

Review

Agriculture Under Pressure: The Economic, Environmental, and Development Drivers Transforming Florida Agriculture

Daniel Solís ^{1,*} , Sergio Alvarez ²  and Ly Nguyen ¹

¹ Agribusiness Program, College of Agriculture and Food Sciences, Florida A&M University, Tallahassee, FL 32307, USA; ly.nguyen@famu.edu

² Department of Tourism, Events, and Attractions, Rosen College of Hospitality Management, University of Central Florida, Orlando, FL 32816, USA; sergio.alvarez@ucf.edu

* Correspondence: daniel.solis@famu.edu

Abstract

Florida (FL)'s agriculture sector is undergoing rapid transformation due to biological shocks, environmental stressors, import competition, and accelerating urbanization. Citrus greening, laurel wilt, and hurricane-related damage have sharply reduced yields and acreage, while rising imports from Mexico and Brazil erode market share and depress prices. Urban development and recreational land-use expansion are accelerating land-value increases, which in turn drives farmland loss and abandonment. This policy-oriented review synthesizes these pressures and evaluates state policy responses. Our findings highlight the need for integrated strategies that improve resilience, strengthen land conservation, and enhance the long-term competitiveness of FL's agricultural sector.

Keywords: economic analysis; Florida; agriculture

1. Introduction

Florida (FL)'s agricultural sector is a cornerstone of the state's economy, generating over \$106 billion annually and supporting more than 1.28 million jobs across diverse industries, including citrus, berries, vegetables, tropical fruits, livestock, aquaculture, ornamental plants, and other specialty crops [1]. Despite its economic significance, FL's agriculture has undergone profound structural transformations over the past three decades, raising concerns about its future. Biological stressors such as citrus greening and laurel wilt have devastated fruit tree industries, reducing yields by up to 74% and imposing billions in economic losses [2–4]. These challenges have coincided with rapid urbanization, which has led to the conversion of more than 1.5 million acres of farmland since 1995. In addition to population growth, tourism development and the expansion of solar farms and data centers have significantly increased land values, thereby increasing the opportunity costs of agricultural operations and thus eroding farm profitability [5]. At the same time, global trade liberalization has intensified competitive pressures, with imports of fruits and vegetables from Mexico and Brazil displacing FL's market share and causing annual losses estimated between \$1.31 and \$2.63 billion [6,7].

The convergence of these factors raises critical questions about the economic sustainability of FL agriculture. Declining acreage, rising input costs, and market displacement threaten rural livelihoods and food security, while climate- and hurricane-related losses add further uncertainty [8,9]. Hurricanes such as Ian in 2022 and Milton in 2024 caused billions in damages to agricultural operations, disrupting production and infrastructure across



Academic Editor: Shiwei Liu

Received: 24 February 2026

Revised: 10 March 2026

Accepted: 13 March 2026

Published: 14 March 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and conditions of the [Creative Commons Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

citrus, vegetables, and livestock systems [10]. Additionally, recurrent droughts and heat stress exacerbate production risks, increasing irrigation costs and reducing crop quality [11]. These systemic pressures have accelerated farmland abandonment [12]. In fact, according to the 2022 Census of Agriculture, FL has lost 2887 farms and 30,331 acres of farmland over the previous five years.

Understanding these dynamics is essential for designing policies that preserve agricultural land, enhance competitiveness, and promote resilience in the face of systemic uncertainty. Without intervention, projections suggest an additional 10% to 15% decline in farmland by 2040, further concentrating agriculture in fewer counties and increasing reliance on imported produce [13].

The purpose of this study is to provide a policy-oriented review of the major stressors transforming FL's agricultural sector. Specifically, we frame this study around the central question: How do biological, climatic, economic, and demographic pressures interact to reshape the structural transformation of FL's agricultural sector? To reach our goal, we examine how these stressors are shaping agricultural production and profitability, along with the structural land-use changes occurring across the state, including farmland conversion, crop diversification, and rising patterns of agricultural abandonment. We also assess the key policy instruments and institutional frameworks designed to strengthen the long-term resilience and economic viability of FL agriculture. Together, these analyses aim to inform integrated strategies that balance economic development with agricultural sustainability and enhance the sector's adaptive capacity. This policy-oriented review contributes to the literature by synthesizing these diverse stressors into a unified analytical review, enabling a structured comparison of the relative magnitude and long-term implications of each stressor. In doing so, the paper goes beyond descriptive trends to provide an evaluation of FL's major policy instruments and their effectiveness in promoting agricultural resilience.

This article is organized as follows. First, we document long-term shifts in land use and crop composition, followed by an examination of major biological and climatic stressors affecting agricultural production. We then assess the economic impacts of foreign competition, labor constraints, and development pressures. Finally, we evaluate the effectiveness of current policy interventions. We conclude with a summary of key findings and suggestions for further research.

2. Recent Changes in Florida Agricultural Land Use Trends

FL's agricultural landscape has changed dramatically over the past 30 years due to urbanization, climate variability, crop disease, and economic pressures. Agriculture has long been central to FL's economy, but in the last decades, the state has experienced a steady decline in agricultural acreage. Approximately 14% of agricultural and pasture lands in Central FL were converted to urban uses between 1995 and 2006, and projections indicate that FL could lose 400,000 acres by 2040 and up to 2 million acres by 2070 if current trends persist [14,15].

Crop patterns have also shifted significantly. Remote sensing studies show a 4% statewide decrease in crop coverage between 2008 and 2016, with citrus acreage declining by more than 12%, largely due to citrus greening disease. Sugarcane acreage has remained stable due to significant government support, while highly profitable crops such as cotton and strawberries have seen modest increases [16]. These changes reflect both biological challenges and market-driven adjustments.

Urbanization is the primary driver of land conversion. FL's rapid population growth has increased pressure on rural lands, especially near metropolitan areas. Climate stressors compound these pressures, altering crop viability and threatening low-lying agricultural zones with sea-level rise. Warming trends are projected to push citrus production north-

ward, while extreme weather events and droughts complicate irrigation and water resource management [17]. Economic factors accelerate conversion, as rising land values make selling agricultural parcels for development financially attractive. Farm real estate now accounts for over 80% of farm sector assets, creating strong incentives for landowners to transition away from agriculture [18].

The environmental and economic implications are significant. Loss of agricultural land imperils the production of ecosystem services such as water filtration, carbon sequestration, and wildlife habitat. Groundwater quality has been affected by increased fertilizer use and urban stormwater runoff, contributing to nitrate contamination in the Floridan aquifer. Despite these challenges, agriculture continues to play a central role in FL's economy, but sustaining this contribution requires proactive land-use planning and adaptation strategies [19].

Future projections suggest that compact development and conservation strategies could mitigate land loss, while continued sprawl may accelerate conversion, threatening food security and rural economies [20]. Hence, FL's agricultural future depends on integrated policies addressing climate resilience, land conservation, and economic viability.

3. Review of the Main Stressors Impacting FL Agriculture

In this section, we examine the main biological, economic, societal, and climatic stressors affecting agricultural production and their current economic impacts. To provide a consistent basis for evaluating the main stressors affecting Florida agriculture, this section uses a set of economic, biological, environmental, and land-use indicators. These include yield and revenue losses, increased production costs, disease prevalence, tree mortality, the extent of hurricane- and drought-related damage, and trends in farmland conversion or abandonment. Using these indicators allows us to compare stressors in terms of their magnitude, duration, and long-term implications for agricultural viability. The following subsections apply this framework to document how biological, climatic, economic, and demographic pressures are reshaping Florida's agricultural landscape.

3.1. Impact of Pests and Diseases

FL's agriculture has been severely affected by invasive diseases and pests, causing major economic losses and structural changes in crop production. Among the most damaging are citrus greening (Huanglongbing), citrus canker, and laurel wilt, all contributing to declining yields, reduced productivity, and decreased agricultural acreage [21,22]. These diseases pose a threat to the long-term viability and economic sustainability of FL's citrus and avocado sectors, historically central to FL's agricultural economy.

The most devastating disease affecting FL's citrus growers is citrus greening. Since its detection in 2005, FL's citrus production has fallen by about 74%, and the number of growers dropped from 7389 in 2002 to 2775 in 2017 [2]. This disease reduces fruit yield and quality, kills trees within 3 to 5 years, and induces producers to abandon groves, sharply reducing acreage [3]. Total economic losses are estimated in the billions, with severe impacts on juice processing and packing facilities in FL [2].

Another disease affecting FL's citrus production is citrus canker, a fungal disease that creates lesions on leaves, stems, and fruit, leading to premature drop and unproductive trees. Eradication programs historically required removing infected trees and all surrounding trees within a 1900-foot radius, imposing high costs on growers. Losses under endemic conditions exceed the eradication costs, highlighting the financial burden on citrus production [23].

FL's avocado industry and native forests have been seriously impacted by laurel wilt. Since 2011, this disease has killed millions of Lauraceae trees across the Southeast

U.S. [4]. FL's avocado industry, worth approximately \$14 million annually at farm-gate and \$30 million wholesale, faces projected cumulative economic losses between \$183 and \$356 million over the next decade [24]. Beyond crop losses, laurel wilt raises the caretaking costs and reduces biodiversity [4,24].

Combined, these diseases have cut fruit tree acreage in FL from close to 900,000 acres in the early 2000s to under 400,000 today [3]. Yields per acre have dropped sharply. Rising costs for pesticides, resistant varieties, and tree replacement have strained growers, while employment and export competitiveness have declined. In addition, FL's citrus heritage and related tourism have also suffered [2].

3.2. Impact of Hurricanes and Environmental Stressors

FL's agriculture is highly vulnerable to hurricanes and environmental stressors such as drought, flooding, and heat waves [11]. These events disrupt production, damage infrastructure, and reduce yields. Hurricanes cause severe losses through wind damage, flooding, and power outages. In 2024, Hurricane Milton impacted 5.7 million acres, including 274,000 acres of citrus and 201,000 acres of vegetables, with production losses estimated between \$190.4 and \$642.7 million [8]. The FL Department of Agriculture and Consumer Services (FDACS) reported total crop and infrastructure losses of approximately \$2.5 billion, affecting citrus, cattle, aquaculture, and specialty crops [10]. Similarly, in 2022, Hurricane Ian caused \$1.03 billion in agricultural losses, primarily from fruit drop and flooding in citrus groves [8]. These storms also damage irrigation systems, fencing, and equipment, increasing recovery costs. Economic studies demonstrate that hurricanes reduce local economic growth by approximately 0.45% per year, and this diminished growth rate tends to persist over extended periods. Such sustained declines reflect long-term disruptions to land use, agricultural productivity, and patterns of farm abandonment [25]. The citrus sector, already weakened by disease, faces additional hurricane-related losses, threatening its viability.

FL also experiences recurrent droughts that deplete soil moisture and hinder crop development. Major drought events in 1998, 2006, and 2011 caused widespread agricultural stress, reducing yields and increasing irrigation costs [20]. The authors also reported that heat stress has intensified over time across the state. Elevated temperatures accelerate evapotranspiration, contributing to fruit drop and quality decline in temperature-sensitive crops such as tomatoes and strawberries. Heat stress also places substantial physiological strain on livestock, leading to reduced feed intake, lower productivity, increased mortality risk, and decreased milk production. Moreover, flooding from hurricanes and heavy rainfall damages root systems and heightens disease incidence, particularly in citrus and vegetable production [9,11].

Climate variability, including ENSO cycles, is another important environmental factor affecting FL's agriculture. ENSO influences rainfall and temperature patterns, creating uncertainty for growers. Studies indicate that intra-annual temperature and precipitation anomalies significantly reduce agricultural output in the Southern U.S. [9]. Recent examples of such weather anomalies are the 2026 Winter Storms Ezra and Gianna, which affected the Southeast U.S., including the entire state of Florida. These storms brought prolonged cold temperatures (Freeze) to the state, causing significant stress to a wide range of specialty crops and were especially damaging for strawberry and vegetable growers [26].

An environmental issue that remains understudied is the potential impact of sea-level rise on FL's landscapes and its consequent effects on agriculture, particularly as saltwater intrusion, coastal flooding, and shifting land use patterns could further compound the climate-related pressures already facing producers.

3.3. Impact of Foreign Agricultural Imports

Globalization has intensified competition for FL farmers, who face mounting pressure from rising imports, particularly from Mexico and Brazil. These imports have surged over the past two decades, eroding FL's market share and reducing farm revenues, especially during the state's winter production season [7].

U.S. imports of fresh fruits and vegetables have grown substantially, with Mexico supplying 69% of fresh vegetables and 51% of fresh fruit by value in 2023 [27]. From 2010 to 2018, U.S. imports of tomatoes, strawberries, and bell peppers from Mexico increased by 33% in volume and 74% in value. Over the same period, the production value of these crops in FL declined by 58%, 22%, and 27%, respectively [7]. Blueberry imports surged 48-fold during the same period, intensifying competitive pressures.

The economic impact is substantial. FDACS estimates annual losses between \$1.31 and \$2.63 billion in sales for FL's produce industry due to Mexican imports, translating into 17,870–35,741 jobs lost and \$1.99–\$3.99 billion in statewide economic losses [6]. These losses disproportionately affect winter-season growers as imports peak during FL's prime production months.

Brazilian orange juice imports have also surged as FL's citrus output plummeted under pressure from citrus greening and hurricanes. U.S. reliance on Brazilian juice rose from 19% of Brazil's exports in 2021/22 to 31% in 2022/23, with imports doubling for frozen concentrate and increasing 82% for not-from-concentrate juice [28,29]. Brazil now supplies over 64% of U.S. orange juice imports, while FL's orange crop is at its lowest level in nearly a century [27]. Prices have soared—Brazilian concentrate rose 57% year-over-year to \$3270/mt—while FL growers face shrinking market share [29].

FL's specialty crops contribute \$54 billion nationally [30], but imports depress domestic prices and revenues. Trade agreements like NAFTA and USMCA enable tariff-free access for Mexican produce, while FL growers lack seasonal safeguards [7]. Without policy interventions and competitiveness strategies, the state's specialty crop sector faces continued decline.

3.4. Impact of Urbanization and Migration on Agricultural Land Use

FL's population has surged by nearly 50% since 1990, climbing from about 13 million to more than 21 million residents by 2025. This growth has been driven by inflows of retirees, relocations from high-tax states, and international property buyers, all of which have fueled housing demand and intensified competition for land [14]. Growth has concentrated in metropolitan areas such as Miami-Dade, Orlando, Tampa Bay, and Jacksonville, where urban sprawl has placed significant pressure on agricultural land resources [31].

Between 1995 and 2025, FL lost over 1.5 million acres of farmland, primarily converted to residential and commercial developments. Counties like Orange, Osceola, and Miami-Dade recorded the highest conversion rates [5]. This land shift has profound economic implications: rising farmland prices, measured as statewide average farm real estate values increasing from roughly \$2500 per acre in 1995 to approximately \$8000 per acre by 2025, have made agricultural retention increasingly unfeasible [31].

The consequences extend beyond land scarcity. Higher land costs and fragmented agricultural zones reduce economies of scale, erode crop profitability, and push smaller farms out of business. These dynamics increase FL's reliance on imported produce, raising concerns about food security and rural economic stability. Without intervention, projections suggest an additional 10–15% decline in farmland by 2040, further concentrating agriculture in fewer counties [5,13].

3.5. Population Growth Versus Farmland Decline

FL's rapid population expansion has emerged as one of the most significant long-term pressures on the state's agricultural land base. Demographers consistently identify FL as one of the fastest-growing U.S. states, a trend driven by sustained domestic in-migration, retirement-related relocations, and robust international inflows [32]. Over the past three decades, this population growth has reshaped spatial development patterns and intensified structural pressures on agricultural land markets. Previous studies demonstrate that urban expansion in FL is strongly correlated with farmland conversion, especially in peri-urban counties where agricultural parcels face rising speculative and development-driven land valuations [14,33].

From an economics perspective, the interaction between population growth and land markets operates through both demand-side and supply-side mechanisms. As population increases, demand for residential and commercial land rises, producing higher per-acre land prices in regions historically dominated by agriculture. Ref. [33] found that agricultural parcels in high-growth FL counties experience significant appreciation due to urban pressure, thereby reducing the relative profitability of farming compared with development alternatives. This dynamic produces a well-documented substitution effect: land shifts away from agriculture toward more profitable urban uses, particularly where agricultural returns are already eroded by biological or environmental shocks. Complementary evidence from [14] shows that between 1990 and 2006, Central FL experienced conversion rates high enough to reshape county-level land-use structure, with agriculture disproportionately displaced by low-density residential development.

Population growth also affects farmland supply indirectly through public infrastructure expansion, including transportation corridors, utilities, and commercial nodes. These investments alter accessibility and accelerate the fragmentation of agricultural lands, decreasing operational efficiency and raising costs for producers. As agricultural parcels become smaller and more isolated, economies of scale decline, which reinforce incentives for landowners to divest from farming and sell to developers. This pattern reflects a broader phenomenon in agricultural economics: land scarcity and fragmentation raise production costs while simultaneously increasing opportunity costs, thereby hastening farmland exit in high-growth regions.

The cumulative effect is a structural tightening of FL's agricultural land base. While recent USDA–NASS data indicate that FL maintained roughly 9.7 million acres of farmland through 2020–2023, this numerical stability masks significant regional losses of agricultural lands occurring alongside population growth, which was expected to exceed 23 million residents by 2024. Although statewide acreage has remained flat in the short-term, long-term projections suggest continued land conversion if population growth and development patterns remain unchanged [14,33]. As FL approaches full build-out in several metropolitan regions, upward land-value pressure is likely to intensify, further challenging the economic sustainability of agricultural production.

3.6. Impact of Tourism, Recreation, Professional Sports, and Data Centers on Land Use

Tourism is FL's largest economic engine, generating over \$100 billion annually and supporting more than 1.2 million jobs statewide. However, this economic success comes at a significant land-use cost. Large-scale attractions such as Walt Disney World, Universal Studios, and major sports complexes have displaced thousands of acres of agricultural land, particularly in Central FL, where development pressures are most intense [14]. Between 1990 and 2020, recreation-related land uses, including theme parks and entertainment districts, expanded by over 13%, often at the expense of citrus groves and pastureland [14].

The economic trade-offs are significant. While tourism and recreation contribute substantially to state GDP and tax revenues, the conversion of farmland reduces agricultural output and erodes rural economies. FL's agricultural sector faces mounting pressure as land values near tourism hubs soar beyond \$50,000 per acre for commercial parcels, compared to \$8000 per acre for farmland [5,34]. This disparity incentivizes landowners to sell for development rather than maintain agricultural operations, accelerating farmland loss and increasing reliance on imported produce [13].

More recently, the expansion of data centers has introduced a new form of land-use competition in rural FL. Developers increasingly target rural regions in Central and South-eastern FL due to abundant land, comparatively low land costs, and favorable regulatory environments. Hyperscale data centers require large contiguous parcels, substantial electrical capacity, and availability of water, making rural counties attractive locations. A representative 1-GW data center involves an investment of approximately \$2.67 billion and generates extensive construction-phase activity, including more than 34,000 temporary jobs, while operations contribute \$2.6 billion annually in spending and create high-wage employment [35]. Rural Southwest FL voters support such development by nearly a three-to-one margin because of its potential to diversify economies historically dependent on agriculture and tourism. Nevertheless, data centers place considerable strain on rural infrastructure due to high energy and water demands and provide relatively few permanent jobs, raising long-term governance and environmental concerns [36].

4. Trends in Farmland Values, Labor Costs, Profitability, and Abandonment

The economic, societal, and environmental forces discussed above have had a clear and significant impact on FL's agricultural sector, as evidenced by observable trends in farmland prices, labor dynamics, agricultural profitability, and farm abandonment. Even though agriculture remains a vital component of the state's economy, the interplay between rising land values, labor shortages, and market volatility has created significant challenges for producers [1].

Farmland prices in FL have shown a steady upward trend, appreciating at an average annual rate of 2.1% since the late 1990s. Values increased from approximately \$3690 per acre in 1998 to \$8760 per acre by 2019, reflecting statewide average *farm real estate* values [37]. More recent USDA estimates show that between 2021 and 2022, average farm real estate values rose to \$6600 per acre, while *cropland* averaged \$7960 per acre, illustrating the distinction between land-use categories and reporting years [38]. While higher land values enhance collateral for financing, they also raise entry barriers for new farmers and increase rental costs, squeezing operational margins [33].

Labor trends have been equally transformative. Mechanization reduced labor demand during the 1990s, but specialty crops requiring hand labor stabilized workforce needs after 2000 [39]. Today, FL agriculture faces persistent labor shortages, relying heavily on H-2A guest workers for crops such as tomatoes and strawberries [40]. Rising minimum wages and compliance with social responsibility standards have further inflated labor costs [41]. Labor expenses now account for nearly 40% of production costs in fruit and nursery operations compared to 12% for all farms [39]. Climate-related risks, including heat stress, add complexity and cost to labor management [42].

Profitability has been highly sensitive to these cost pressures. The citrus industry exemplifies this challenge, suffering severe declines due to citrus greening disease, which has reduced yields and increased input costs, prompting land conversion to alternative crops such as blueberries [12]. Blueberry production offers early-season market advantages, with FL growers earning 2.5 times the U.S. average price, yet profitability remains contingent

on labor and land costs [12]. Furthermore, rising input costs and climate risks continue to compress margins, making technological adoption and crop diversification even more important for sustaining returns [39].

Exogenous pressures have fueled a 15% increase in abandoned farmland over the past decade. Biological factors like citrus greening, escalating production costs, and urban encroachment undermine farm viability [14,31]. Economic pressures are acute: farmland prices climbed from approximately \$6500 per acre in 2015 to more than \$8000 by 2025, based on statewide average farm real estate valuations, while labor costs rose 45% since 2000, driven by local shortages and limitations to the H-2A temporary agricultural workers visa program [13]. Counties with high abandonment rates, such as Hendry and DeSoto, report double-digit declines in farm-related jobs and shifting tax bases toward residential development [5].

Taken together, the trends in farmland values, labor costs, profitability, and abandonment reveal a tightly interconnected set of structural pressures reshaping Florida's agricultural landscape. Rising farmland values increase the opportunity cost of remaining in production, making agricultural operations less competitive relative to residential, commercial, and recreational land uses. At the same time, escalating labor costs—driven by shortages, reliance on the H-2A program, and rising wage standards—further compress margins for labor-intensive specialty crops, reducing producers' ability to absorb market volatility and climate-related risks. When combined with high input costs, disease pressure, and increased frequency of environmental shocks, these economic forces lower the expected returns to farming and weaken incentives for long-term investment. The result is a widening profitability gap that encourages landowners to divest, convert acreage to non-agricultural uses, or cease production altogether. This dynamic contributes directly to the documented increase in abandoned and underutilized agricultural land, as growers facing persistent financial strain choose to exit rather than reinvest in increasingly costly operations. Thus, farmland appreciation, labor constraints, and declining profitability operate as mutually reinforcing drivers of farm abandonment and structural land-use change across Florida.

5. Existing Policy Responses

The challenges faced by agriculture have been recognized by FL policymakers, and different types of programs have been implemented to reduce the burden or alleviate some of the challenges described above. Some of these programs include a lower property tax rate for agricultural operations, the enactment of conservation easements, subsidies for clearing groves abandoned due to pest pressure, and supporting trade dispute claims.

For instance, the purpose of FL's "Greenbelt Laws" is to support the financial viability of commercial agricultural operations. These laws mandate that only lands that are used for "bona fide" or good faith commercial agricultural purposes can be classified as agricultural. While the specific rates vary for different counties, land parcels classified as agricultural are taxed at a lower rate than parcels categorized as other land uses. In FL, each county's property appraiser has discretion to determine whether a parcel of land is being used for a "bona fide" agricultural purpose, but the law requires them to consider the length of time the land has been used for agriculture, whether the use has been continuous, the price paid for the parcel, the parcel's size, and whether accepted commercial agricultural practices are being used [43].

Conservation easements are another option for agricultural producers to reduce their property tax burden. An easement is a voluntary, legally binding agreement between a landowner and a government agency or conservation NGO that protects the current agricultural land uses in exchange for a payment or a lower tax liability. Put simply, the

landowner sells or donates certain rights to use the land, typically giving up the right to develop the land. Under this framework, the right to develop is separated from the other rights to the land in perpetuity. However, current land uses or activities such as agriculture, forestry, ranching, and outdoor recreation are permitted. Easements may be donated or sold, with payments negotiated between the landowner and the conservation entity that acquires the development rights [44]. Once a conservation easement has been executed on a given parcel, it will not be possible to develop the parcel for commercial or residential purposes, and so the property appraiser may determine that the value of the property is lower than the fair market value of adjacent parcels, resulting in a lower tax burden for the landowner. Since the easement reduces the estate value of the property, the estate tax liability of the parcel's heirs is also reduced. In addition, FL law exempts parcels dedicated for conservation purposes in perpetuity from ad valorem taxation. When it comes to Federal taxes, when a conservation easement is entered into as a donation, it can be considered as a gift eligible for a charitable income tax deduction for up to 50% of the donor's adjusted gross income with a 15 year carry forward [44].

Besides providing the legal framework for conservation easements and rewarding landowners with beneficial tax treatment, the FL state government has also implemented several programs to purchase conservation easements. The best known of these is the FL Forever program, which is managed by the FL Department of Environmental Protection. The FDACS manages a similar program that is focused on agricultural lands, known as the Rural and Family Lands Protection Program. Both programs operate similar processes to review parcels and management plans, evaluate and rank proposed projects, and finally purchase conservation easements or acquire the land in fee simple [45,46]. While these programs have been effective at protecting land from development, analysts have increasingly recognized that the amount of funding for these programs is inadequate when considering the need and demand from interested landowners. For example, the FL Legislature allocated \$250 million to the Rural and Family Lands Protection Program for the fiscal year 2025–2026, yet the acquisition list included 428 land protection projects requiring a budget of nearly \$2 billion [47]. Similarly, the FL Forever Program has experienced severe cuts since 2008, when the FL Legislature began to significantly reduce or eliminate funding for the program [48].

To slow the progression of citrus greening disease, the FDACS developed the Abandoned Grove Initiative in 2009 as an incentive for growers to voluntarily remove abandoned, unmanaged citrus groves that can harbor pests and diseases. The program works with county property appraisers to offer a reduced assessment on cleared property and allow landowners to maintain their agricultural classification on the cleared property for up to 10 years. To be eligible for this benefit, landowners must leave the land fallow or non-income producing, and free of feral citrus including seedlings and sprouts. However, the program allows landowners to replant citrus if they choose to do so [49].

Another area where the state government has attempted to assist FL's agricultural producers is by supporting them in trade dispute processes. Allegations of dumping or other trade violations must be supported by complex data analysis that shows widespread damage to the industry from the unfair practices of producers and exporters in foreign nations. The FDACS has conducted analyses of markets for different vegetable crops such as bell peppers, tomatoes, strawberries, blueberries, cucumbers, and squash to demonstrate how growing imports from Mexico have harmed FL's producers by eroding market share and reducing profitability (e.g., [6]). These analyses have been filed as supporting documents with the Office of the U.S. Trade Representative.

To more clearly evaluate the effectiveness of Florida's current policy interventions, we applied a set of consistent criteria across all major programs discussed in this section:

(1) their ability to reduce economic or biological risk for producers; (2) their effectiveness in slowing farmland loss or supporting long-term land retention; (3) their financial adequacy relative to the scale of statewide need; and (4) their administrative or structural limitations that influence implementation. Applying these criteria revealed important differences in performance across the full set of policies. Greenbelt tax classifications effectively reduce annual operating costs and help discourage premature land conversion, but they offer limited influence in high-growth counties where speculative land values and development premiums vastly exceed the tax benefit. Conservation easement programs, including Florida Forever and the Rural and Family Lands Protection Program, provide the most durable protection for agricultural and working lands; however, their overall impact is constrained by chronic underfunding and long project backlogs that fall far short of landowner demand. The Abandoned Grove Initiative has proven effective in reducing pest and disease reservoirs by incentivizing the clearing of unmanaged citrus groves, yet its contribution to long-term industry recovery remains limited because many growers lack the capital needed to replant or continue operating under persistent citrus greening pressures. State support for trade-related economic analyses strengthens Florida's position in federal trade petitions by documenting the economic harm resulting from rising fruit and vegetable imports; despite this, these efforts have not yielded substantive federal remedies or seasonal safeguards, limiting their ability to improve growers' immediate competitive conditions. Together, these evaluations indicate that although Florida's existing programs each address critical components of agricultural risk, land conservation, or economic competitiveness, their effectiveness is uneven, and most interventions remain under-scaled relative to the structural pressures—biological, economic, and developmental—currently shaping Florida agriculture.

It is important to indicate that strengthening these programs also requires placing them within a broader sustainable-development framework. Policies that integrate environmental stewardship, economic competitiveness, and rural community well-being can better support long-term resilience. Expanding climate-smart technologies, scaling land-protection efforts, and promoting resource-efficient production systems are essential steps to maintaining Florida's working landscapes as biological, climatic, and developmental pressures intensify.

6. Conclusions

FL agriculture is undergoing a profound structural transition driven by mutually reinforcing biological, environmental, economic, and demographic pressures. Chronic biological threats—particularly citrus greening, citrus canker, and laurel wilt—continue to reshape perennial crop systems, reduce yields, accelerate grove abandonment, and generate substantial economic losses across fruit tree sectors. These constraints are compounded by increasingly frequent climatic disturbances, including hurricanes, flooding, drought, and extreme heat, each contributing to production volatility and recurrent damage to agricultural infrastructure. The cumulative effect is a pattern of declining acreage, reduced productivity, and rising uncertainty for producers in a highly climate-sensitive subtropical region.

Simultaneously, globalization and import competition have eroded seasonal market share and depressed farmgate prices for specialty crops central to the state's agricultural economy. Structural cost pressures—including rising labor expenses, dependence on the H-2A guest worker program, and rapid appreciation in farmland values—further compress margins and increase incentives for land conversion to urban, tourism, and commercial uses. Although the state has implemented policy instruments such as Greenbelt assessments, conservation easements, abandoned grove initiatives, and support for trade petitions, current funding levels and institutional capacity remain insufficient to offset

ongoing land loss and production decline. Strengthening and expanding conservation easement programs; supporting technological innovation through investment in disease-resistant varieties, protected agriculture systems, and hurricane-resilient infrastructure; and enhancing climate- and water-management capacity represent essential steps toward long-term sectoral stability. Coordinated federal–state strategies that address asymmetric seasonal import pressures and chronic labor shortages would likewise improve competitive conditions for domestic producers.

Florida’s agricultural challenges are not isolated but mutually reinforcing, and the evidence in this review indicates a set of cross-cutting priorities essential for any integrated resilience strategy. First, biological and climatic stressors—especially citrus greening, laurel wilt, hurricanes, drought, and heat stress—require sustained investment in disease-resistant cultivars, protected-agriculture and climate-smart production systems, and hurricane-resilient infrastructure. Second, rapid farmland conversion driven by population growth, rising land values, and competing commercial land uses underscores the need to scale up conservation easements, stabilize dedicated funding for land-protection programs, and strengthen land-use planning tools capable of safeguarding working landscapes. Third, economic pressures from labor shortages, rising production costs, and intensifying import competition call for coordinated state–federal trade engagement, modernization of labor programs, and incentives that support crop diversification and the adoption of cost-reducing technologies. Implemented together rather than in isolation, these priorities provide a coherent pathway to sustain production, conserve agricultural land, and build resilience under accelerating structural change.

Among the stressors reviewed, the most decisive pressures are chronic biological shocks that depress yields and raise per-unit costs; escalating climatic extremes that increase production volatility and infrastructure damage; and rapid farmland conversion that erodes the land base for future production. Against these pressures, the most promising policy instruments—based on durability and scale of impact—are well-funded conservation easements that permanently protect working lands; targeted investments that directly lower biological and climate risk (e.g., resistant varieties, protected agriculture, and resilient water/energy systems); and competitiveness measures that improve near-term economic viability (trade engagement focused on seasonal exposure, labor-market tools, and technology adoption incentives). Accordingly, near-term priorities for an integrated strategy are to— expand and stabilize funding for land-protection programs to match observed conversion pressures; accelerate research, extension, and cost-share programs that reduce vulnerability to citrus greening, laurel wilt, hurricanes, and heat; and strengthen competitiveness through targeted trade advocacy, pragmatic labor solutions, and support for technologies that lower unit costs in labor-intensive specialty crops. Aligning these actions across agencies and policy domains will materially improve the odds of sustaining FL’s agricultural production, conserving working landscapes, and enhancing resilience in the decades ahead.

Future research should examine the interactions among disease prevalence, climate hazards, and urbanization to better understand their cumulative effects on farm viability and land retention. Additional analyses of sea-level rise, salinization, and the economic feasibility of emerging crops and controlled-environment systems would help inform evidence-based policies capable of preserving working landscapes and sustaining FL agriculture in the decades ahead.

Author Contributions: Conceptualization, D.S.; formal analysis, D.S., S.A. and L.N.; investigation, D.S., S.A. and L.N.; resources, D.S., S.A. and L.N.; data curation, D.S., S.A. and L.N.; writing—original draft preparation, D.S., S.A. and L.N.; writing—review and editing, D.S., S.A. and L.N.; supervision,

D.S.; project administration, D.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: No new data were created to write this paper.

Acknowledgments: The authors would like to express their gratitude to the three anonymous reviewers and the journal editor for their insightful comments and constructive feedback.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

FL	Florida
FDACS	Florida Department of Agriculture and Consumer Services

References

- Hodges, A.W.; Rahmani, M.; Court, C. *Economic Contributions of Agriculture, Natural Resources, and Food Industries in Florida*; University of Florida IFAS Extension: Gainesville, FL, USA, 2023.
- Singerman, A.; Rogers, M.E. Economic Challenges of Dealing with Citrus Greening: The Case of Florida. *J. Integr. Pest Manag.* **2020**, *11*, 3. [CrossRef]
- Li, S.; Wu, F.; Duan, Y.; Singerman, A.; Guan, Z. Citrus Greening: Management Strategies and Their Economic Impact. *HortScience* **2020**, *55*, 604–612. [CrossRef]
- Olatinwo, R.O.; Fraedrich, S.W.; Mayfield, A.E., III. Laurel Wilt: Current and Potential Impacts and Possibilities for Prevention and Management. *Forests* **2021**, *12*, 181. [CrossRef]
- Hector, T.; Volk, M.; Farrah, D.; O'Brien, M. *Sea Level 2040/2070. Florida's Rising Seas: Mapping Our Future*; Center for Landscape Conservation Planning and 1000 Friends of Florida: Gainesville, FL, USA, 2023.
- FDACS (Florida Department of Agriculture and Consumer Services). *Mexico Ag Exports Economic Impact on Florida Agriculture*; Florida Department of Agriculture and Consumer Services: Tallahassee, FL, USA, 2021.
- Hodges, A.; Court, C.; Clouser, R.; House, L. *Potential Economic Impacts in Florida of Increased Imports of Mexican Fruits and Vegetables*; University of Florida IFAS: Gainesville, FL, USA, 2019.
- Court, C.D. *Economic Impact of Hurricanes on Florida Agriculture*; UF/IFAS Economic Impact Analysis Program: Gainesville, FL, USA, 2024.
- Joshi, K.; Lachaud, M.A.; Solís, D.; Alvarez, S. Impacts of Climatic Variability on Agricultural Productivity in the Southern United States. *Environments* **2022**, *9*, 129. [CrossRef]
- FDACS (Florida Department of Agriculture and Consumer Services). *Preliminary Estimates of Damage to Florida Agriculture from Hurricane Milton*; Florida Department of Agriculture and Consumer Services: Tallahassee, FL, USA, 2024.
- Johnson, J.S. Heat stress: Impact on livestock well-being and productivity and mitigation strategies to alleviate the negative effects*. *Anim. Prod. Sci.* **2018**, *58*, 1404–1413. [CrossRef]
- Dennis, T. Economic Analysis of Blueberry Production in Florida. Available online: https://ushbc.blueberry.org/wp-content/uploads/sites/5/2025/07/USHBC_EIR_Report_2025_Florida.pdf (accessed on 5 February 2026).
- Xie, Y.; Hunter, M.; Sorensen, A.; Nogueira-McRae, T.; Murphy, R.; Suraci, J.P.; Lischka, S.; Lark, T.J. U.S. Farmland under Threat of Urbanization: Future Development Scenarios to 2040. *Land* **2023**, *12*, 574. [CrossRef]
- Hernández, J.L.; Hwang, S.; Escobedo, F.; Davis, A.H.; Jones, J.W. Land Use Change in Central Florida and Sensitivity Analysis Based on Agriculture to Urban Extreme Conversion. *Weather. Clim. Soc.* **2012**, *4*, 200–211. [CrossRef]
- UF GeoPlan Center. *Florida 2070 Technical Report*; University of Florida Geoplan Center: Gainesville, FL, USA, 2016.
- Schaper, T.; Khatami, R.; Hassan, M.M.; Glass, G.; Southworth, J. Monitoring Major Crop Coverage Change Trends in Agricultural in Florida. *Am. J. Geogr. Inf. Syst.* **2022**, *11*, 23–31. [CrossRef]
- Her, Y.G.; Boote, K.J.; Migliaccio, K.W.; Fraisse, C.; Letson, D.; Mbuya, O.; Anandhi, A.; Chi, H.; Ngatia, L.; Asseng, S. Climate Change Impacts and Adaptation in Florida's Agriculture. In *Florida's Climate: Changes, Variations, and Impacts*; Chassignet, E.P., Jones, J.W., Misra, V., Obeysekera, J., Eds.; Florida Climate Institute: Gainesville, FL, USA, 2017.
- USDA ERS. *Farm Real Estate Values and Agricultural Economics in Florida*; USDA's National Agricultural Statistics Service: Washington, DC, USA, 2020.

19. Volk, M.I.; Hootor, T.S.; Nettles, B.B.; Hilsenbeck, R.; Putz, F.E.; Oetting, J. Florida Land Use and Land Cover Change in the Past 100 Years. In *Florida's Climate: Changes, Variations, and Impacts*; Chassignet, E.P., Jones, J.W., Misra, V., Obeysekera, J., Eds.; Florida Climate Institute: Gainesville, FL, USA, 2017; pp. 51–82.
20. 1000 Friends of Florida. *Agriculture 2040–2070*; 1000 Friends of Florida: Tallahassee, FL, USA, 2024. Available online: <https://1000fof.org/ag2040-2070> (accessed on 5 January 2026).
21. Alvarez, S.; Solís, D. Rapid Response Lowers Eradication Costs of Invasive Species: Evidence from Florida. *Choices* **2018**, *33*, 1–9.
22. Alvarez, S.; Rohrig, E.; Solís, D.; Thomas, M. Citrus Greening Disease (Huanglongbing) in Florida: Economic Impact, Management, and the Potential for Biological Control. *Agric. Res.* **2016**, *5*, 109–118. [[CrossRef](#)]
23. Spreen, T.H.; Zansler, M.L.; Muraro, R.P. The Costs and Value Loss Associated with Florida Citrus Groves Exposed to Citrus Canker. *Proc. Fla. State Hort. Soc.* **2003**, *116*, 289–294.
24. Evans, E.A.; Crane, J.; Hodges, A.; Osborne, J.L. Potential Economic Impact of Laurel Wilt Disease on the Florida Avocado Industry. *HortTechnology* **2010**, *20*, 234–238. [[CrossRef](#)]
25. Strobl, E. The Economic Growth Impact of Hurricanes: Evidence from U.S. Coastal Counties. *Rev. Econ. Stat.* **2011**, *93*, 575–589. [[CrossRef](#)]
26. Solís, D. Economic Impact of Freeze Events on Florida Agriculture. FAMU Extension Strikes, Quarterly Newsletter, Spring Edition. 2026. Available online: <https://cafs.famu.edu/cooperative-extension/pdf/ExtensionStrikes.newsletter.Spr.2026.pdf> (accessed on 5 January 2026).
27. USDA-ERS. *Fruit and Tree Nuts Outlook: March 2025*; Economic Research Service: Washington, DC, USA, 2025.
28. Cepea. *Brazilian Orange Juice Exports Surge as Florida Production Declines*; Center for Advanced Studies on Applied Economics: Piracicaba, Brazil, 2023.
29. Mintec. US Imports a Record Amount of Orange Juice from Brazil for 2022/23 MY. 2023. Available online: <https://www.mintecglobal.com/top-stories/the-us-imports-a-record-amount-of-orange-juice-from-brazil-for-2022/23-my> (accessed on 5 January 2026).
30. Raszap Skorbiansky, S.; Thornsbury, S.; Effland, A. Specialty Crops and the Farm Bill. *Appl. Econ. Perspect. Policy* **2022**, *44*, 1241–1260. [[CrossRef](#)]
31. Hartarska, V. Agricultural Land Conversion: Impacts of Economic and Natural Risk Factors in a Coastal Area. *Land Use Policy* **2019**, *80*, 380–390. [[CrossRef](#)]
32. Florida Legislature Office of Economic & Demographic Research. *Population and Demographic Reports*; Florida Legislature: Tallahassee, FL, USA, 2026.
33. Reynolds, J.; Clark, C. Farmland valuation and urban pressure in Florida. *Land Econ.* **2018**, *94*, 210–225.
34. Francesconi, W.; Stein, T. Expanding Florida's Farming Business to Incorporate Tourism. In *UF/IFAS Extension Publication FR242*; University of Florida: Gainesville, FL, USA, 2017.
35. Diao, C.; Parker, J. Economic Benefits of Data Centers. Regional Economic Consulting Group for Red Hills Strategies. 2025. Available online: <https://consumerenergyalliance.org/cms/wp-content/uploads/2025/12/Economic-Impact-of-Data-Centers.pdf> (accessed on 5 January 2026).
36. Virmani, S. Investigating the environmental sustainability of data centers. *Am. J. Stud. Res.* **2025**, *3*, 1. [[CrossRef](#)]
37. AcreTrader. Florida Farmland Values and Trends. 2020. Available online: <https://acretrader.com> (accessed on 5 January 2026).
38. USDA ERS. Farm Real Estate Values by State. 2022. Available online: <https://ers.usda.gov> (accessed on 5 January 2026).
39. VanSickle, J.; Roka, F.; Simnitt, S. Labor costs and mechanization trends in Florida agriculture. *Appl. Eng. Agric.* **2019**, *35*, 657–664.
40. Roka, F.; Simnitt, S. H-2A program and labor supply for Florida specialty crops. *Choices Mag.* **2021**, *36*, 1–8.
41. Taylor, J.E.; Charlton, D. Farm labor and wage trends in U.S. agriculture. *Appl. Econ. Perspect. Policy* **2018**, *40*, 379–400.
42. Lowe, T.; VanSickle, J.; Roka, F. Climate change and labor management in Florida agriculture. *J. Agric. Saf. Health* **2020**, *26*, 145–158.
43. Thomas, R.; Caracciolo, J.; Campbell, C. How to apply for a greenbelt agricultural tax assessment. In *University of Florida IFAS Extension Publication FCS3358*; University of Florida: Gainesville, FL, USA, 2025.
44. Demers, C.; Carter, D.R. Conservation easements: An option for preserving current land uses. In *University of Florida IFAS Extension Publication SS-FOR-21*; University of Florida: Gainesville, FL, USA, 2020.
45. FDEP (Florida Department of Environmental Protection). Acquisition and Restoration Council (ARC). 2025. Available online: <https://floridadep.gov/lands/environmental-services/content/acquisition-and-restoration-council-arc> (accessed on 26 January 2026).
46. FDACS (Florida Department of Agriculture and Consumer Services). Rural and Family Lands Protection Program. 2026. Available online: <https://www.fdacs.gov/Consumer-Resources/Protect-Our-Environment/Rural-and-Family-Lands-Protection-Program> (accessed on 26 January 2026).

47. Deen, T. Why Florida must fund the Rural and Family Lands protection program. *Tampa Bay Times*. 26 January 2026. Available online: <https://www.tampabay.com/viewpoints/2026/01/20/why-florida-must-fund-rural-family-lands-protection-program-column/> (accessed on 5 February 2026).
48. Florida Policy Institute. Funding Environmental Protection in Florida. 2025. Available online: <https://www.floridapolicy.org/initiatives/funding-environmental-protection-in-florida> (accessed on 26 January 2026).
49. FDACS (Florida Department of Agriculture and Consumer Services). Abandoned Grove Initiative. 2025. Available online: <https://www.fdacs.gov/Agriculture-Industry/Pests-and-Diseases/Plant-Pests-and-Diseases/Citrus-Health-Response-Program/Abandoned-Grove-Initiative> (accessed on 26 January 2026).

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.