





Agroforestry Adoption in the Southeastern United States: A Comparative Analysis of the 2017 and 2022 Census of Agriculture

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Abstract

The Southeastern United States holds significant potential for agroforestry, with silvopasture systems being the most implemented. These systems offer advantages such as increased economic returns, diversified farm enterprises, and enhanced cash flow. Despite growing recognition of agroforestry's environmental and economic benefits, there is limited information on its regional adoption patterns and temporal trends, particularly at the state and parish levels. This study addresses this gap by analyzing and mapping changes in agroforestry adoption between 2017 and 2022 using data from the United States Census of Agriculture, with a focus on identifying spatial patterns, trends, and state-level changes over time. This study utilized the 2017 and 2022 Census of Agriculture data to examine state-level adoption of agroforestry in the Southeastern United States. A GIS-based approach was applied in ArcGIS Pro, where the data were organized into attribute tables and linked to shapefiles. Five maps were created using a graduated color scheme to visualize the spatial distribution and changes in farms practicing agroforestry across the region. The study discovers that between 2017 and 2022, total farm numbers in the Southeastern U.S. slightly declined, but agroforestry adoption increased, particularly in Virginia, North Carolina, and Georgia, highlighting a regional shift toward more sustainable and resilient farming practices. The study concludes that expanding agroforestry in the Southeastern U.S., particularly in low-adoption states, requires stronger policies, financial incentives, technical support, and market development to boost resilience, sustainability, and economic growth.

Keywords

Urbanization, Alley Cropping, Riparian Buffers, Silvopasture

1. Introduction

Over the past centuries, agriculture in the United States of America has shifted from integrated farm systems to specialized practices, resulting in the separation of crops, livestock, and other agricultural activities (Agunbiade et al., 2025). Soil and land resources remain essential for food production and development. The changing of food patterns and the demand for more products are increasing the demand for land and water resources, exhausting the resources and increasing the uncertainty regarding food security (Viana et al., 2022). Ensuring food security while maintaining soil fertility, crop yields, and ecosystem health requires strategies that balance productivity with sustainable, climate-resilient practices (Agunbiade et al., 2025).

With rising pressure to diversify farms and remain globally competitive, more landowners are adopting agroforestry to increase income while also delivering environmental and ecosystem benefits (Jose et al., 2012). Although two-thirds of the nation's prime farmland is used for crops, less than half of the prime farmland in the southern U.S. is cropland. In this region, over one-third of prime farmland is forested and 16% is pasture, compared with only 13% forest and 11% pasture for the U.S. overall (Zinkhan & Mercer, 1996). Agroforestry offers opportunities for producing biofuel feedstocks, specialty and organic crops, and livestock products, while also contributing to carbon sequestration, soil health, biodiversity, and improved air and water quality. It is also beneficial to both farmers and society at large (Jose et al., 2012). Agroforestry integrates agriculture and forestry to create sustainable, productive land-use systems that benefit from interactions between trees, crops, and livestock. While originating in tropical food systems, agroforestry in temperate regions is classified into five main practices: windbreaks, riparian buffers, alley cropping, silvopasture, and forest farming (USDA, Southwest Climate Hub, 2025).

Agroforestry is increasingly recognized as a focus of research and development in temperate regions, particularly in the United States (Zinkhan & Mercer, 1996). This field has emerged globally as a critical land-use strategy for addressing the intertwined challenges of climate change, food insecurity, land degradation, and rural livelihood vulnerability (Nair & Kumar, 2011). However, rapid urbanization is increasing land values along the rural-urban fringe, converting farmland and natural habitats into developments to accommodate population growth (Workman et al., 2014). In response to escalating climate pressures and shifts in land-use dynamics, agroforestry has gained prominence as a multifunctional system capable of simultaneously supporting agricultural output and environmental conservation (Bhol et al., 2024).

Agroforestry is a land-use system in which woody perennials (trees and shrubs) are deliberately integrated with crops and/or livestock on the same land management unit, either spatially or temporally, in ways that create ecological and economic interactions among the components (Nair, 1993). U.S. agriculture remains heavily dependent on annual crops with minimal perennial vegetation, but agroforestry practices such as riparian buffers, alley cropping, windbreaks, silvopasture, and forest farming can restore vital ecological functions to these landscapes (Schultz et al., 1995).

The southern U.S. demonstrates particularly high potential for agroforestry adoption due to its diverse landscapes, climate variability, extensive agricultural and forest resources, and growing need to address environmental and economic challenges (Zinkhan & Mercer, 1996). Globally, agroforestry is common, with 43% of farmland incorporating trees, while only 1.7% of U.S. farmers practice it. In 2022, the USDA introduced a \$60 million program under the Partnership for Climate Smart Commodities to expand agroforestry, aiming to establish 30,000 acres by 2026 (Philpott, 2024). In the 21st century, U.S. farm families face ongoing pressures such as land-use change, urbanization, intensification of natural resource use, climate change, water challenges, global competition, and food security needs. These natural and anthropogenic factors shape their land and resource management strategies (Workman et al., 2014). Advances in agroforestry research continue to position it as a central component of multifunctional working landscapes in the United States (Jose et al., 2012).

Despite its environmental benefits, agroforestry's profitability remains uncertain. Limited federal support means that most financial risk falls on landowners, creating a need for expanded economic research to ensure returns comparable to those of conventional farming. Disseminating such findings is essential to encouraging adoption in the southern U.S. (Zinkhan & Mercer, 1996). In the Southeast, forestlands have been exploited for over 300 years, with much privately owned forest, critical for wildlife habitat and water regulation, remaining unmanaged (Workman et al., 2003). Agroforestry trials in Louisiana tested cool-season forages to offset the dormancy of native warm-season species during winter and reduce livestock feed costs. Additional barriers to agroforestry adoption include farmers' limited experience in economic planning, a lack of institutional and policy support, and inadequate access to suitable technology (Workman et al., 2003). Awareness of agroforestry as a sustainable land-use option remains low among landowners, foresters, extension agents, and other land-use professionals (Workman et al., 2003).

Although agroforestry is increasingly valued for its environmental and economic advantages, detailed information on its regional adoption patterns and changes over time in the Southeastern United States, especially at the state and parish level, remains scarce. This study seeks to fill that gap by examining and mapping shifts in agroforestry adoption between 2017 and 2022 using data from the Census of Agriculture. This study aims to examine and map the adoption of

agroforestry practices across the Southeastern United States, utilizing data from the 2017 and 2022 United States Censuses of Agriculture. It focuses on identifying spatial patterns, trends, and temporal changes in agroforestry adoption at the state level.

2. Agroforestry in Southeastern U.S.A

Agroforestry in the U.S. began in the 1930s with the adoption of windbreaks, but scientific research and broader implementation gained traction only in the 1970s. Its growth was initially limited by a lack of strong evidence demonstrating its benefits, which slowed adoption by farmers, practitioners, and policymakers (Jose et al., 2012). A 1995 national survey of state natural resource professionals revealed that only 20 states had legislation addressing major agroforestry practices, with nine states offering direct legislation through cost-sharing programs (primarily for windbreaks), while 11 states used indirect incentives such as tax benefits (Cutter et al., 1999). Agroforestry has long been practiced in tropical regions, where forages are integrated with palms, fruit trees, or hardwoods (Nair, 2019). Interest in these systems is increasing in the temperate areas, where trees, crops, pastures, and livestock are often combined.

In the United States, agroforestry commonly features pines, managed pastures, and cattle (Pearson & Lewis, 1989). The southeastern U.S. has strong potential for agroforestry, with silvopastoral systems being the most widely adopted. These systems provide benefits such as higher economic returns, enterprise diversification, and improved cash flow (Zinkhan & Mercer, 1996). Alley cropping is less common due to challenges like lower-than-expected productivity, tree damage during cultivation, and increased labor and management demands (Zinkhan & Mercer, 1996). Research in the region demonstrates that integrating trees, pastures, and livestock can effectively support both beef production and pine growth. However, sustaining forage yields requires thinning, pruning, or wide tree spacing (Pearson & Lewis, 1989).

Agroforestry in the Southeast began in Georgia in the mid-1940s, where trials tested warm-season grasses and legumes under longleaf and slash pine on various soil preparation, fertilization, and liming treatments (Pearson & Lewis, 1989). In Florida, cattle ranching remains a significant agricultural activity, with ranchlands covering more than 2.4 million hectares, supporting over 1.8 million cattle, and generating more than \$300 million annually (Nair et al. 2005). Opportunities for expanding agroforestry in the Southeast include restoring marginal lands, implementing windbreaks and buffer strips to improve water quality and wildlife habitat, enhancing the profitability of pine and hardwood systems, and producing specialty crops on small farms (Zinkhan & Mercer, 1996).

Over time, Agroforestry is increasingly discussed as a practical response to the reality that agricultural landscapes are being asked to do more under tighter ecological constraints. By integrating trees into farming systems, it enhances soil fertility, reduces nutrient losses, supports local food security, improves land-use ef-

efficiency, minimizes soil and water loss, and often provides higher economic returns compared to traditional practices (Jose et al., 2012); (Workman et al., 2014). Agroforestry delivers a wide range of ecological and social benefits, including increased biodiversity, improved soil health, enhanced climate resilience, and better air and water quality. These outcomes contribute to stronger rural economies, improved food security, and more sustainable livelihoods. Expanding research and resources could particularly benefit small-scale farms in regions such as the Southwest (Mpanga et al., 2021). Integrating trees with crops and livestock also improves soil quality, produces nutrient-rich foods, and strengthens resilience to climate change (Philpott, 2024).

In southeastern Louisiana, alley cropping, forest farming, and silvopasture were found to be less common than expected, while professionals undervalued the benefits of windbreaks. Riparian buffers and windbreaks were the most frequently used practices, although landowners did not view water quality benefits as a high priority. Multistrata home gardens, however, were widely used and recognized by professionals (Workman et al., 2003). Southeastern forage systems require balancing ecological and economic considerations through adaptive grazing, soil and nutrient management, and practices such as rotational grazing to ensure long-term sustainability (Agunbiade et al., 2025).

The practice provides numerous environmental services, including flood reduction, climate regulation, and habitat enrichment for both wildlife and people, while serving as a cost-effective alternative to strict environmental regulations (Bainbridge, 1995). Agroforestry promotes a green economy by combining sustainable forestry and agriculture, especially benefiting small-scale producers while reducing negative environmental impacts (Mpanga et al., 2021). Globally, agroforestry is gaining traction as an efficient approach for intensifying and diversifying agriculture, particularly in marginal lands of the southeastern U.S., where tree-crop and tree-forage systems are proving to be both productive and economical (Workman et al., 2003). Silvopasture, which integrates trees with forage systems, offers a flexible and resource-efficient solution for managing these lands (Center for Environmental Farming Systems, 2024).

Experts have suggested incorporating trees into corn and soybean rotations while allowing livestock grazing to recycle nutrients through manure, emphasizing that trees have historically been more established in the Midwest than annual crops (Philpott, 2024). Agroforestry systems also contribute significantly to climate change mitigation; for example, an acre of agroforestry can sequester up to five metric tons of CO₂ annually, compared to one ton per acre for corn or soybeans (Philpott, 2024). Once established, agroforestry can be highly profitable. A 2018 study found that black walnut alley cropping with corn and soybeans could outperform conventional crop-only systems across roughly a quarter of the Corn Belt (Philpott, 2024).

Riparian buffers are particularly effective at reducing nonpoint-source pollution and improving water quality (Schultz et al., 1995). However, more research

is needed to fully understand the environmental impacts of silvopastoral systems, particularly their effects on surface and groundwater quality. Trees' deeper root systems are likely to improve nutrient uptake, especially for nitrogen, compared to shallow-rooted crops (Nair et al. 2005). Over the past few decades, agroforestry has evolved into a highly integrated, sustainable approach to land management that incorporates trees, shrubs, palms, or bamboo in spatial or temporal arrangements with crops and livestock. This model addresses pressing environmental challenges while improving productivity and long-term resilience (Agunbiade et al., 2025).

3. Methodology

3.1. Study Area

Figure 1 shows the Southeastern region of the United States, encompassing eleven states: Louisiana, Arkansas, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Virginia, Tennessee, and Kentucky (U.S. Census Bureau, 2023). This region, often referred to as the Southeast, is recognized for its diverse climatic and ecological conditions that make it one of the most agriculturally productive areas in the country.

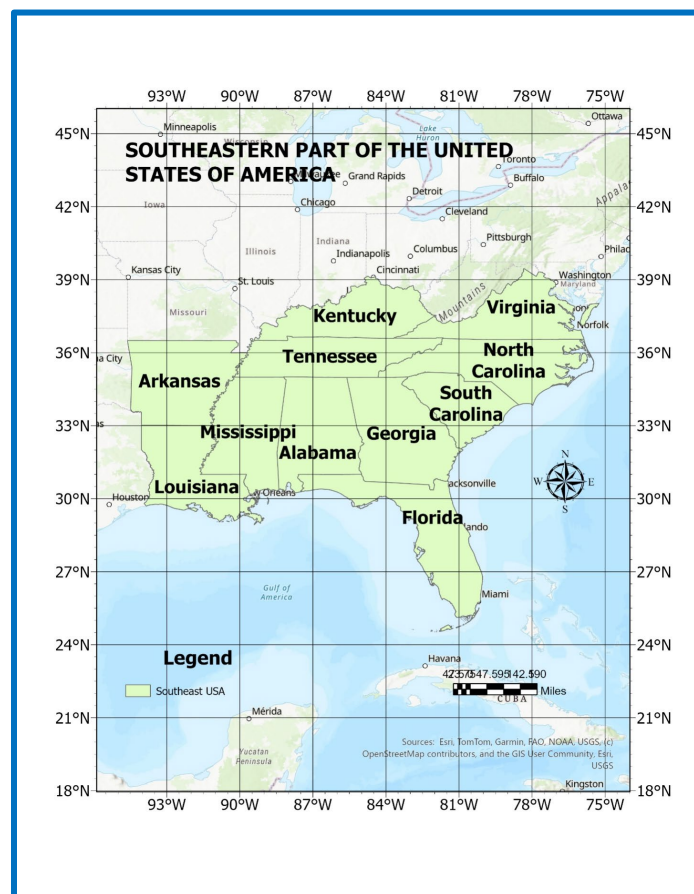


Figure 1. A map showing the southeastern part of the United States of America.

Geographically, the Southeast extends from approximately 30°N to 39°N latitude and 75°W to 93°W longitude, covering a variety of landscapes including the Atlantic and Gulf Coastal Plains, the Piedmont Plateau, and the southern Appalachian Mountains. The main features that influence the Southeast's climate are latitude, the presence of the Atlantic Ocean and the Gulf of Mexico, and regional topography (Paleontological Research Institute (PRI), 2021). This region reflects a more uniform climate than that found in most other parts of the United States. The Southeast records an overall average high temperature of 22°C (72°F) and average low of 9°C (48°F) and an average annual precipitation ranging from 100 to 125 centimeters (40 to 50 inches) inland to over 150 centimeters (60 inches) along the Gulf Coast of Mississippi, Alabama, and the Florida Panhandle (Paleontological Research Institute (PRI), 2021). Agriculture plays a vital role in the Southeast's economy, contributing significantly to national production of crops such as soybeans, corn, cotton, peanuts, and hay, as well as timber and poultry (U.S. Department of Agriculture, Economic Research Service (USDA ERS), 2022). The combination of fertile soils, favorable climatic conditions, and diverse land-use systems provides an ideal setting for examining spatial and temporal trends in agroforestry practices.

3.2. Data Sources

This research utilized data from the 2017 and 2022 United States Census of Agriculture (USDA NASS, 2019, 2024), as cited in (Kellerman et al., 2025) to examine the adoption of agroforestry in the Southeastern United States. Conducted nationwide by the U.S. Department of Agriculture's National Agricultural Statistics Service (USDA NASS), the Census of Agriculture offers detailed information on farm operations, land use, and conservation practices. This study specifically focused on the number of farms in each state reporting at least one agroforestry practice. This study relied solely on data from the 2017 and 2022 Censuses of Agriculture, as these are the most recent years in which the U.S. Department of Agriculture gathered complete and standardized national data on agroforestry practices. The 2017 Census was the first to systematically include agroforestry information, providing a dependable baseline, while the 2022 Census offers the latest available dataset. Focusing on these two consecutive censuses ensures consistency and enables a clear comparison of adoption trends over time, avoiding issues linked to earlier datasets that lacked uniform agroforestry measures. Additionally, the 2017-2022 period captures key advancements in climate-smart agriculture and sustainable land-use policies, offering a timely and accurate picture of current agroforestry adoption patterns across the Southeastern United States.

3.3. Methods

The Census of Agriculture categorizes "agroforestry practice" as land-management approaches that deliberately integrate trees and shrubs with crops or livestock to provide environmental, economic, and social benefits. This includes spe-

cific practices such as silvopasture (combining trees with forage and livestock), alley cropping (growing crops between tree rows), windbreaks (tree or shrub lines that reduce wind erosion), riparian buffers (vegetated zones along waterways to enhance water quality), and forest farming (producing high-value specialty crops under a forest canopy) (USDA NASS, 2019, 2024; Kellerman et al., 2025). While each practice is reported separately in the Census, for analytical purposes, farms implementing any of these activities are grouped under the overall category of agroforestry. The study utilized a GIS-based method to map and analyze the spatial patterns of farms engaged in agroforestry across the Southeastern United States for 2017 and 2022. Data on farms reporting at least one agroforestry practice were obtained from the U.S. Census of Agriculture and organized into an attribute table within ArcGIS Pro. This dataset was then joined to a corresponding state-level shapefile of the Southeastern region to facilitate spatial visualization. Using the symbology function with a graduated color scale, the study illustrated variations in the number of agroforestry farms among states. A total of five thematic maps were created to depict both spatial and temporal differences in agroforestry adoption, revealing areas with higher or lower participation over the two census years. These visual outputs provided valuable findings about regional patterns, emerging trends, and notable shifts in agroforestry practices across the Southeastern United States.

4. Results

This section outlines the results of the study, focusing on the total number of farms in the Southeastern United States and the adoption of agroforestry practices across states using data from the 2017 and 2022 United States Census of Agriculture. For each state, the data includes the total number of farms, the number and percentage of farms implementing at least one agroforestry practice, and changes in adoption between the two census years.

Table 1 summarizes the total number of farm operations in the Southeastern United States for 2017 and 2022, including the number and percentage of farms implementing at least one agroforestry practice in each state. It also indicates the changes in agroforestry adoption over the five years, highlighting states with the highest participation, such as Virginia and North Carolina, and those with lower adoption, like Louisiana. Overall, the data show a slight decline in total farm numbers, accompanied by a general increase in agroforestry practices throughout the region (**Table 1**).

Figure 2 illustrates the distribution of farms across the Southeastern United States in 2017, using a choropleth color gradient to depict variations in farm numbers by state. States shaded in darker red represent those with the highest farm counts, while lighter yellow tones indicate states with comparatively fewer farms.

Based on the data, Kentucky recorded the largest number of farms in 2017, with 75,966 farms, making it the leading agricultural state in the region. It was

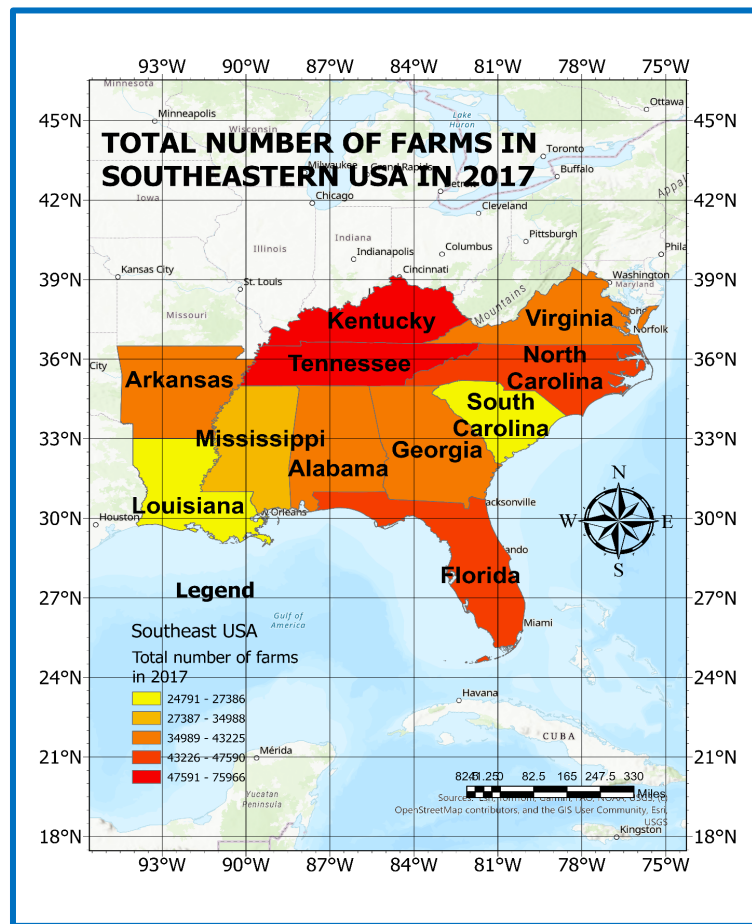
Table 1. Total number of farm operations in the southeastern United States reporting agroforestry by state, based on the 2022 and 2017 United States Census of Agriculture.

State	Total number of farms in 2017	Total number of farms in 2022	Number of farms reporting at least one agroforestry practice in 2017	Number of farms reporting at least one agroforestry practice in 2022	Percentage of farms reporting at least one agroforestry practice in 2017	Percentage of farms reporting at least one agroforestry practice in 2022	Change in the proportion of farms reporting at least one agroforestry practice from 2017 to 2022
Alabama	40,592	37,362	635	736	1.56%	1.97%	0.41%
Florida	47,590	44,703	803	804	1.69%	1.80%	0.11%
Georgia	42,439	39,264	969	1087	2.28%	2.77%	0.49%
Arkansas	42,625	37,756	585	686	1.37%	1.82%	0.44%
Kentucky	75,966	69,425	1028	1102	1.35%	1.59%	0.23%
Louisiana	27,386	25,006	349	359	1.27%	1.44%	0.16%
Mississippi	34,988	31,290	542	571	1.55%	1.82%	0.28%
North Carolina	46,418	42,817	1162	1416	2.50%	3.31%	0.80%
South Carolina	24,791	22,633	667	721	2.69%	3.19%	0.50%
Tennessee	69,983	63,105	938	1015	1.34%	1.61%	0.27%
Virginia	43,225	38,995	1526	1534	3.53%	3.93%	0.40%

Source: (USDA NASS, 2019); (USDA NASS, 2024); (Kellerman et al., 2025).

followed closely by Tennessee, which reported 69,983 farms. States such as Florida, North Carolina, and Virginia also showed relatively high counts, with 47,590, 46,418, and 43,225 farms, respectively. Arkansas and Georgia recorded 42,625 and 42,439 farms, while Alabama had 40,592 farms. At the lower end of the scale, Mississippi had 34,988 farms, placing it in a mid-range category, whereas Louisiana and South Carolina reported the fewest farms, with 27,386 and 24,791 farms, respectively. These variations are clearly conveyed through the map's color gradient, which effectively differentiates states with higher farming activity from those with fewer agricultural operations. Overall, the map demonstrates a clear concentration of farms in states like Kentucky and Tennessee, while states such as South Carolina and Louisiana maintain significantly smaller farm numbers.

Figure 3 depicts the distribution of farms across the Southeastern United States in 2022, using a choropleth color gradient to highlight differences in farm numbers by state. Data show that Kentucky led the region with 69,425 farms, retaining its position as the most agriculturally active state. Tennessee followed with 63,105 farms, placing it in the same top category. Florida ranked third with 44,703 farms, while North Carolina reported 42,817 farms, and Virginia recorded 38,995 farms. Mid-range figures were seen in Georgia with 39,264 farms, Arkansas with 37,756 farms, and Alabama with 37,362 farms.

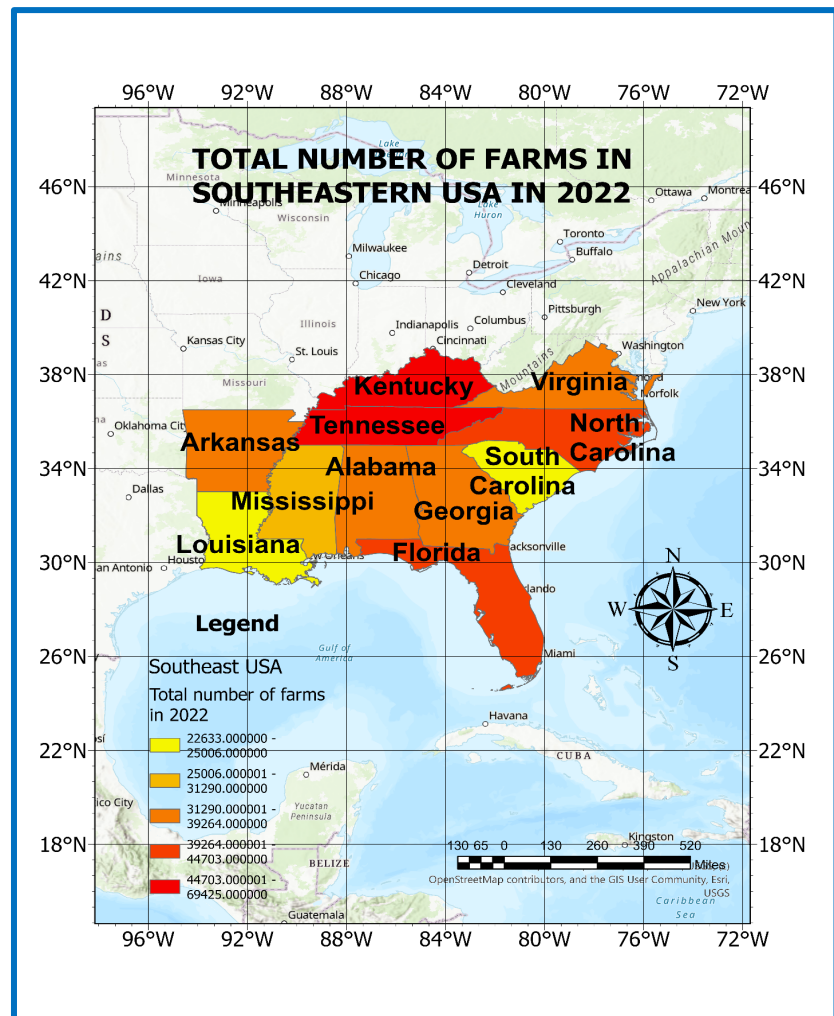


Source: (Kellerman et al., 2025).

Figure 2. Total number of farms in southeastern USA in 2017.

In contrast, states with fewer farms included Mississippi with 31,290 farms, while Louisiana and South Carolina recorded the lowest counts, at 25,006 and 22,633 farms, respectively. The color scheme of the map effectively emphasizes these differences, clearly distinguishing states with high levels of farming activity, such as Kentucky and Tennessee, from those with significantly fewer farms, including South Carolina and Louisiana (Figure 3).

As shown in Figure 4 below, in 2017, the number of farms in the Southeastern United States that reported using at least one agroforestry practice varied greatly from state to state. Agroforestry, which combines trees and shrubs with agricultural land, is more commonly practiced in some areas than in others. The data indicate that Virginia has the highest number of farms, with 1526 farms engaging in agroforestry, placing it in the top category for adoption. This makes Virginia the leader in agroforestry within the region. Following closely is North Carolina, with 1162 farms, showing strong engagement, though slightly fewer than Virginia. Kentucky comes in third with 1028 farms, also reflecting a considerable level of adoption, while Tennessee, with 938 farms, demonstrates substantial involvement as well, though just below Kentucky.

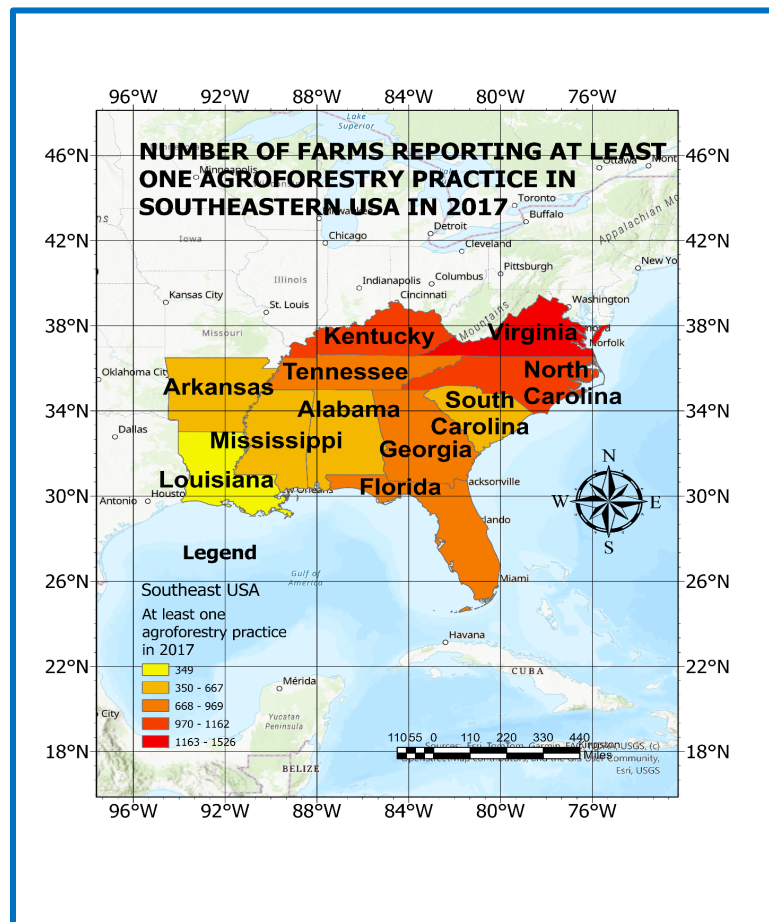


Source: (Kellerman et al., 2025).

Figure 3. Total number of farms in the southeastern USA in 2022.

Georgia and Florida report significant agroforestry activity, with 969 and 803 farms, respectively, indicating moderate adoption in both states. South Carolina shows a similar level of agroforestry involvement, with 667 farms. At the lower end, Alabama reports 635 farms using agroforestry, placing it in the mid-range category. Arkansas and Mississippi report 585 and 542 farms, respectively, indicating slightly lower levels of practice but still more than in Louisiana. Louisiana has the smallest number of farms, with just 349 reporting agroforestry practices, making it the state with the least adoption in the region.

Figure 4 reveals clear regional patterns in the adoption of agroforestry. Virginia, North Carolina, and Kentucky are leading the way, while Louisiana and Mississippi have fewer farms practicing agroforestry. These trends may be influenced by various factors such as state-specific agricultural policies, climate, and land-use traditions, highlighting regional differences in agroforestry implementation across the Southeastern U.S.



Source: (Kellerman et al., 2025).

Figure 4. Number of farms reporting at least one agroforestry practice in the southeastern USA in 2017.

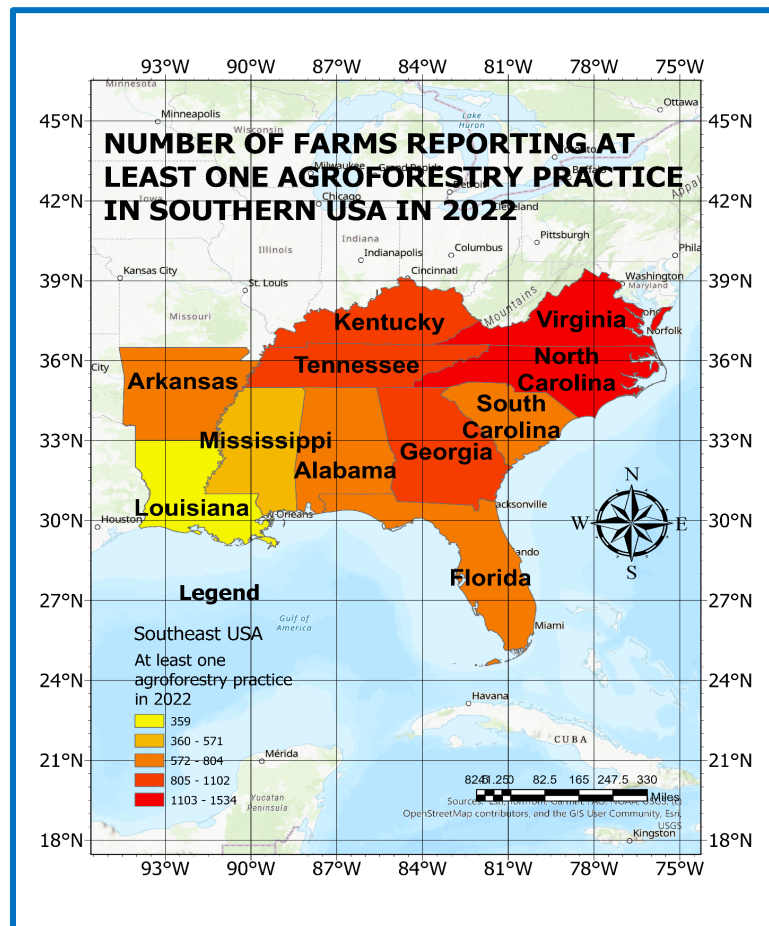
In **Figure 5**, the level of agroforestry adoption across the Southern United States shows significant variation among states in 2022. Virginia led the region with the highest number of farms, reporting 1534 farms practicing agroforestry. This places Virginia in the top tier, indicating its strong embrace of agroforestry methods. North Carolina followed closely with 1416 farms, also ranking in the highest category, signaling widespread agroforestry use throughout the state.

Next, Kentucky had 1102 farms, reflecting considerable participation in agroforestry practices, while Georgia, with 1087 farms, showed similarly robust engagement. Tennessee, with 1015 farms, also demonstrated solid adoption, though its numbers were slightly lower than those of Kentucky and Georgia. In the middle range, Florida reported 804 farms, and South Carolina had 721. Both states exhibited moderate involvement in agroforestry, with Florida slightly ahead in terms of adoption, though neither state reached the levels seen in the top-ranking states.

At the lower end, Alabama reported 736 farms, placing it within the middle range. Arkansas had 686 farms, indicating a somewhat lower adoption rate but still a fair level of participation. Mississippi, with 571 farms, showed a more mod-

est level of engagement compared to the others, while Louisiana, with only 359 farms, had the fewest agroforestry participants, suggesting that the practice is still in its early stages in the state.

Overall, the 2022 data demonstrates that states like Virginia, North Carolina, and Kentucky are leading in agroforestry adoption, while Louisiana continues to have the smallest share of participating farms. The data point to a growing trend in agroforestry across the region, with some states, such as Georgia and Florida, showing the potential for even greater expansion in the future (Figure 5).



Source: (Kellerman et al., 2025).

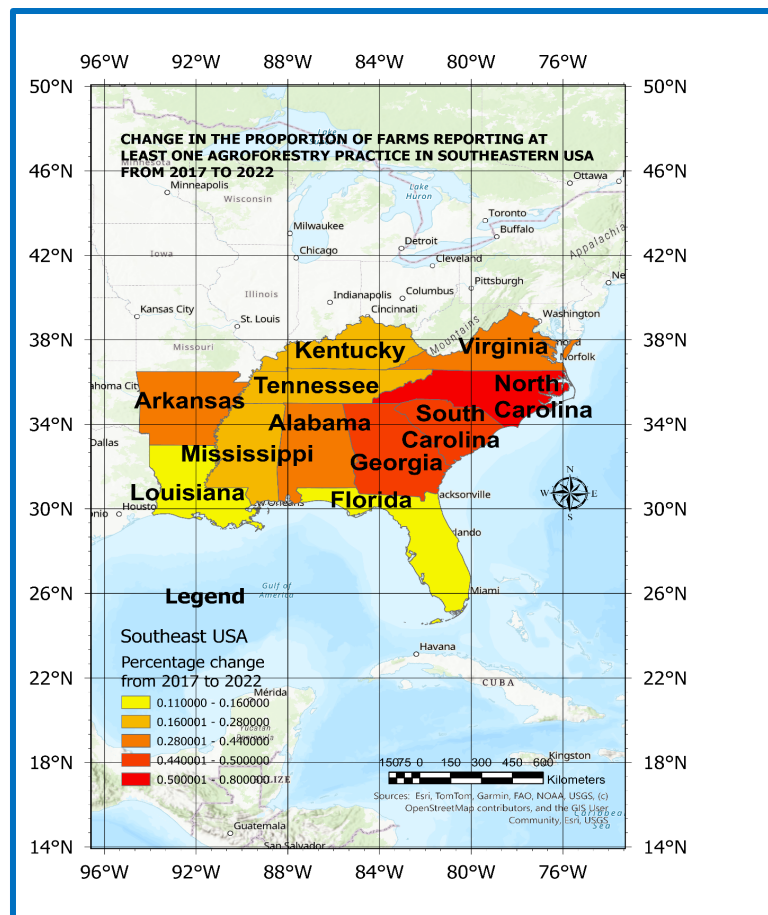
Figure 5. Number of farms reporting at least one agroforestry practice in the southeastern USA in 2022.

Figure 6 displays the changes in the proportion of farms in the Southeastern United States that reported using at least one agroforestry practice from 2017 to 2022. It employs a color gradient to indicate the percentage change across different states, with each color shade representing a specific range of change. The scale ranges from yellow, indicating the smallest increase, to very dark red, which signifies the largest increase in agroforestry practices. According to the key, yellow represents a small increase (0.111% to 0.1600%), orange shows a moderate in-

crease (0.1601% to 0.2800%), red indicates a substantial increase (0.2801% to 0.4400%), dark red denotes a very large increase (0.4401% to 0.5000%), and very dark red reflects the highest level of change (0.5001% to 0.8000%).

The map highlights that the most significant increases in agroforestry practices are concentrated in the southeastern U.S., with states like North Carolina, South Carolina, and Georgia, which are shaded in very dark red, demonstrating the highest growth in adoption. These states experienced a change in the range of 0.5001% to 0.8000%, indicating a strong trend toward adopting agroforestry techniques in recent years.

In comparison, states such as Virginia and Tennessee, marked in red, show significant increases in agroforestry, with changes between 0.2801% and 0.4400%. These states have made considerable progress in integrating agroforestry practices, though their growth rate is not as pronounced as that seen in the darkest red states. States like Florida, Alabama, and Mississippi, shaded in yellow and light orange, exhibit more modest increases, with changes ranging from 0.111% to 0.2800%, indicating a slower rate of adoption.



Source: (Kellerman et al., 2025).

Figure 6. Change in the proportion of farms reporting at least one agroforestry practice from 2017 to 2022.

Lastly, areas like Louisiana and Arkansas, showing yellow and light orange shades, have experienced minimal to no significant change in agroforestry practices. This suggests a slower or more limited adoption of agroforestry techniques in these regions. Overall, the map provides a comprehensive view of the growing trend of agroforestry adoption across the Southeastern U.S., highlighting the substantial progress made in certain states while showing more gradual growth in others (**Figure 6**).

5. Discussion and Conclusion

The 2017 and 2022 Census of Agriculture data highlight notable trends and changes in farming activity and the adoption of agroforestry throughout the Southeastern United States. Overall, the total number of farms in the region showed a slight decline between the two census periods, reflecting nationwide patterns such as farm consolidation, shifts in the demographics of farm operators, and increasing urbanization. The spatial distribution of farms (**Figure 2**) demonstrates that agricultural activity remains most concentrated in states such as Kentucky and Tennessee, which consistently reported the highest number of farms during the 2017 census period. These states form a central agricultural corridor within the Southeast, characterized by long-standing mixed crop-livestock systems, relatively favorable topography, and strong agricultural infrastructure (**Knox et al., 2014**).

In contrast, states such as Louisiana and South Carolina exhibited notably lower farm counts, reflecting differences in land availability, land-use history, and, in some cases, greater urbanization or wetland dominance. These spatial patterns align with previous assessments, indicating that farm density in the southeastern United States tends to decline toward the coastal plain. These regions often experience higher levels of urban expansion, wetland coverage, and competing land uses that limit the extent of traditional agricultural operations (**Napton et al., 2010**).

The pattern of agroforestry adoption differed across the region, with Virginia leading in both census years, recording 1526 farms practicing agroforestry in 2017 (**Figure 4**) and slightly increasing to 1534 in 2022. According to the (**Virginia Department of Forestry, 2025**), the department promotes agroforestry through initiatives that provide training, mentorship, and resources for landowners. The Virginia Tech Agroforestry Initiative, in partnership with Appalachian Sustainable Development, offers hands-on workshops, peer learning, and demonstration sites to help farmers adopt practices like silvopasture and forest farming. Meanwhile, the Virginia Department of Forestry supports landowners through conservation easements, estate planning help, and recognition programs, encouraging sustainable management of working landscapes.

North Carolina also showed strong growth, rising from 1162 farms in 2017 to 1416 in 2022. For instance, the Agroforestry Research Unit at Cherry Farm (NC State University's CEFS) studies tree-livestock systems like silvopasture and serves

as a demonstration site for farmers. CEFS also works with the U.S. Forest Service's Southeast Regional Climate Hub to promote climate-smart practices and provide technical support for sustainable, resilient land management ([Center for Environmental Farming Systems, 2024](#)). By 2022, Kentucky, Georgia, and Tennessee each had over 1000 farms implementing agroforestry practices. In contrast, Louisiana consistently had the lowest level of adoption, with only 349 farms in 2017 and 359 in 2022, illustrating the regional differences in the implementation of agroforestry systems.

The relative increase in agroforestry adoption between 2017 and 2022 is especially notable. North Carolina, South Carolina, and Georgia experienced the largest proportional growth, with rates ranging from 0.5001% to 0.8000%. This trend likely reflects focused initiatives or rising interest among farmers in these states, potentially driven by conservation programs, efforts to diversify farm income, or growing awareness of agroforestry's environmental benefits. Virginia and Tennessee also saw meaningful increases, though at a somewhat slower rate, whereas Louisiana and Arkansas showed minimal change, suggesting that obstacles to adoption persist in certain areas of the region.

Several factors likely explain these regional variations. States with well-established forestry industries, strong extension services, or policies promoting conservation are more prone to higher rates of agroforestry adoption. Moreover, the advantages of agroforestry, such as improved soil stability, reduced erosion, enhanced water quality, and diversified farm income, are particularly attractive to farms in areas affected by climate variability and land degradation. In contrast, states with lower adoption rates may encounter obstacles like limited technical expertise, smaller markets for agroforestry products, and competing agricultural priorities.

For instance, in Louisiana and Arkansas, agroforestry adoption tends to be lower due to challenges like poor market access for agroforestry products, small or divided farms, land or soil conditions that are not ideal for integrating trees with crops, limited technical knowledge, and few policy or financial supports. These factors contribute to the slower uptake of agroforestry compared with states that have higher adoption rates ([Workman et al., 2003](#); [Zinkhan & Mercer, 1996](#)). Overall, the data suggest that although the total number of farms is declining, the uptake of agroforestry is on the rise, indicating a gradual but significant move toward more sustainable agricultural practices.

The review of the 2017 and 2022 Census of Agriculture data reveals both continuity and change in agriculture across the Southeastern United States. Although conventional farming continues to dominate, there has been a noticeable decline in total farm numbers, with Kentucky and Tennessee remaining the most agriculturally active states. In contrast, agroforestry shows a positive trend, with Virginia, North Carolina, and Georgia leading in adoption, highlighting the potential of tree-based systems to strengthen farm resilience and support environmental sustainability.

The greatest proportional increases in agroforestry were observed in North Carolina, South Carolina, and Georgia, reflecting growing farmer engagement and possible state-level support for sustainable land management. Conversely, slower adoption in Louisiana and Arkansas indicates that challenges such as limited awareness, technical knowledge, and financial incentives continue to restrict wider implementation.

These results emphasize the importance of targeted outreach, education, and supportive policies to promote agroforestry, especially in states with low participation. Enhancing research and technical assistance, developing markets for agroforestry products, and incorporating these practices into broader conservation and climate adaptation strategies could accelerate adoption. By diversifying farm income, improving soil and water resources, and boosting ecosystem resilience, agroforestry presents a viable and sustainable pathway for agricultural development throughout the Southeastern United States.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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