA regarding the spread of the disease.

Florida has instituted several of its own programs to control and hopefully eradicate citrus greening. Because of the state's history and experience with citrus, production dating from the Spanish plantings by Ponce De Leon in the 16th century,⁹³ Florida is in a better position to resolve the citrus greening threat and leads the way in helping other citrus producing states eradicate the disease.

Florida has a long history of battling citrus diseases. The most notable of which is citrus canker, originally discovered in 1912.⁹⁴ Florida's on and off eradication program has continued for almost a century.⁹⁵ Eradication efforts in the late 1990s led to the cutting back or removal of roughly 1.56 million commercial trees and 600,000 backyard trees.⁹⁶ In addition to the loss of over 2 million citrus trees,⁹⁷ state government has endured class action lawsuits brought against the Florida Department of Agriculture and Consumer Services (FDACS).⁹⁸ As citrus canker is still present today, eradication efforts have not been entirely effective.⁹⁹

Another holdover from Florida's citrus canker eradication policy is the Citrus Health Response Program (CHRP).¹⁰⁰ CHRP is a tandem effort between the

90. Lawrence Hopkins, *Identify Citrus Diseases with New iPhone App*, U.S. DEP'T OF AGRIC. (Apr. 12, 2012), <https://perma.cc/Y9AL-C6WY>.

91. *Id.*

92. *See id.*

93. CITRUS INDUSTRY HISTORY, *supra* note 40.

94. Gottwald et al., *supra* note 1.

95. *Id.*

96. *Id.*

97. *See generally id.*

98. *See e.g.*, Jay Weaver, *16 Years Later, Citrus Canker Legal Battle Finally Goes to Trial in Miami-Dade*, MIAMI HERALD (May 9, 2016), <http://www.miamiherald.com/news/local/article76614477.html>.

99. Interview with Callie Walker, Chief of Eradication & Control, Fla. Dep't of Agric. & Consumer Serv. (Apr. 18, 2017).

100. *Id.*

USDA and citrus growing states, such as Florida,¹⁰¹ to address citrus diseases by providing growers with best management practices (BMPs) and other initiatives.¹⁰² BMPs are developed by FDACS via rule and exist primarily to reduce agricultural impacts to water quality; but the practices that are included in the BMPs may be beneficial to more than just water quality issues.¹⁰³ One such project, the Abandoned Grove Initiative, allows landowners whose groves have been severely impacted by citrus greening the opportunity to keep their land classified as “agricultural land” pursuant to Florida’s Greenbelt Law.¹⁰⁴ Florida’s Greenbelt Law is a statute that dictates that property assessors in the state must classify land as agricultural or nonagricultural—agricultural land being taxed at a *de minimis* value.¹⁰⁵ To qualify for the classification the land must be designated for a bona fide agricultural use.¹⁰⁶ The Abandoned Grove Initiative allows landowners whose land was removed from production by a state or federal program the opportunity to keep their land taxed at an agricultural rate.¹⁰⁷ To comply with the terms of the Abandoned Grove Initiative, landowners must uproot their trees before receiving the valuation.¹⁰⁸ While uprooting infected trees has been hailed as a viable way of preventing the spread of citrus greening,¹⁰⁹ most small farmers do not have the economic means to completely remove all infected trees.¹¹⁰ This specific program is further addressed in the fourth part of this paper.

The University of Florida Institute of Food and Agricultural Sciences (IFAS) has created Citrus Health Management Areas (CHMAs) to help manage and prevent the spread of citrus greening.¹¹¹ CHMA is a local grower group that

101. *Citrus Health Response Program*, U.S. DEP’T OF AGRIC. ANIMAL & PLANT HEALTH INSPECTION SERV., <https://perma.cc/R6TT-MRKD> (archived April 10, 2018).

102. *Abandoned Grove Initiative*, FLA. DEP’T AGRIC. & CONSUMER SERV., <https://perma.cc/T4NF-MGAT> (archived April 14, 2018); *Agricultural Best Management Practices*, FLA., DEP’T OF AGRIC. & CONSUMER SERV., <https://perma.cc/4EYN-9L47> (archived April 14, 2018).

103. *Agricultural Best Management Practices*, FLA., DEP’T OF AGRIC. & CONSUMER SERV., <https://perma.cc/4EYN-9L47> (archived April 14, 2018).

104. *See generally* FLA. STAT. § 193.461 (2018); *Abandoned Grove Initiative*, *supra* note 102.

105. FLA. STAT. § 193.461.

106. *Id.*

107. *Id.*

108. Abby Taylor, *FDACS Promotes the Abandoned Grove Initiative*, CITRUS INDUSTRY, <https://perma.cc/6F8Z-ZB8H> (archived Oct. 9, 2018).

109. Interview with Callie Walker, *supra* note 99.

110. *Id.*

111. *See Citrus Health Management Areas*, UNIV. OF FLA. INST. OF FOOD & AGRIC. SERV., <https://perma.cc/3L6J-JTGH> (archived April 14, 2018).

coordinates pesticide rotation and other methods of combatting citrus greening.¹¹² By rotating pesticide applications, pest resistance to chemical control in the participating areas is less likely.¹¹³ When a CHMA is designated, FDACS and Division of Plant Industry (DPI) officials assist by sending real time reports on CHMAs to growers within the CHMA area.¹¹⁴ These reports provide the grower with information necessary for making the best decision possible with respect to pesticide use as well as providing accurate information about psyllid populations.¹¹⁵ CHMA statistics provide growers with a better grasp of the citrus greening situation in their area.¹¹⁶ No records are kept on CHMA participation because it is a voluntary program.¹¹⁷

The control of citrus greening is a multi-state effort. Florida's Southern Gardens has enlisted technology from Texas A&M University resulting in the development of experimental trees that could be resistant to the disease.¹¹⁸ The trees contain a spinach gene which scientists have found resistant to citrus greening.¹¹⁹ As reported in the Wall Street Journal, trees are at least five years from producing fruit; the timing doesn't include additional testing to ensure the genetically altered citrus crop isn't harmful to the environment.¹²⁰ While this technology is promising, timing is a troubling aspect as well as consumer wariness of genetically modified organisms. If food companies refuse to buy the genetically modified fruit, all this research could be futile.¹²¹

The California Department of Food and Agriculture (CDFA) is also taking steps to address citrus greening.¹²² Steps include regional quarantines and providing accessible quarantine information useful to California growers.¹²³ The CDFA also

112. *Id.*

113. *Id.*

114. *See id.*

115. *See id.*

116. *Id.*

117. Interview with Callie Walker, *supra* note 99.

118. Wernau, *supra* note 6.

119. *Id.*

120. *See id.*

121. *Id.*

122. *California Citrus Pest and Disease Prevention Committee*, CALIF. DEP'T OF FOOD & AGRIC. PLANT HEALTH & PEST PREVENTION SERVICES, <https://perma.cc/26CV-2LTZ> (archived April 10, 2018).

123. *See* Candace M. Clark, Comment, *The Asian Citrus Psyllid and the Regulatory Takings that Organic Farmers in the State of California May Face Asian with its Eradication Program* 22 SAN JOAQUIN AGRIC. L. REV. 85, 88 (2013); *Asian Citrus Psyllid (ACP)*

has a Citrus Pest and Disease Prevention Committee (CPDPC) addressing citrus greening.¹²⁴ The CPDPC sends research and CDFA rulemaking decisions to citrus growers in the state and provides them with information about recommended (but not required) citrus greening prevention and management techniques.¹²⁵ One unique aspect of the CPDPC's 2014 report is that it provides current analysis of citrus greening management techniques for organic growers.¹²⁶ While organic growers do not represent a large fraction of citrus growers, they are an important component of California's agricultural economic base. Consumers have begun to increasingly seek organically grown crops; organic growers have branded themselves in such a way that the market for their produce is on the rise.¹²⁷ The USDA Economic Research Service (ERS) has found that consumers switch to organic produce because of concerns regarding their own health, welfare of animals, and environmental concerns.¹²⁸ The ERS estimated that more than \$35 billion worth of organic products would be sold in 2014, a \$6 billion jump from 2012 and estimations predicting a continued increase.¹²⁹ It will become important in the future for California to keep its organic growers in mind when mandating citrus policy. If policymakers mandate that citrus producers must apply pesticides to their groves, there could be severe backlash from the organic growers and consumers.¹³⁰ The CDFA lists treatment plans that do not require the use of pesticides and insecticides for growers who are finding their trees infected by citrus greening.¹³¹ They also contain an extensive list of prescribed insecticides and pesticides to be used in conjunction with the treatment plans the CDFA approves for use on citrus

Regulation and Quarantine Boundaries, CAL. DEP'T OF FOOD & AGRIC., <https://perma.cc/SAS9-3LTT> (archived Oct. 10, 2018).

124. Candace M. Clark, Comment, *The Asian Citrus Psyllid and the Regulatory Takings that Organic Farmers in the State of California May Face Asian with its Eradication Program* 22 SAN JOAQUIN AGRIC. L. REV. 85, 88 (2013); *Asian Citrus Psyllid (ACP) Regulation and Quarantine Boundaries*, CAL. DEP'T OF FOOD & AGRIC., <https://perma.cc/SAS9-3LTT> (archived Oct. 10, 2018).

125. See e.g., CAL. DEP'T OF FOOD & AGRIC., ASIAN CITRUS PSYLLID AND HUANGLONGBING SCIENCE ADVISORY REPORT PANEL - ADDENDUM (2014), https://www.cdfa.ca.gov/citruscommittee/docs/reports/SAP_ReportAddendum.pdf.

126. *Id.*

127. Meredith Cohn & Tim Wheeler, *USDA Takes Accounting of Organic Farms*, CHI. TRIB., <http://www.chicagotribune.com/lifestyles/sns-green-certified-organic-farms-story.html>.

128. *Organic Market Overview*, U.S. DEP'T AGRIC. ECON. RES. SERV., <https://perma.cc/G9MJ-YQRQ> (archived April 10, 2018).

129. *Id.*

130. Clark, *supra* note 123, at 93, 97.

131. *UC Pest Management Guidelines*, UNIV. CAL. INTEGRATED MGMT. PROGRAM, <https://perma.cc/8DRR-RAZH> (April 10, 2018).

greening, with the idea that a more diverse approach to the problem should help to create a more viable solution.¹³²

Notably, California has not implemented any programs similar to the CHMA program or the CHRP program in Florida. The Florida programs are implemented at a relatively low cost to the state and could become more important in the efforts to keep California's citrus industry afloat. It would behoove California to follow Florida's lead in this area, especially in this instance of a low cost, high reward policy.

The Brazilian Agriculture Ministry has also been involved in controlling and eradicating citrus greening. Brazilian agriculture represents a major driver in the country's economy.¹³³ Agribusiness represents 38% of Brazil's exports¹³⁴ and 23% of Brazil's GDP.¹³⁵ In 2009, agriculture in Brazil employed 19 million people.¹³⁶ As dependent on agriculture as Brazil is, effective citrus greening policy is necessary for the future of the Brazilian economy.

In 2000, the Brazilian Agriculture Ministry enacted an agriculture and livestock plan for the purpose of guiding agricultural policy in the country, which is reviewed every year.¹³⁷ The 2016-2017 plan allocates \$185 billion in credit to farmers with the funds tied to agricultural uses.¹³⁸ The plan serves all agribusinesses in Brazil, including sugar cane, soy, grain, and beef cattle.¹³⁹ Funds must be shared within the separate but related agricultural industries.¹⁴⁰

Brazil's federal government has issued normative instructions for citrus growers. For example, Normative Instruction n° 53, 10/16/2008 provides for quarterly inspections on groves by the Secretary of Agriculture's office.¹⁴¹ Trees that appear infected by HLB based on visual inspection are to be labeled and

132. *Id.*

133. Hiba El Dahr, *Agriculture, a Strategic Sector for Brazil's Economic Growth*, MOMAGRI, <https://perma.cc/8ECD-3T98> (archived April 10, 2018).

134. *Id.*

135. *Id.*

136. *Id.*

137. *Samples Indicate a 9.3% Non-Conformity Index*, AGRIC., LIVESTOCK & FARMING, <https://translate.google.com/translate?hl=en&sl=pt&u=http://www.agricultura.gov.br/&prev=search> (last visited Oct. 11, 2018).

138. *Id.*

139. Paulo Cesar de Faccio Carvalho, *Brazil*, GRASSLAND & PASTURE CROPS, <https://perma.cc/CN8F-64F4> (archived April 10, 2018).

140. *Id.*

141. Instrução Normativa n° 53 de 16 de Outubro de 2008, Article 7 °, Secretaria de Agricultura e Abastecimento (Braz.), <https://perma.cc/9TZC-7Q6Q>.

samples sent for lab testing.¹⁴² If laboratory results indicate there is an incidence of citrus greening in less than 28% of the trees sampled, only those trees will be destroyed.¹⁴³ If the disease incidence is greater than 28% of the trees sampled, all trees in the production unit must be destroyed.¹⁴⁴ It is the grower's responsibility to eradicate any infected trees at the grower's expense. Growers are not entitled to compensation from the government.¹⁴⁵ Failure to remove identified infected trees results in fines for the grower.¹⁴⁶ Additionally, growers must submit their own reports to the Órgãos Estaduais de Defesa Sanitária Vegetal (State Bodies of Plant Protection) for visual inspection of trees.¹⁴⁷

The state of São Paulo is Brazil's largest citrus producing area and has specific laws in place for the management of citrus greening. In the context of production of healthy trees in closed nurseries, São Paulo State Law Coordenaria de Defesa Agropecuária (Agriculture Defense Coordination (CDA)) n.5 02/03/2005 provides guidance.¹⁴⁸ São Paulo's law provides that closed nurseries must be at least twenty meters from the nearest citrus grove.¹⁴⁹ The law also provides minimum requirements for mesh used to protect trees and specific requirements for sanitization, including workers, equipment, and other organic matter that enters the closed nursery.¹⁵⁰ Additionally, all seeds, budwood, and rootstocks must come from CDA registered mother trees.¹⁵¹

IV. ANALYZING POLICIES IN USE

The policies in place under the state and federal governments in the United States and Brazil are not to be viewed in a vacuum. These policies must be viewed in light of what growers are actually doing on a day-to-day basis, current research about citrus greening and its spread, and the challenges to the policies made by growers.

142. *See id.*

143. Instrução Normativa n° 53 de 16 de Outubro de 2008, Article 9 °, Secretaria de Agricultura e Abastecimento (Braz.), <https://perma.cc/9TZC-7Q6Q>.

144. *Id.*

145. *Id.*

146. *Id.*

147. Instrução Normativa n° 53 de 16 de Outubro de 2008, Article 7 °, Secretaria de Agricultura e Abastecimento (Braz.), <https://perma.cc/9TZC-7Q6Q>.

148. Resolução SAA No. 10, de 29 de Março 2006, Secretário de Agricultura e Abastecimento de 30.03.2006 (Braz.).

149. *Id.*

150. *Id.*

151. *Id.*

To date, because of its extensive reach, the United States federal quarantine has probably been the most impactful policy decision on citrus greening thus far.¹⁵² Fortunately for Florida growers, most oranges grown in the state are used for orange juice production.¹⁵³ Once processed as orange juice, the product may leave the state because it is no longer carrying any potential citrus greening threat.¹⁵⁴ It is important to note that fruit can leave the state as whole fruit once it has been inspected, treated, waxed, and certified by the USDA.¹⁵⁵ The entire state of Florida is under quarantine; California and Texas are currently not.¹⁵⁶

The Tree Assistance Program, noted earlier, has been another policy decision with a positive impact on growers. As noted earlier, the downside of the program is the funding an individual can receive¹⁵⁷ and some of the restrictions placed on growers. Specifically, growers whose newly planted trees are infected with citrus greening receive no funding if newly planted trees have been infected.¹⁵⁸ Growers in an area already inundated with citrus greening will find it challenging to protect new trees from infection. If and when the new trees become infected, growers are not eligible for payments for a minimum of six years.¹⁵⁹ As such, growers may be forced out of the citrus industry due to a lack of capital to sustain their groves.

Florida growers have recently begun using plastic mulch in efforts to thwart the Asian Citrus Psyllid.¹⁶⁰ The mulch disorients psyllids as they look to find new host trees.¹⁶¹ Cost associated with this kind of mulching involves time and money in “ground preparation, plastic, drip fertigation, and chemigation.”¹⁶² Despite the cost, methods such as plastic mulch have their benefits. Benefits reduced chance

152. 7 C.F.R. § 301.76-3 (2019).

153. ZANSLER, *supra* note 4, at 4.

154. APHIS Federal Order DA-2012-09, Quarantine for *Guignardia Citricarpa* Kiely Causal Agent of Citrus Black Spot (CBS) (U.S.D.A. 2012).

155. *Id.*

156. *Id.* Since only Federally specified regions are quarantined in those two states, growers not under quarantine are at an economic advantage over their neighbors. Not being forced to follow procedures that cost money in order to ship their product (special cleaning and hauling measures are examples) saves these growers money—money that can be spent on preemptive measures to keep greening from their groves.

157. Singerman & Roka, *supra* note 67 at 2.

158. *Id.*

159. *Id.*

160. Ernie Neff, *Phil Stansly: Psyllid Slayer*, CITRUS INDUS., <https://perma.cc/KV6U-KR92> (archived April 14, 2018).

161. *Id.*

162. *Id.*

of psyllid resistance to the pesticide.¹⁶³ Plastic mulch application has been successfully used in combatting infection when in combination with pesticide application in Florida's gulf region through one of the first CHMAs.¹⁶⁴ The use of these two methods, through a state supported program, offers a hopeful example of grower practices and state policy working together.

CHRP has been an essential part of Florida state-level policy in dealing with citrus greening. The Abandoned Grove Initiative has recently been modified from previous versions; the newest version provides growers the option to enter the program for five years.¹⁶⁵ While CHRP provides growers with an opportunity to hit "reset" on their groves but, it will not quell all a grower's fears. Once trees have been removed, a grower has five years from entering a compliance agreement to re-plant or the land reverts to the appraiser valued the end of five years.¹⁶⁶

With the amount of capital necessary to re-plant a fully functioning grove, this approach can prove difficult for some growers. The DPI of the Florida Department of Agriculture and Consumer Services does not keep active participation tallies.¹⁶⁷ Subsequently, it is difficult to determine how many growers are utilizing the program. Program data would be helpful because it would provide policymakers accurate statistics concerning current policies. Without such data, implementing future policy decisions is more difficult. The most challenging aspect of the CHRP program is providing assistance to those who need it long-term.

CHRP gives growers an opportunity to start over, but starting over can prove difficult, especially for smaller growers. Clearing grove land is expensive; it requires labor and heavy equipment. Growers cannot participate in the CHRP until they've cleared their land of infected trees.¹⁶⁸ Assuming a grower can afford to clear his or her land, they then have five years to fund the planting of new trees.¹⁶⁹ Replanting is expensive and only one of many concerns facing Florida growers. Costs associated with running effective citrus greening prevention and management plans, compiled with the costs of planting a new grove, may be too

163. *Id.*

164. *Id.*

165. Taylor, *supra* note 108.

166. *Id.*

167. Interview with Callie Walker, *supra* note 99. While DPI doesn't keep track of participation, the county Property Appraiser who classifies property as agricultural or not will be keeping track, as non-agricultural classified land is taxed at a much higher rate than land classified as agriculture.

168. *Id.*

169. See generally FLA. STAT. § 193.461.

onerous for growers. The Abandoned Grove Initiative does assist citrus growers challenged in implementation and prevention management. However, the initiative is not enough.

In certain areas of the state, there is no participation data kept by the DPI for the CHMA.¹⁷⁰ However, the DPI researchers monitor CHMA's psyllid control levels and orange production.¹⁷¹ In areas where CHMA participation is high,¹⁷² there have been better records in psyllid counts and orange production.¹⁷³ If CHMA participation indicates a correlation with better psyllid counts and orange production, CHMA participation should be heavily encouraged.

Bactericides are another chemical application common for citrus growers. Injected into the tree, bactericides spread throughout the tree's canopy and root system.¹⁷⁴ While bactericides do not eliminate citrus greening, they are effective at controlling the spread of the disease.¹⁷⁵ Most Florida growers have experimented with bactericides.¹⁷⁶

In 2016, the Citrus Research and Development Foundation recommended the use of bactericides in tandem with thermotherapy.¹⁷⁷ Thermotherapy is a method of treating citrus greening by applying vaporized water at high temperatures to the roots of an infected tree for the purpose of killing the HLB bacteria.¹⁷⁸ While cumulative results seem to suggest thermotherapy is worth implementing in most

170. Interview with Callie Walker, *supra* note 99.

171. *Id.*

172. *Id.* DPI assumes participation is high because of the types and quality of prevention and management methods in place.

173. *Id.*

174. CITRUS RESEARCH & DEV. FOUND., THE USE OF BACTERICIDES IN PLANT AGRICULTURE WITH REFERENCE TO USE IN CITRUS TO MITIGATE HLB (Feb. 2016) <https://perma.cc/A4FK-HWTN>.

175. *Id.*

176. See Ernie Neff, *CRDF Considers a "One-Two Punch" at HLB*, CITRUS INDUS. NEWS, <http://citrusindustry.net/2016/12/28/crdf-panel-considers-a-one-two-punch-at-hlb/> (last visited Oct. 10, 2018) [*"One-Two Punch"*].

177. *Id.*

178. Reza Ehsani et al., *Controlling HLB with Thermotherapy: What Have We Learned So Far?*, CITRUS INDUS. NEWS, <http://citrusindustry.net/2016/10/21/controlling-hlb-with-thermotherapy-what-have-we-learned-so-far/> (last visited June 11, 2018). Thermotherapy involves treating the bases of citrus trees to temperatures above 120 degrees Fahrenheit for varying amounts of time (usually no longer than two minutes) with a machine that produces vaporized water. While the science is still being researched, early results are positive and indicate that trees treated with thermotherapy multiple times are more likely to kill citrus greening.

groves,¹⁷⁹ it has not been widely used by growers.¹⁸⁰ Treating groves with thermotherapy has been estimated to cost growers roughly \$45 per tree.¹⁸¹

Given the current state of the industry, this paper finds the most reliable method for handling citrus greening is removing infected trees and replanting while using any additional affordable methods. As removal and replanting seem to be the most effective means of combatting citrus greening, the Florida Legislature recently passed the Greening Removal or Vector Elimination (GROVE) program.¹⁸² This is an application-based program¹⁸³ that provides cost sharing with growers who wish to remove and replant trees. Florida in connection with CHRP received \$4.5 million to assist growers with a limit of \$125,000 per grower.¹⁸⁴ Unfortunately, assuming each eligible grower receives the maximum amount available, \$125,000, only thirty-six growers will receive assistance each year. While helpful to those who receive it, yearly cost sharing assistance to thirty-six growers out of some 8,000 in the state is not likely to dramatically curb citrus greening.¹⁸⁵

In Brazil, growers have begun organizing management areas similar to Florida's CHMAs.¹⁸⁶ While these management groups are not organized through any particularized policy similar to Florida's CHMA, they perform similar functions such as, providing growers with up-to-date psyllid population numbers and organize pesticide application and tree removal.¹⁸⁷

Growers in Brazil have also begun working together in tree removal and replanting.¹⁸⁸ Following removal, growers are planting trees in higher densities and minimizing borders with neighbor growers.¹⁸⁹ These cooperative practices, especially when in conjunction with group, citrus greening control methods, help

179. *See id.*

180. "One-Two Punch", *supra* note 176.

181. JIANI CHEN, ET AL., APS CITRUS KILLER: BATTLING BACK AGAINST HLB (2017), <https://perma.cc/K25U-TLDD>.

182. *See* S. Res. 1010, 2016 Reg. Sess. (Fla. 2016).

183. *Id.*

184. *See* Interview with Callie Walker, *supra* note 99; *Additional \$4.5 Million Goes towards Citrus Greening Research*, FLORIDA CITRUS (Dec. 29, 2014), <https://perma.cc/HL63-ADNW>.

185. Robert A. Morris, *Structure Overview of the Florida Citrus Industry in 2009*, UNIV. OF FLA. INST. OF FOOD AND AGRIC. SCI., 1 (2009), <http://perma.cc/NZ3D-EFHR>.

186. *See* Stephen H. Futch, *HLB Management in Brazil*, CITRUS INDUS. NEWS, <https://perma.cc/QC5x-HBYX> (archived Nov. 2, 2018).

187. *Id.*

188. *Id.*

189. *Id.*

to manage larger areas and subsequently benefit whole regions.¹⁹⁰ São Paulo State Law CDA n.5 02/03/2005 seems to conflict with this approach as growers were given directives on establishing closed nurseries.¹⁹¹ Closed nurseries require significant buffers (twenty meters) between themselves and trees not in the nursery.¹⁹² While both methods have their advantages and disadvantages, the question of which method will be more effective in the future in supporting Brazil's citrus production is far from answered.¹⁹³

Another Brazilian method is reducing stress on infected trees.¹⁹⁴ Growers have found by reducing tree stress using nutrients, plant growth regulators, and hormones, fruit production has improved in infected trees.¹⁹⁵ This measure is not a cure-all for citrus greening, but giving growers a more active growing time with trees already in the ground helps keep costs down.

Brazilian growers and juice manufacturers have been working together for decades. Fundecitrus, an organization run by citrus growers and juice manufacturers, was established forty years ago to provide a multitude of services to the Brazilian citrus industry.¹⁹⁶ Fundecitrus provides research to growers and juicers on various important topics to the citrus industry.¹⁹⁷ Formerly, the organization played a role in the federal inspection of trees for citrus greening.¹⁹⁸ A fair comparison would be the role that Florida Citrus Mutual plays in the United States for Florida growers.¹⁹⁹ Organizations like Fundecitrus are essential for

190. *Id.*

191. *See* Resolução SAA No. 10.

192. *Id.*

193. The group control method allows for more comprehensive and protective citrus greening measures as all the farmers in a group share resources and responsibility for the entirety of the grove as opposed to just theirs. The downside to this method is that all members have to cooperate in order for it to be effective. If one slips, then the cumulative grove will suffer. The closed nursery offers the advantage of being under serious scrutiny, which is effective in protecting the trees inside. The disadvantage is the costs associated with sanitizing everything that comes in and out of the nursery, and the wasted "dead space" where growers cannot grow anything.

194. Futch, *supra* note 187.

195. *Id.*

196. *About*, FUNDECITRUS, <https://perma.cc/5SL8-YM8V> (archived April 10, 2018).

197. *Id.*

198. Bassanezi et al., *Current Situation Management and Economic Impact of Citrus Canker in Sao Paula and Mina Gerais, Brazil*, FUNDECITRUS 2-3, <https://perma.cc/HHU4-SGRA> (archived Nov. 2, 2018).

199. *See id.*; *Florida Citrus Mutual Mission Statement: Florida Citrus Mutual Is Dedicated to Protecting and Enhancing the Future of Our Grower Members*, FLA. CITRUS MUTUAL, <https://perma.cc/A4CR-BJY8> (archived Oct. 10, 2018). Florida Citrus Mutual is a

research, and its dissemination to those in the field for ensuring the proliferation of the citrus industry in Brazil.²⁰⁰ Like its counterpart in Florida, grower participation and support of Fundecitrus in Brazil is imperative to the industry's long-term success.²⁰¹

V. REVIEWING CITRUS CANKER POLICY FOR GUIDANCE IN MAKING NEW CITRUS GREENING POLICY

Before citrus greening was citrus growers' main concern, citrus canker devastated the industry. To effectively shape citrus greening policy, the lessons from citrus canker policymaking should be discussed. Citrus canker is a disease that was introduced to the United States through the increase in international travel and trade.²⁰² "The disease was first found around 1912 [and] spread throughout the southeastern U.S. imported seedlings from Japan."²⁰³ Though declared eradicated from Florida in 1933,²⁰⁴ the disease was found again in western Florida in 1986 and declared eradicated again in 1994.²⁰⁵ Unfortunately, a separate strain of the disease was reported in Miami in 1995.²⁰⁶

After the discovery of the disease in Miami, an eradication program was established between FDACS, DPI, APHIS, and the USDA.²⁰⁷ The mandatory eradication of residential and commercial trees under the program resulted in the removal of over 1.56 million infected trees.²⁰⁸ Originally the Citrus Canker Law, which gave the state the power to remove trees, allowed for removal of all trees within a 125-foot radius of an infected tree.²⁰⁹ Unfortunately, the 125-foot radius was not as effective as hoped, and a new radius of 1,900 feet was established to create a more effective buffer zone to prevent disease spread.²¹⁰

member-driven citrus grower organization for Florida Citrus Growers. It provides lobbying services to preserve its' members interests in federal and state law.

200. Bassanezi et al., *supra* note 198, at 2-3.

201. *Florida Citrus Mutual Mission Statement*, *supra* note 200.

202. Gottwald, et al., *supra* note 1.

203. *Id.*

204. *Id.*

205. *Id.*

206. *Id.*

207. *Id.*

208. *Id.*

209. Fla. Dep't. of Agric. & Consumer Serv. v. City of Pompano Beach, 792 So. 2d 539, 542 (Fla. Dist. Ct. App. 2001). The policy was promulgated following the recommendation from a study from Argentina.

210. *Id.*

The new eradication radius was met with strong opposition from municipalities²¹¹ as well as residential and commercial growers.²¹² In 2001, municipalities and residents in Dade County filed suit against FDACS's enacted eradication program for inverse condemnation.²¹³ Later, the Fourth District Court of Florida found FDACS had the proper statutory authority to create and enforce the program.²¹⁴

In 2004, the Florida Supreme Court decided *Haire v. Florida Dept. of Agriculture and Consumer Services*, where municipalities and individuals challenged the constitutionality of the citrus canker law arguing the law constituted a taking of private property and violated tree owners' due process.²¹⁵ The court found for the state, stating the citrus canker law was a valid use of the state's police power and did not violate the plaintiff's due process rights.²¹⁶

Despite these two rulings on the citrus canker law, litigation continues from residential tree owners in Miami-Dade County.²¹⁷ Brian and Bunny Patchen of Miami, Florida, were residential tree owners who had enjoyed the use of their citrus trees for decades.²¹⁸ They were subject to the citrus canker law. Their citrus trees were destroyed in fall of 2000.²¹⁹ Mr. Patchen, a Florida attorney, organized a class action lawsuit representing approximately 100,000 residential tree owners in Miami-Dade County.²²⁰ The class action plaintiffs may recover \$120 million in damages for 250,000 trees that were removed by the state under the citrus canker law from 2000-2006.²²¹ While the state was offering checks and Wal-Mart gift cards for the trees that were taken prior to the lawsuit, some plaintiffs claimed they received nothing.²²² At issue was whether the tree owners who did receive compensation from the state received "just" compensation.²²³ Currently, there are no further updates on the lawsuit. However, equitable compensation may influence future citrus canker policy decisions.

211. *See e.g. id.*

212. *See e.g. Haire v. Fla. Dep't. of Agric. & Consumer Serv.*, 870 So. 2d 774 (Fla. 2004).

213. *See City of Pompano Beach*, 792 So.2d 539.

214. *Id.* at 547-48.

215. *Haire*, 870 So.2d at 777-78.

216. *Id.* at 790.

217. *Weaver*, *supra* note 98.

218. *Id.*

219. *Id.*

220. *Id.*

221. *Id.*

222. *See id.*

223. *Id.*

Internationally, allegations of citrus canker in fruit have led to World Trade Organization battles.²²⁴ In 2001, the United States barred shipments of lemons from Argentina into the United States claiming the fruit posed a citrus canker contamination threat.²²⁵ Argentina brought a case against the United States claiming the restrictions were a form of protectionism for United States citrus growers.²²⁶ However, the World Trade Organization did not find the argument persuasive.²²⁷

In Florida and possibly Brazil (given some other normative instructions they have pertaining to agriculture), it appears both governments are legally empowered to order eradication of infected and non-infected trees for the purposes of saving their respective citrus industries. It would appear that neither government have any desire to mandate a strong citrus greening eradication order because of the lessons learned from citrus canker eradication program.

VI. CONCLUSION

There is no cure for citrus greening.²²⁸ The disease is decimating the Florida citrus industry. Brazilian citrus is impacted as well. The danger of greening is real. The disappearance of industries in Africa and Asia²²⁹ should leave no doubt in policy-makers' minds of the ramifications of poor decisions in dealing with the disease. The United States and Brazil have both been proactive in their dealing with the disease and will need to continue to do so if their citrus industries are to survive. This paper does not present a cure-all policy prescription for the preservation of the citrus industry but does present a recommendation for both nations.

Brazilian and American citrus industries have worked together in the past and will likely continue to do so in the future. Currently, the USDA and the University of Florida provide citrus production analysis to Brazil. In return, Brazilian growers, through Fundecitrus, have welcomed Florida growers to their groves to observe their operations and efforts to control psyllid populations, the vectors of citrus greening.

224. See Raj Bhala, et al., *World Trade Organization Case Review 2015*, 33 *Ariz. J. INT'L & COMP. L.* 505, 518-20 (2016).

225. *Id.* at 518.

226. *Id.*

227. *Id.* at 531-32.

228. CITRUS GREENING FAQ, *supra* note 24.

229. Mead, *supra* note 27.

Experts at the FDACS DPI have stressed the importance of participation in the CHMA programs.²³⁰ In areas where CHMA participation and compliance is strong, FDACS research has shown that psyllid counts²³¹ have been lower than in areas with poor CHMA participation.²³² The same FDACS research has shown that strong CHMA participation has led to better citrus production.²³³ Regional greening and psyllid management provides growers with the best short-term disease management solution until a better solution is discovered.

Legally, neither country would have an issue in making participation in regional management programs mandatory. In the United States, the court in *Haire* decided that Florida had the ability under its police power to mandate eradication of citrus trees within a 1900-foot radius of a citrus canker infected tree.²³⁴ Currently, Florida is reluctant to issue similar mandates to control citrus greening.²³⁵ In Brazil, the government has the legal ability and uses that ability, to mandate eradication of trees when necessary. Under Title 7 of the Brazilian Constitution, state expropriations of agrarian land need only to be justified by evidence of unproductive land use—a burden easily met with tree loss from citrus greening.²³⁶

The evidence in both countries suggests regional management areas provide meaningful improvements to participating growers. Both countries' policymakers should make it their priority to implement either further incentivized programs to bring more growers into the fold or consider the possibility of mandatory participation. The data from both country's voluntary programs indicates that involvement of entire growing communities will lead to better end yields and healthier groves. The citrus industry should utilize every opportunity it has to protect itself from citrus greening, and regional management areas are a viable option to be explored for citrus greening control.

230. Interview with Callie Walker, *supra* note 99.

231. Estimated number of Asian Citrus Psyllids in a given region using survey methods.

232. Email from Callie Walker, Chief of Eradication & Control, Fla. Dep't of Agric. & Consumer Serv. (Apr. 18, 2017) (on file with author).

233. *Id.*

234. *Haire v. Fla. Dep't. of Agric. & Consumer Serv.*, 870 So. 2d 774 (Fla. 2004).

235. Interview with Callie Walker, *supra* note 99.

236. Constituição Federal [C.F.] [Constitution] art. 7 (Braz.).