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Characteristics and Trends of U.S. Rice Production Practices, Costs, and Returns, 2013–24

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Characteristics and Trends of U.S. Rice Production Practices, Costs, and Returns, 2013–24

Kate Vaiknoras, Jeffrey Gillespie, and Nathan Childs

Abstract

In 2024, the United States planted nearly 3 million acres of rice, almost entirely in California and the South. This report identifies major trends in rice farming from approximately 2013 to 2024 and examines their causes and implications. While previous research has examined these trends for earlier periods, newly available data from the 2021 Agricultural Resource Management Survey (ARMS) combined with other data from the U.S. Department of Agriculture, including on production costs, acreage, and prices, allows for an updated analysis. This data is timely as the rice industry has faced challenges such as drought, flooding, rising input prices, and increased export competition over the past decade. Since 2013, total U.S. planted acreage of rice has fluctuated, largely because of inconsistent rainfall patterns. Technology use has shifted as the adoption of hybrid and nongenetically modified, herbicide-tolerant rice varieties increased from 2013 to 2021. Recently, rising input prices have contributed to increased production costs: The total nominal cost of producing 1 acre of rice increased 36 percent from 2020 to 2024 (or a 14-percent increase in real terms using 2024 dollars). The trends identified in this report have implications for rice growers, other agricultural producers in rice-producing regions, U.S. rice consumers, policymakers, and other stakeholders.

Keywords: Rice, Agricultural Resource Management Survey (ARMS), commodity costs and returns, agricultural production practices, agricultural input costs

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A report summary from the Economic Research Service

Characteristics and Trends of U.S. Rice Production Practices, Costs, and Returns, 2013–24

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Key Points

- The total number of U.S. farms producing rice fell by 32 percent from 2012 to 2022, while the number of farms producing more than 1,000 acres of rice grew by 11 percent.
- Since 2013, total planted rice acreage in the United States has fluctuated annually due largely to adverse weather: Drought in California caused a steep drop in acreage in the State in 2022 and flooding in the southern United States adversely affected planted acreage in several years.
- In 2021, 48 percent of rice acres nationally were planted with herbicide-tolerant varieties and 44 percent were planted with hybrids. All adoption was in the South. In California, which primarily grows medium-grain rice, hybrid and herbicide-tolerant varieties are not available.
- In 2021 and 2022, U.S. agricultural input prices rose sharply, particularly for fertilizer. This contributed to an increase in production costs for rice and other crops. The nominal average total cost of producing 1 acre of rice increased 36 percent from \$954 in 2020 to \$1,296 in 2024. In real terms (adjusted for inflation), the total cost of producing 1 acre of rice declined from 2013 to 2020, after which it increased until 2022 before falling slightly in 2023 and again in 2024.

Why Does This Matter?

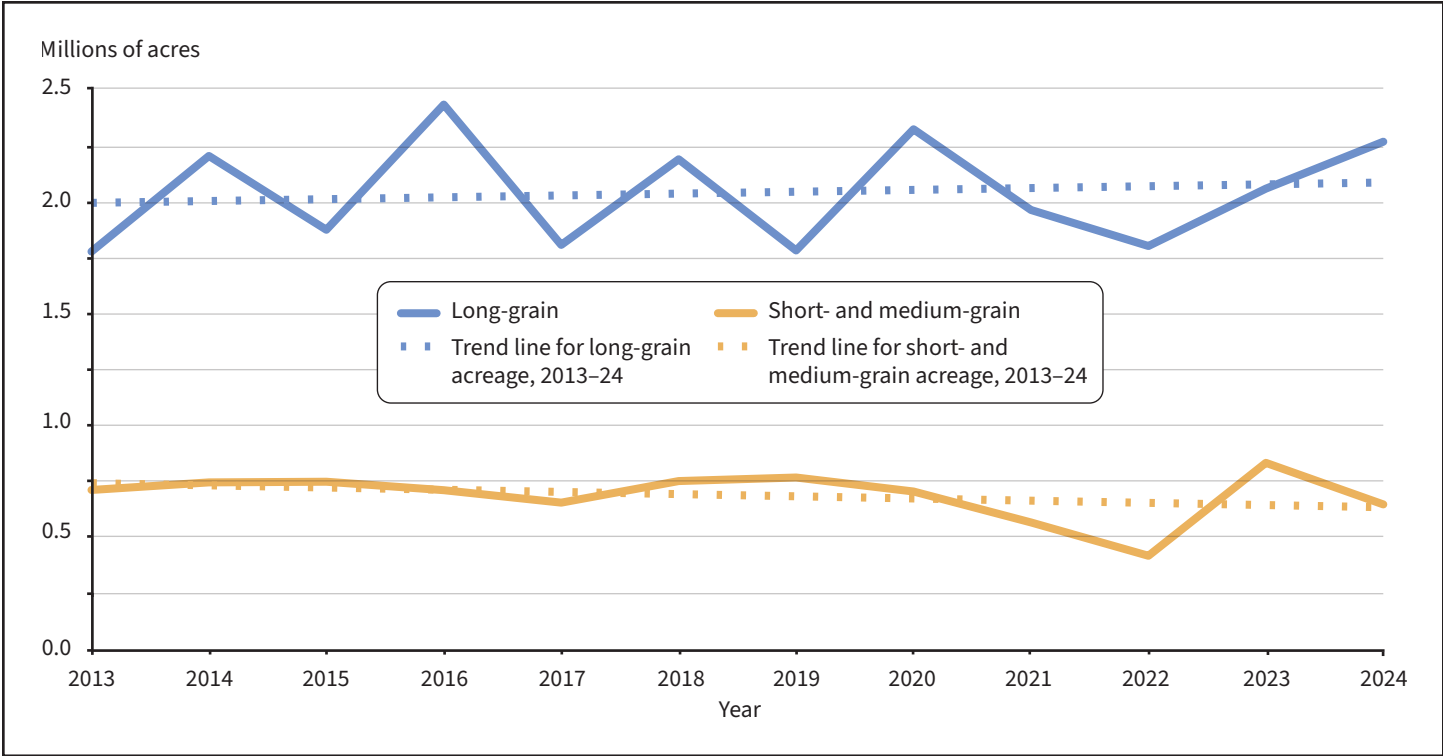
In the past decade, U.S. rice producers, who are almost entirely located in California or the South, have faced many challenges. This report identifies major trends in rice farming from approximately 2013 to 2024 and examines their causes and implications. Rice is relatively expensive to produce compared to other U.S. crops, leaving rice farmers particularly affected by increases

in input costs. The detailed information about trends in prices, costs, trade, structural change, technology use, management practices, and profitability documented in this report serves as a comprehensive update that can be used by a variety of stakeholders to understand the evolution of and changes in the U.S. rice sector in recent years.

A Few More Details

This study uses data from several sources, including USDA, Economic Research Service (ERS) Commodity Costs and Returns estimates and the 2021 USDA, National Agricultural Statistics Service (NASS) and USDA, ERS Agricultural Resource Management Survey (ARMS). In 2024, U.S. rice growers planted 2.28 million acres of long-grain rice, 615,000 acres of medium-grain rice, and 29,000 acres of short-grain rice (USDA, NASS, 2025a). Over the past decade, medium- and short-grain rice acreage was lowest in 2022 due primarily to drought in California. In 2023, medium- and short-grain rice acreage fully recovered, doubling its 2022 level. Long-grain rice acreage has fluctuated over the past decade, largely due to flooding in certain years, primarily in Arkansas, the largest long-grain producing State.

Total rice planted acreage in the United States



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Crop Production*.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

Characteristics and Trends of U.S. Rice Production Practices, Costs, and Returns, 2013–24

Introduction

This report explores recent developments in U.S. rice production at a national, State, and regional level. It first examines trends in the number of rice farms, planted acreage, yields, prices, and exports from around 2013 to 2024, with the specific years examined being dependent upon data availability. It then summarizes recent trends in technology, costs and returns, and productivity of rice farming and explains drivers of these trends such as weather events. The objective of the report is to provide a thorough overview of the U.S. rice industry over the past decade.

This report uses newly available nationally representative survey data from the 2021 Agricultural Resource Management Survey (ARMS), jointly administered by USDA, National Agricultural Statistics Service (NASS) and USDA, Economic Research Service (ERS). Prior to 2021, the most recent ARMS to survey rice farmers was conducted in 2013; data from that survey was covered in a previously published report on rice production by McBride et al. (2018). This report references some of the trends discussed in McBride et al. (2018) but does not provide comprehensive coverage of the 2013 survey data. Data on costs and returns of rice farming come from the USDA, ERS Commodity Costs and Returns estimates (USDA, ERS, 2025a). Additional data sources include the USDA, ERS Rice Yearbook Tables (USDA, ERS, 2025b); USDA, NASS reports on rice acreage, yields, production, and prices; U.S. Department of Commerce, Bureau of the Census trade data; and the USDA Census of Agriculture (USDA, NASS, 2012; 2017; 2022; 2025a; 2025b). Data from these sources are summarized in tables and figures and discussed together in the text.

Most U.S. rice is produced in six States: Arkansas, California, Louisiana, Mississippi, Missouri, and Texas. California produces mostly medium-grain rice and a small amount of short-grain rice, while the remaining States all specialize in long-grain rice, with Arkansas and Louisiana producing the most medium-grain outside of California. Because different types of rice have distinct production regions and markets, this report describes many trends by rice type.

Recent Trends in U.S. Rice Farming

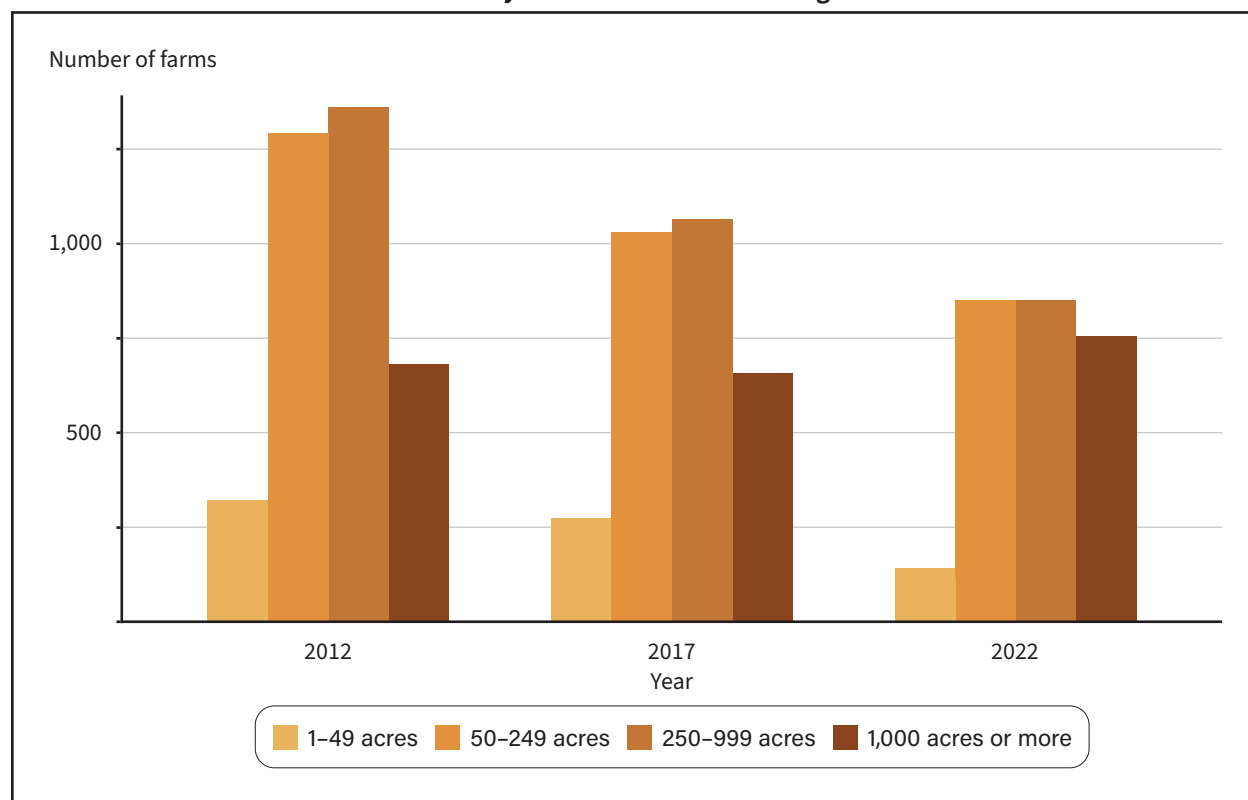
Rice Farms

The number of farms (defined as any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year) producing rice in the United States has been falling for decades (McBride et al., 2018; Baldwin et al., 2011). Between 1992 and 2007, the number of rice farms in the United States fell by almost half, while the average size of rice farms almost doubled (Baldwin et al., 2011). This trend has continued in recent years. In 2012, there were 5,591 farms producing rice in the United States. By 2017, this number had fallen 17 percent to 4,637, and by 2022 it fell an additional 18 percent to 3,824 farms producing rice (USDA, NASS, 2012;

2017a; 2022a). The number of farms in all size categories fell consistently except for the largest farms: There were 11 percent more farms harvesting more than 1,000 acres of rice in 2022 compared to 2012 (figure 1). By contrast, the number of farms harvesting between 1 and 49 acres declined 45 percent from 2012 to 2022, the number of farms harvesting between 50 and 249 acres fell 35 percent, and the number of farms harvesting between 250 and 999 acres fell 61 percent. As the number of farms declined, harvested acres per farm grew 20 percent from 2012 (482 acres per farm) to 2022 (581 acres per farm).

Figure 1

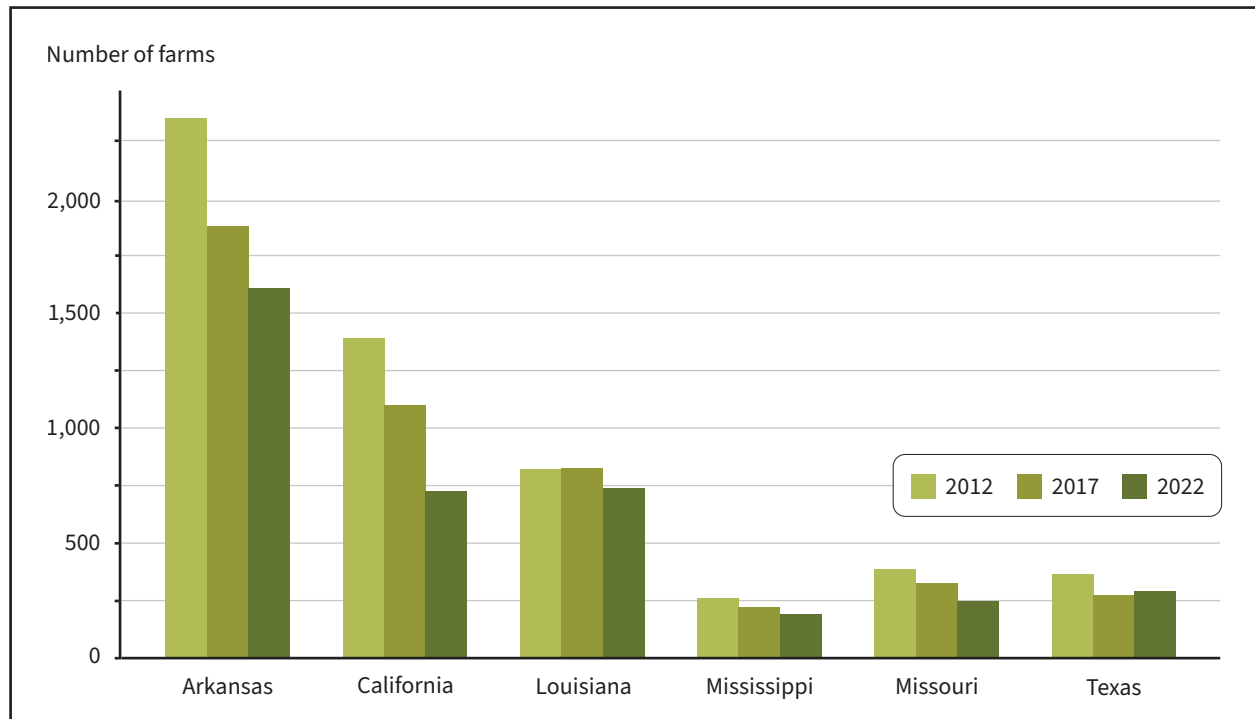
Number of rice farms in the United States by total harvested rice acreage



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Agricultural Census*.

Arkansas had the most rice farms in the United States in 2012, 2017, and 2022, totaling 1,607 farms in 2022. California and Louisiana had the second- and third-most rice farms in 2022. The number of rice farms in each major rice-producing State fell between 2012 and 2022, with the biggest decline in California at 48 percent (figure 2). The smallest decline was in Louisiana, at 10 percent.

Figure 2
Number of rice farms in 2012, 2017, and 2022 by State



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Agricultural Census*.

Acreage

The United States plants more long-grain rice than short- and medium-grain rice combined (see box, “U.S. Rice by Class: Characteristics, Production, and Uses”). In 2024, a total of 2.92 million rice acres were planted in the United States, of which 2.28 million acres were long-grain, 615,000 were medium-grain, and 29,000 were short-grain. Arkansas had the most planted acres of any State, with the vast majority (92 percent) being planted to long-grain varieties (figure 3). This was followed by California, which plants most of the country’s medium- and short-grain rice. Acreage in the remaining major producing States (Louisiana, Mississippi, Missouri, and Texas) was entirely or mostly planted with long-grain varieties.

U.S. Rice by Class: Characteristics, Production, and Uses

The United States produces three classes of rice: long-grain, medium-grain, and short-grain. Each class of rice has unique physical characteristics, is grown in distinct geographic regions, and satisfies specific consumer demands. For detailed information on characteristics of different types of rice, see the United States Standards for Rice (USDA, Grain Inspection, Packers, and Stockyards Administration (GIPSA) & Federal Grain Inspection Services (FGIS), 2002). Long-grain is the dominant class of rice grown in the United States, produced almost exclusively in the South, and typically accounts for almost 75 percent of total U.S. rice production and a slightly smaller share of exports.

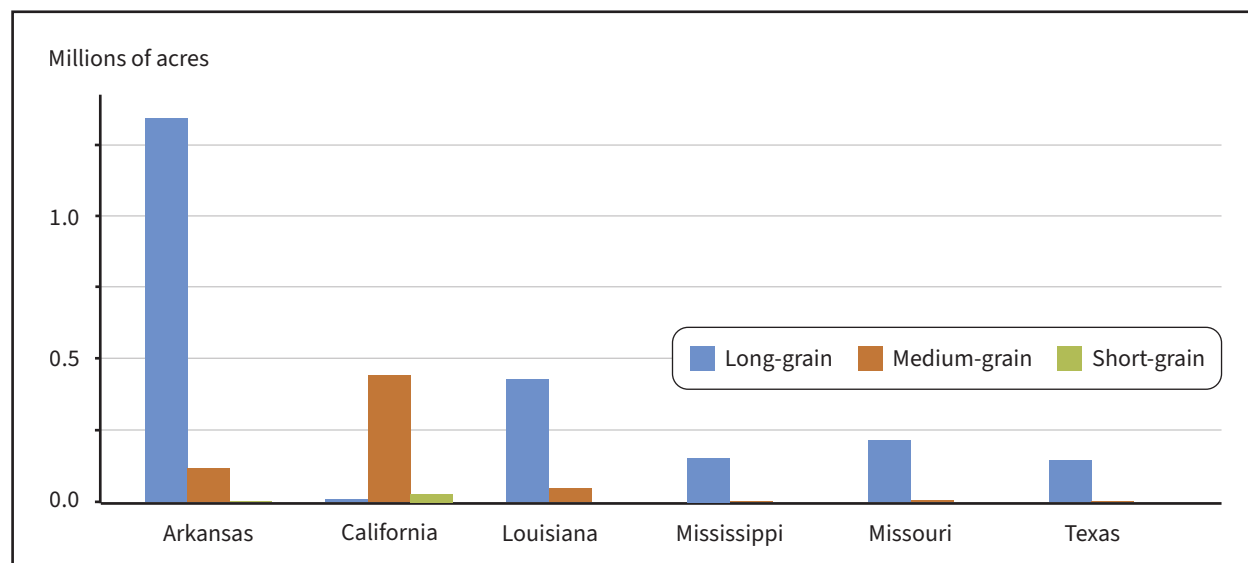
Long-grain, or indica, rice is long and thin, at least 3.4 times longer than it is wide (USDA, Marketing and Regulatory Programs et al., 2020). When long-grain rice cooks, the grains separate due to starch composition; the degree to which grains separate can be an important quality attribute for some consumers. Indica rice is typically grown in warm climates, much of it being produced in the tropics. Much of this rice is consumed as direct food use, with a smaller share used in beer, pet food, breakfast cereals, and packaged foods. Long-grain rice accounts for all of the parboiled rice produced in the United States. In parboiling, the unmilled rice is steamed under pressure which causes the nutrients to be pushed from the outer bran layer into the inner kernel. The process stiffens the grain, resulting in fewer broken kernels, a byproduct of rice milling.

Medium-grain, or Japonica, rice accounts for about 25 percent of total U.S. rice production, and is grown in both California and the South (primarily Arkansas and Louisiana), with California accounting for 66–75 percent of the total U.S. medium-grain crop. California typically supplies virtually all U.S. medium-grain exports. This class of rice is shorter and wider than long-grain rice, typically two or three times longer than it is wide. When cooked, the rice is moist, with the grains sticking together. Medium-grain rice is grown mostly in temperate climates, primarily in East Asia, as well as in Australia, California, Egypt, and Europe. In addition to direct food use, medium-grain rice is used in paella, risotto, certain breakfast cereals, beer, pet food, and various side dishes. The southern medium-grain varieties are less sticky and moist than the California varieties and are rarely a substitute for California medium-grain rice in the global or domestic rice markets.

Short-grain rice accounts for 1–1.5 percent of U.S. rice production, with most of the crop grown in California and a much smaller amount (approximately 2.5 percent of the total U.S. short-grain production in 2024) produced in Arkansas. The rice is short and very round, less than twice as long as it is wide. Short-grain rice cooks soft and very sticky, with grains clinging together. This rice is often used in sushi and rice balls. Much of the U.S. short-grain crop is grown under contract for export to Japan.

Globally, most rice is used for human food. However, a small but growing share of rice is used as livestock feed and for industrial use (Raszap Skorbiensky et al., 2018; Lin et al., 2025). This share grew from 4.6 to 7.6 percent from 1991 to 2021 (Lin et al., 2025). Generally, broken rice is used for these purposes, while it is also consumed by humans.

Figure 3

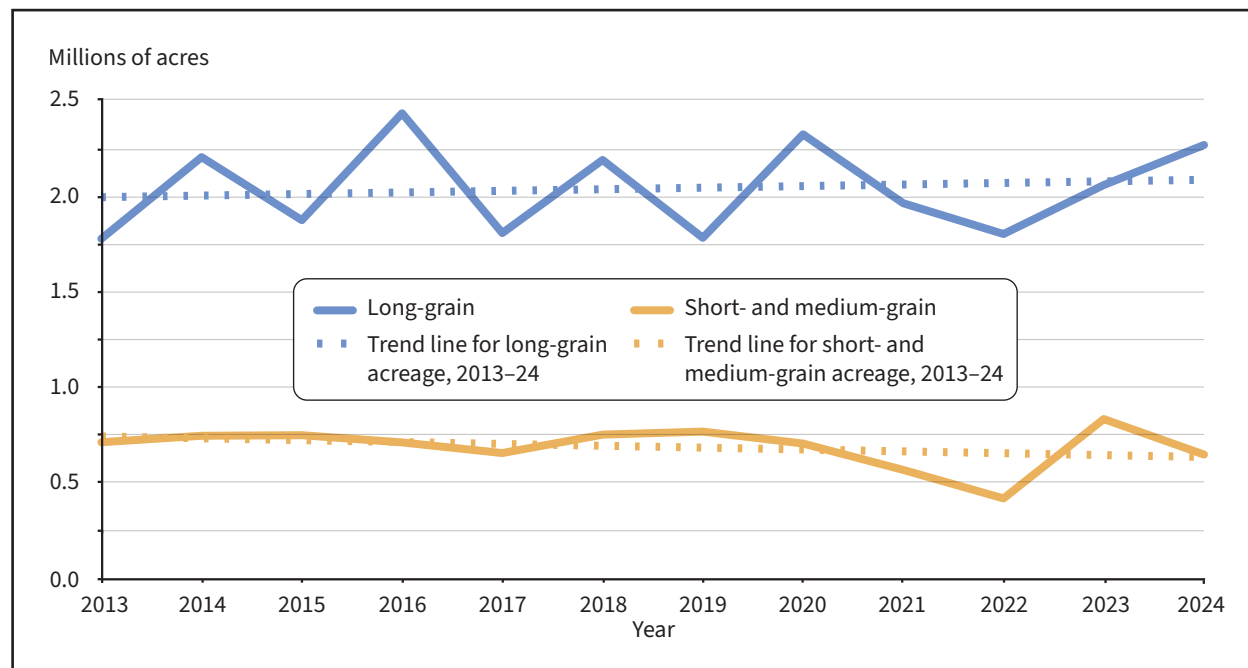
Rice planted acreage by State and type, 2024

Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Crop Production*.

Trends in Long-grain Rice Acreage

From 2013 to 2024, U.S. planted long-grain acreage was the highest in 2016 at 2.44 million acres and the lowest in 2019 at 1.79 million acres, with annual variation often caused by adverse weather (figure 4). Rice-growing areas in the southern States experienced combinations of cold, wet weather, large rainfalls, and/or flooding in the springs of 2013, 2015, 2017, and 2019 that negatively affected rice plantings. In 2019, record-breaking floods along the Arkansas River caused many rice farmers to plant 1–2 months late and contributed to the record-low acreage that year. Overall, the trend in long-grain acreage increased slightly from 2013 to 2024.

Figure 4

Total rice planted acreage in the United States, by type

Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Crop Production*.

Trends in Short- and Medium-grain Rice Acreage

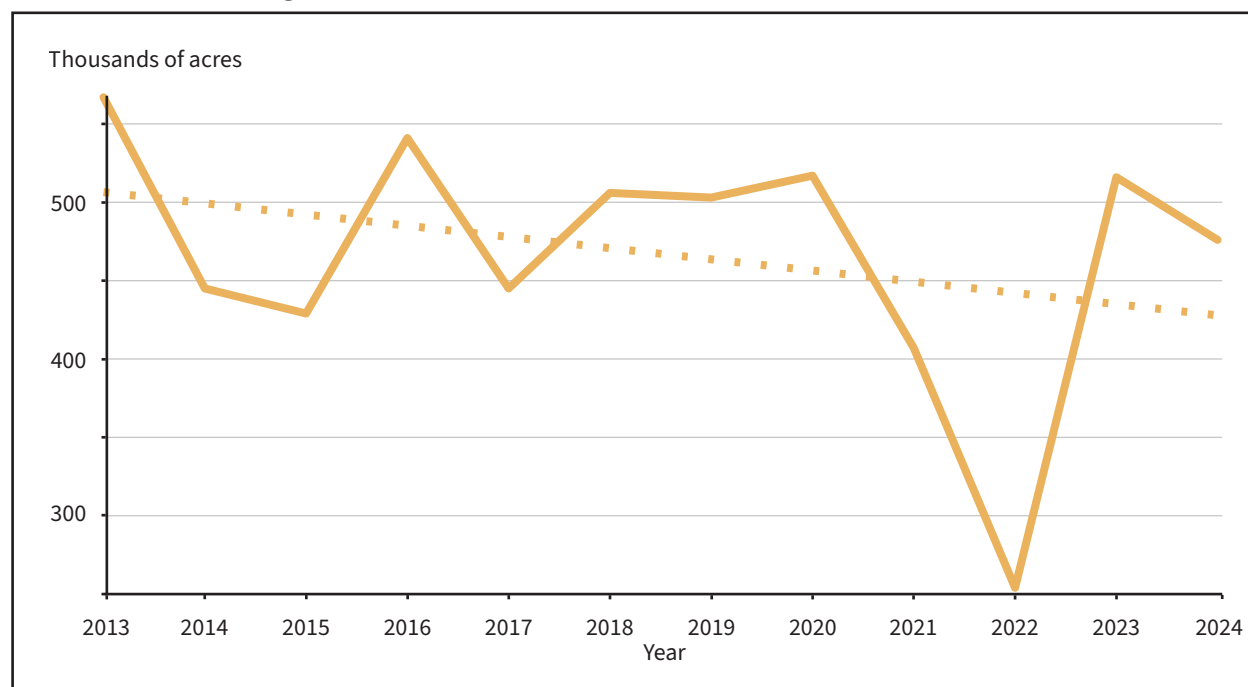
Since 2013, short- and medium-grain rice acreage has been affected by two droughts in California. Adverse weather can have a particularly strong effect on rice production in California, partly because the area where rice is grown in California is geographically small relative to the southern regions. The California rice-growing area was impacted by a severe drought in 2014 and 2015 that was part of the longer late-2011 to early-2017 California wide-drought. Five consecutive California water years — October 1–September 30—saw dry winters and reduced snowpack and snow melt. Water allocations were reduced in both the 2014/15 and 2015/16 water years, and some rice farmers sold their water rights in 2015 to permanent tree growers—walnut trees, pistachio trees, almonds, grapevines—or to urban users (Raszap Skorbiansky & Childs, 2018).

Half-a-decade later, a historic drought caused severe impacts across California from the summer of 2020 until December 2022. By 2022, low reservoir levels and water restrictions severely affected total California rice plantings, most of which were of short- and medium-grain varieties, which fell to 254,000 acres, the lowest since 1958/59. Total U.S. plantings of short- and medium-grain rice fell from 702,000 acres in 2020 to 563,000 acres in 2021 to 413,000 acres in 2022 (figure 4).

In 2023, U.S. medium- and short-grain acreage more than doubled from the year before, rebounding fully to above the 2020 level as a result of drought recovery in California and expanded plantings in the South (Smith, 2023). Total California acreage rebounded to 516,000 acres in 2023. California acreage fell 7.8 percent in 2024 to 476,000 acres, contributing to a decline in total U.S. short- and medium-grain acreage that year. Overall, from 2013 to 2024, acreage of short- and medium-grain rice fell in California and overall in the United States.

Figure 5

Total rice planted acreage in California



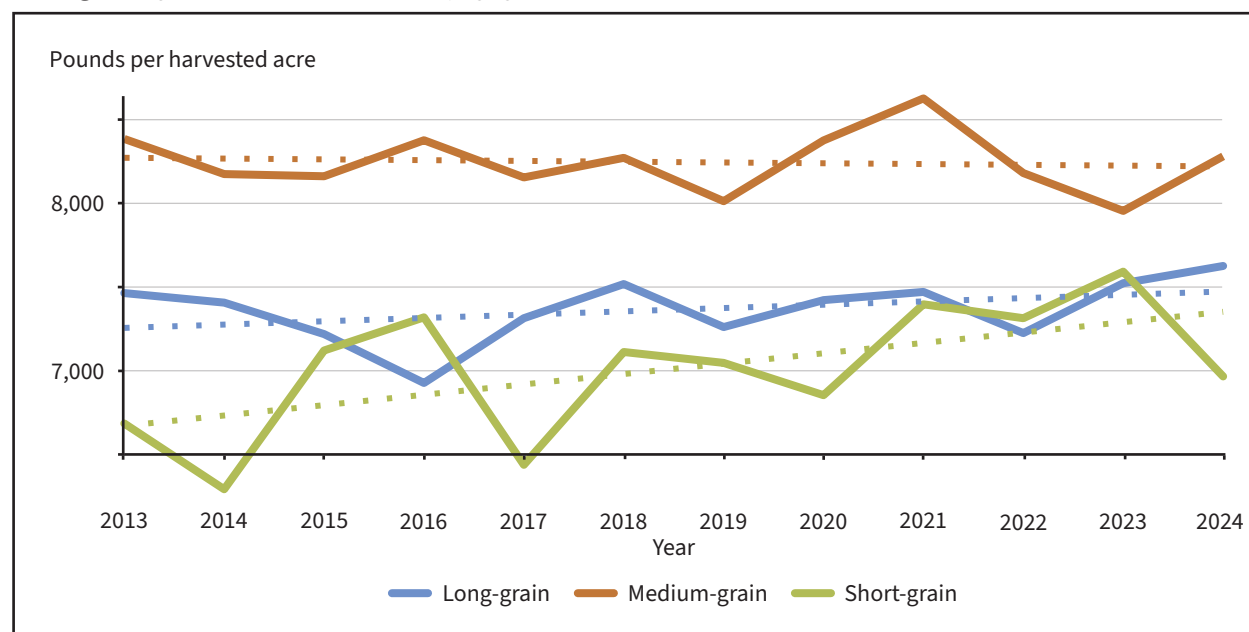
Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Crop Production*.

Yields and Production

Yields fluctuated for long- and medium-grain rice between 2013 and 2024 (figure 6). For long-grain rice, yields were highest during this period in 2024, at 7,626 pounds per harvested acre. Yields for medium-grain rice were consistently higher than for long-grain rice during this period and were highest in 2021, at a record 8,627 pounds per acre. The record yield that year was largely due to low rice acreage planted in California, with only the most productive land growing rice. Yields declined in 2022 and 2023, partly due to a larger share of medium-grain rice being grown in the South than in typical years, where yields are consistently below California yields. Yields of short-grain rice increased over this period and in 2023 reached their highest level at 7,592 pounds per acre.

Figure 6

Average rice yield in the United States, by type



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Crop Production*.

U.S. rice production has largely followed trends in acreage. Despite declining numbers of rice farms over the previous 10 years, the United States produced more rice in 2024 (22 billion pounds) than in 2013 (19 billion pounds). This was due in part to the shift toward larger farms, which have higher production. Between 2013 and 2024, total rice production was highest in 2020 at 23 billion pounds and lowest in 2022 at 16 billion pounds (USDA, NASS, 2025a).

Rice Markets

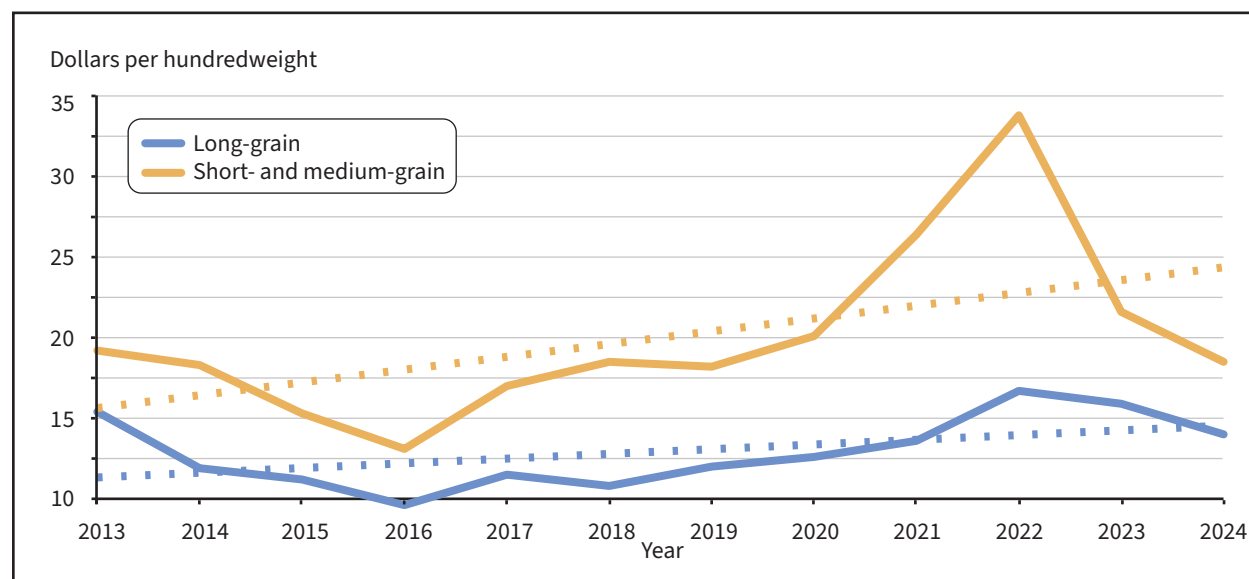
Prices

Prices are consistently higher for medium- and short-grain rice than for long-grain rice (figure 7), with California medium- and short-grain prices well above southern medium- and short-grain prices. Quality factors, limited acreage suitable for producing these varieties, and a strong and consistently reliable export market in East Asia account for California rice's higher prices than rice grown in the South. U.S. rice prices, especially for long-grain, typically move in tandem with global trading prices,

with around 40 percent of the U.S. rice crop exported annually. Prices for all types fell from 2013 to 2016. Prices then increased in most years from 2017 to 2022. Between 2020 and 2022, prices for medium- and short-grain varieties increased more sharply than in preceding years due to reduced acreage from drought in California. Prices were at record highs for all types in 2022 at \$33.80 per hundredweight (cwt) for short- and medium-grain varieties, and \$16.70 per cwt for long-grain varieties. These high prices were due to relatively low acreage in both the South and California, particularly in California due to severe drought that year. When acreage recovered in 2023, prices fell to \$15.90 per cwt for long-grain and \$21.60 for medium- and short-grain rice (USDA, NASS, 2025b). The price of all types of rice collectively fell further during marketing year 2024, from \$17.30 the year before to \$15.10.

Figure 7

Average rice marketing year price in the United States, by type



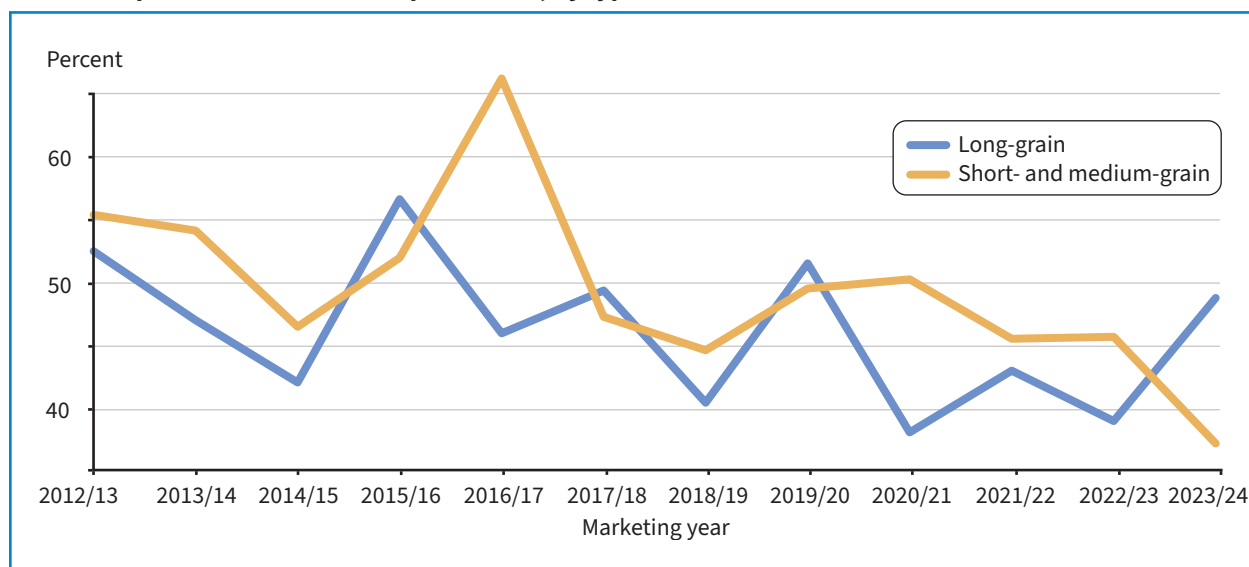
Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, *Agricultural Prices*.

Exports and Imports

USDA data on rice exports and imports are provided by marketing year, which for rice runs from August 1 through July 31. U.S. rice exports rose from 106.6 million cwt in 2012/13 to a near-record 114.8 million cwt in 2016/17, then declined to just 64.7 million cwt in 2022/23, the lowest exported quantity since 1985/86. The substantial decline over the 10-year period was largely due to tight supplies and uncompetitive prices. U.S. exports increased to 99.0 million cwt in 2023/24, mostly due to larger supplies and lower prices. Exports dropped to 90.5 million cwt in 2024/25, mostly due to strong price competition from South American and Asian exporters in markets in the Western Hemisphere.

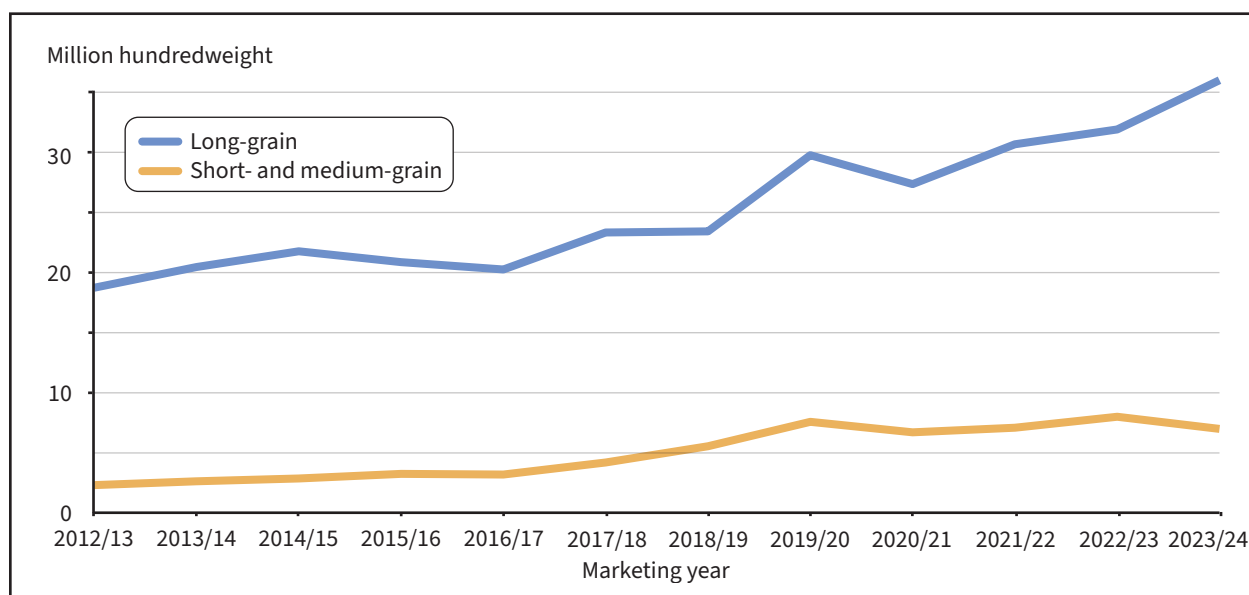
Exports have also fallen as a share of production for both long-grain and short- and medium-grain rice since 2012/13 (figure 8). Total exports as a share of total production were highest over this period in 2015/16 at 55 percent of total production. In 2022/23 slightly more than 40 percent of total rice production was exported (39 percent of long-grain production and 46 percent of short- and medium-grain production), the lowest share reported for the United States since at least 1960/61. Exports as a share of total production increased in 2023/24 to 45 percent.

Figure 8

U.S. rice exports as a share of total production, by typeSource: USDA, Economic Research Service, *Rice Yearbook*.

By contrast, U.S. rice imports have steadily increased over the same period (figure 9). In 2012/13, the United States imported 18.7 million cwt of long-grain rice and 2.3 million cwt of short- and medium-grain rice. In 2023/24, the United States imported 37.2 million cwt of long-grain rice and 7.2 million cwt of short- and medium-grain rice. Imports have also risen as a share of total production; imports of all rice made up about 11 percent of total rice production in 2012/13. From 2021/22 to 2023/24, U.S. rice imports were equal to 20–25 percent of U.S. production. The bulk of U.S. long-grain rice imports and almost all the growth has been in Asian aromatic varieties, primarily jasmine rice from Thailand and basmati from India, with Pakistan supplying a much smaller quantity of basmati. The United States does not grow aromatic varieties with the exact same cooking and taste characteristics as the Asian varieties. The United States typically imports much smaller quantities of broken kernel rice, typically from Brazil.

Figure 9

U.S. rice imports by typeSource: USDA, Economic Research Service, *Rice Yearbook*.

U.S. and Global Rice Trade

The United States is currently the sixth-largest rice exporting country in the world, accounting for about 5 percent of total global rice exports. India is the largest exporter, accounting for almost 37 percent of total global rice exports from 2021 to 2025, followed in descending order by Vietnam, Thailand, Pakistan, and Cambodia. More than 11 percent of the global rice crop is traded annually, which is almost double the 5.6 percent that was traded in 2000 (USDA, Foreign Agricultural Service (FAS), 2025a). The largest rice importing regions are Sub-Saharan Africa and Southeast Asia, with the Philippines and Vietnam the largest buyers. However, the United States commercially sells little rice to these two regions (USDA, FAS, 2025a).

Sub-Saharan Africa does import a small amount of U.S. long-grain rice, all milled rice that is shipped mostly as food aid, with small amounts of commercial shipments of broken kernels in some years (USDA, Agricultural Marketing Service, 2025). Food aid shipment levels vary each year, accounting for as much as 5 percent of total U.S. rice exports on a milled-equivalent basis (USDA, FAS, 2025b). In January 2025, the United States announced a freeze on U.S. foreign aid. The impact of this freeze on the U.S. rice industry is unknown as this time.

The United States exports rough rice, brown rice, fully milled white rice, and broken rice.¹ In addition, the United States exports parboiled rice, which is sold as milled rice and sells at a premium to regular white milled rice. Rough rice and fully milled white rice account for the bulk (approximately 85 percent) of U.S. rice exports, with brown rice, parboiled rice, and broken kernel shipments much smaller. Class and types of rice exports vary by market, with little, if any, substitution by class or type by buyers (USDA, FAS, 2025b).

The largest export market for U.S. long-grain rice is Latin America, which takes mostly rough rice from the United States, as well as a much smaller amount of milled rice in certain markets.² U.S. exports to six countries in Central America and the Caribbean benefit from the Dominican Republic-Central American Free Trade Agreement (CAFTA-DR) which was signed into law on August 2, 2005. Under CAFTA-DR, after 20 years of phased-in reductions and increasing duty-free import quotas, all import duties on U.S. rice to Costa Rica and the Dominican Republic will be eliminated in 2025. In 2023, all import duties on U.S. rice were eliminated in El Salvador, Guatemala, Honduras, and Nicaragua after 18 years of phased-in reductions and rising duty-free import quotas (U.S. Trade Representative, 2005). In late 2024, the Government of the Dominican Republic established quotas to limit rice imports into the country; U.S. rice imports above the quotas will face increased tariffs (USDA, FAS, 2025c).

U.S. long-grain exports have also benefited from the 2012 Colombia-U.S. Trade Promotion Agreement (TPA) that established a tariff rate quota for rice and declining tariffs for imports outside the duty-free quota, with the tariff fully eliminated in 2030 (Congressional Research Service, 2022). Colombia purchases both rough and milled rice from the United States, with rough rice the dominant type purchased over the past decade (USDA, FAS, 2025b).

continued on next page ►

¹ Rough rice contains the hull, bran layer, and the endosperm which contains the starch, proteins, and other nutrients. Removing the outer hull results in brown rice, which is fully edible. Removing the bran layer yields fully milled rice, which is the form in which rice is typically consumed.

² Any impacts of tariff changes by Canada, China, and Mexico announced in March 2025 on global rice trade and U.S. rice exports have not been evaluated at this time.

U.S. and Global Rice Trade (continued)

Since 2017, the United States has faced increasing competition for exports to Mexico, Central America, and the Caribbean from several South American exporters—especially Brazil and Uruguay—losing substantial market share in many countries. The South American suppliers, which ship both rough and milled rice to Latin American markets, have gained market share due to more competitive prices and specific quality attributes desired by the importers. In late 2023, Asian exporters began shipping non-aromatic milled rice into key Latin American markets, mostly to Brazil, Central America, Haiti, and Mexico, due to price competitiveness (Trade Data Monitor, 2025). Previously, Brazil was only a sporadic buyer of non-aromatic rice from Asia, while a few other Latin American countries purchased small amounts.

California typically supplies nearly all U.S. medium- and short-grain rice exports. East Asia is the largest export market for U.S. medium- and short-grain rice, taking both fully milled white rice and brown rice. Japan, South Korea, and Taiwan account for almost all these sales. Their annual purchases are made under World Trade Organization (WTO) agreements, with total import quantities fixed (Raszap Skorbiensky et al., 2018). The U.S. share of these annual WTO purchases is typically quite stable unless U.S. supplies are insufficient. These three East Asian countries typically account for around two-thirds of U.S. medium- and short-grain rice exports each year (USDA, FAS, 2025b).

Structural Change

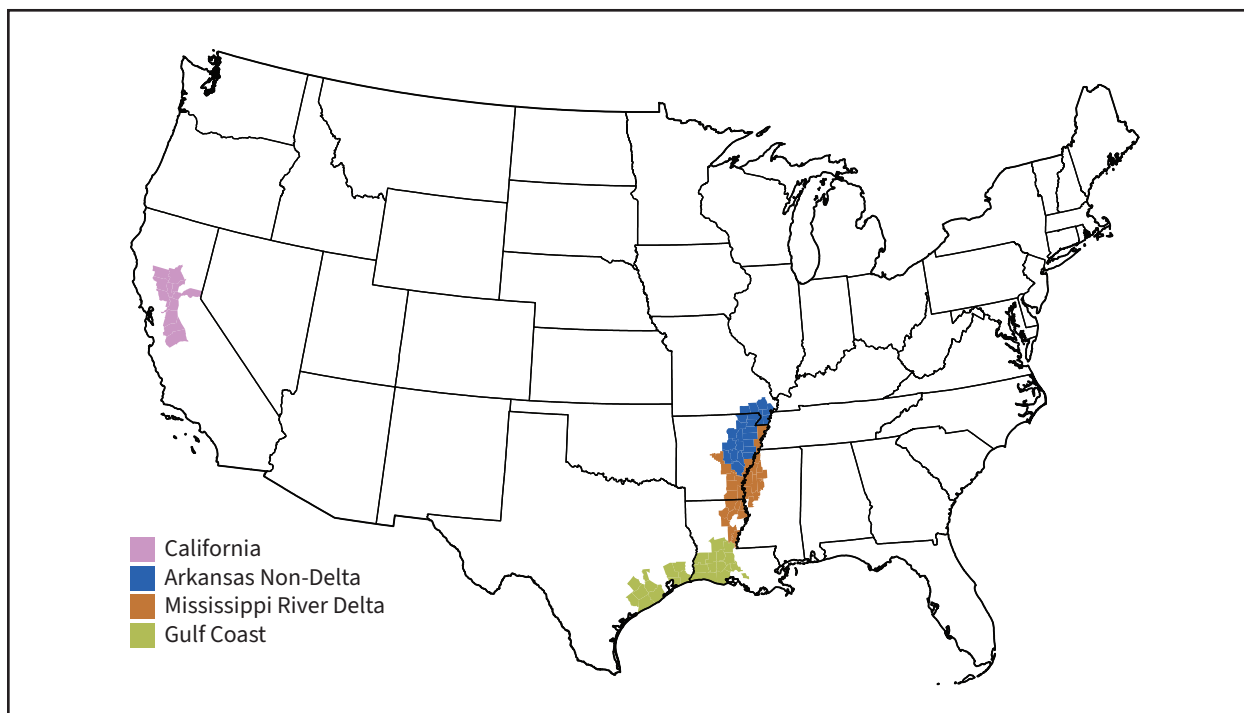
This section summarizes data from the 2021 ARMS rice commodity survey. It provides statistics on farm and farmer characteristics, technology use, and input use on U.S. rice farms. Much of the information is summarized by the following rice production regions (figure 10):

- California,
- Arkansas Non-Delta (which contains counties in Arkansas and southeastern Missouri),
- Gulf Coast (which contains counties in Texas and southwestern Louisiana), and
- Mississippi River Delta (containing counties in Arkansas, Mississippi, and northeastern Louisiana).

These regions cover parts of six States (California, Arkansas, Missouri, Mississippi, Louisiana, and Texas) and are used in reporting the USDA, ERS Commodity Costs and Returns rice estimates. Previous reports such as McBride et al. (2018) also provided information broken down by these production regions. Farms are assigned to a region based on the county in which they are located, allowing regional means to be developed using the ARMS data.

Figure 10

Rice production regions as surveyed in the USDA Agricultural Resource Management Survey, rice version



Note: Alaska and Hawaii are not shown in the map. They are not surveyed in the USDA Agricultural Resource Management Survey, rice version.

Source: USDA, Economic Research Service.

Agricultural Resource Management Survey

The Agricultural Resource Management Survey (ARMS) is an annual survey conducted jointly by USDA, Economic Research Service and USDA, National Agricultural Statistics Service to gather information about the economic status of the U.S. farm sector. Data collected provides information on farm structure and on costs and returns at both the farm household and farm business levels, operator demographics, and production practices used. Special commodity-specific ARMS surveys are conducted on rotating cycles of 4 to 10 years, depending on the commodity and other considerations, to collect information on the costs and returns and production practices used in producing that commodity. Rice is one of the 12 commodities for which ARMS commodity surveys are periodically conducted, and ARMS rice surveys were conducted in 2000, 2006, 2013, and 2021. States selected for ARMS rice surveys constitute at least 90 percent of U.S. rice acreage and have included Arkansas, California, Louisiana, Mississippi, and Missouri for each of these 4 years. The target population is farms that produce at least 1 acre of rice in the surveyed States.

Data collection for ARMS 2021 presented particular challenges because of the Coronavirus (COVID-19) pandemic. Several complex sections of ARMS have traditionally been collected by personal enumeration—an enumerator would conduct the survey in person with the respondent. Because of COVID-19, enumeration for these and other sections was instead conducted via the phone using a computer-assisted personal interview instrument.

For each ARMS commodity survey year, a unique cross-sectional sample of farms producing the commodity is surveyed. This approach is in contrast with repeated surveying of the same farms year after year, through which panel data would be collected. Since farms commonly enter and exit the industry, and the subgroup of farms that remain in business across surveys would not necessarily be representative of the farm population, repeated cross-sectional surveys are preferable. It is noted, however, that differences across time can result from the fact that different operators are surveyed during each survey year.

Farm and Operator Characteristics

The 2021 ARMS Phase 3 rice version data are used to compare farm and operator characteristics by U.S. rice region. The highest percentage of U.S. rice farms was in the Arkansas Non-Delta region (38 percent), followed by California (24 percent), the Gulf Coast (21 percent), and the Mississippi River Delta (16 percent) regions (table 1). Total acres operated on rice farms, including all land (not only land in rice), averaged 1,921 acres, up from 1,848 acres in 2013, as reported by McBride et al. (2018). The largest farms were in the Mississippi River Delta region, averaging 3,144 acres, and the smallest were in California, averaging 585 acres. Consistent with their smaller farm sizes, fewer acres of rice were harvested on California farms than on farms in the other three regions.

Table 1

U.S. rice farm and operator characteristics, by rice region, 2021

Item	Arkansas Non-Delta (a)	Mississippi River Delta (b)	Gulf Coast (c)	California (d)	All U.S. rice farms
Number of farms	1,633	687	923	1,050	4,294
Percent of rice farms	38	16	21	24	100
Percent of harvested rice acres	45	16	23	16	100
Farm size					
Total farm operated acres (mean)	2,298 ^{bd}	3,144 ^{acd}	1,862 ^{bd}	585 ^{abc}	1,921
Total farm owned operated acres (mean)	353 ^{bc}	632 ^{acd}	204 ^{ab}	285 ^b	349
Percent of farm acres owned	15 ^{cd}	20 ^{cd}	11 ^{abd}	49 ^{abc}	18
Harvested rice acres (mean)	678 ^d	572 ^d	625 ^d	386 ^{abc}	578
Farm diversification					
Percent of farm value of production from rice	43 ^{bcd}	28 ^{acd}	67 ^{ab}	78 ^{ab}	46
Percent of farms producing corn	64	D	D	0	35
Percent of farms producing soybeans	D	D	28	0	59
Percent of farms producing wheat	9	D	D	0	5
Farm operator characteristics					
Age, years (mean)	55	57 ^c	53 ^b	57	55
Percent with college degree	37	40	30	34	35
Farm financial measures					
Debt-asset ratio (mean)	0.242 ^{bd}	0.078 ^a	0.128	0.092 ^a	0.139
Percent of operator household income from farm (mean)	90 ^d	87 ^d	81	69 ^{ab}	84

Note: D = insufficient data for disclosure. The lettered superscripts throughout the table denote statistically significant differences. A lettered superscript denotes that the item mean reported in a column is statistically significantly different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 90-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided by the USDA, National Agricultural Statistics Service for the Agricultural Resource Management Survey data, as discussed in Dubman (2000). Data from this table come from the full Phase 3 sample of data collected in the ARMS Rice Version 2021. Costs and returns estimates report planted acreage which comes from Phase 2 data. The full Phase 2 and Phase 3 samples do not match perfectly.

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

Only 18 percent of the farm acres operated (which does not include any acreage on a farm rented to another farmer) were owned as opposed to being rented or leased from another party. Consistent with results for 2000, 2006, and 2013, higher percentages of California rice farms were operator owned (49 percent) compared with rice farms in the other regions (McBride et al., 2018). Gulf Coast rice farms had the lowest percentages of their farmland that were owned (11 percent).

On U.S. rice farms, an average of 46 percent of the farm value of production was from rice as opposed to other commodities in 2021. This is compared with 51–52 percent reported by McBride et al. (2018) for 2000, 2006, and 2013. On average, California and Gulf Coast farms were more specialized in rice than Arkansas Non-Delta and Mississippi River Delta farms. About 59 percent of rice farms also produced soybeans in 2021, which is within the range of 57–63 percent reported by McBride et al. (2018) for 2000, 2006, and 2013. Soybeans are often used in rotations with rice in the southern United States. Corn and wheat crops were produced on 35 percent and 5 percent of U.S. rice farms, respectively.

U.S. rice farmers are younger and slightly more likely to have completed a college degree than farm operators in general. The average age of a U.S. rice farm's principal producer—the individual who had primary responsibility for farm decision-making—was 55 years, equal to the average reported by McBride et al. (2018) for 2013. This is compared with an average age of 62 years for all U.S. farm principal producers as reported by USDA, ERS Farm Household Income and Characteristics data for 2022 (USDA, ERS, 2025c). Mississippi River Delta rice farm principal producers were older on average (57 years) than Gulf Coast rice farm principal producers (53 years). About 35 percent of U.S. rice farm principal producers held 4-year college degrees in 2021 compared with 36 percent in 2013, as reported by McBride et al. (2018). USDA, ERS Farm Household Income and Characteristics data report that 33 percent of all U.S. farm principal producers held 4-year college degrees in 2022 (USDA, ERS, 2025d).

The average U.S. rice farm had a debt-asset ratio of 0.139, which is comparable to the U.S. all-farm debt-asset ratio of 0.136, reported by the USDA, ERS Farm Income and Wealth Statistics data for 2021 (USDA, ERS, 2025d). Arkansas Non-Delta farms were the most highly leveraged rice farms on average, with debt-asset ratios averaging 0.242 as compared with 0.078 and 0.092 for Mississippi River Delta and California rice farms, respectively. Principal producer farm households depended on farm income for an average of 84 percent of their total household income. Arkansas Non-Delta and Mississippi River Delta rice farm principal producers received averages of 90 percent and 87 percent of their total household income from the farm, respectively, as compared to California farms which received 69 percent of their total household income from the farm. The greater dependency of Arkansas Non-Delta and Mississippi River Delta households on farm income relative to California rice-farm households is consistent with the larger farm sizes of the former regions relative to California.

Crop Rotations

Rice is commonly planted in rotation with other crops in some regions of the United States. In table 2, we provide percentages of planted acres that are cultivated under four of the most common crop rotation practices according to the 2021 ARMS rice version data. In 2021, 35 percent of U.S. planted rice acreage was planted in rice the previous year, down from 46 percent for 2013 as reported by McBride et al. (2018). In California, 93 percent of planted rice acres were planted in rice the previous year. In the South, a higher percentage of Gulf Coast planted rice acreage was planted in rice the previous year (42 percent) than in the other southern regions (15 percent in the Arkansas Non-Delta and 22 percent in the Mississippi River Delta). In cases where rice was planted on the same field for the previous 2 years, we label this system as rice monoculture (the practice of continuously growing a single crop over multiple growing seasons). Rice monoculture was practiced on 26 percent of rice planted acreage in 2021, down from 34 percent reported for 2013 by McBride et al. (2018). Rice monoculture was the most

common production system in California; rice is the dominant crop in many of California's rice-growing counties (Smith, 2023). Other crops grown include tree nuts such as almonds and walnuts, which are also relatively water-intensive; therefore, this region's crops are particularly vulnerable to drought.

Table 2

Percentage of rice planted acres by crop rotation by region, 2021

System	Arkansas Non-Delta (a)	Mississippi River Delta (b)	Gulf Coast (c)	California (d)	All U.S.
Previous crop					
Rice	15 ^{cd}	22 ^{cd}	42 ^{abd}	93 ^{abc}	35
Soybeans	56 ^c	71 ^c	10 ^{ab}	0	38
Fallow	D	0	27	D	15
Rice monoculture	D	D	31 ^d	93 ^c	26
Crawfish harvested in same field as rice	0	0	43	0	10

D = insufficient data for disclosure.

Note: A lettered superscript denotes that the item mean reported in a column is statistically significantly different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 90-percent confidence level. Tests were conducted using a delete-a-group jackknife variance estimator, with 30 replicates provided by the USDA, National Agricultural Statistics Service for the Agricultural Resource Management Survey (ARMS) dairy version data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

In the southern United States, it is common to rotate rice with soybeans as a pest control practice. Rice followed soybeans on 38 percent of U.S. planted rice acreage in 2021, down slightly from 40 percent in 2013, as reported by McBride et al. (2018). Rice followed soybeans on majorities of planted rice acreage in the Arkansas Non-Delta and Mississippi Delta regions but only on 10 percent of planted rice acreage in the Gulf Coast region. Rice following a field being fallow the previous year accounted for 15 percent of planted rice acreage in 2021, compared with 11 percent in 2013, as reported by McBride et al. (2018). Rice production following fallow was most commonly practiced in the Gulf Coast region. Rice growers in the Gulf Coast region have fewer alternative planting options than growers in other parts of the South, mostly due to the climate.

Some regional changes in rice rotation systems are noted for 2021 relative to 2013, as reported by McBride et al. (2018). In the Mississippi River Delta region, rice following rice declined from 41 percent of planted acreage in 2013 to 22 percent in 2021, while rice production following soybeans increased from 56 percent of planted acreage in 2013 to 71 percent in 2021. In the Gulf Coast region, rice monoculture increased from 7 percent of planted acreage in 2013 to 31 percent in 2021. Rice following soybeans was down from 36 percent of planted acreage in 2013 to 10 percent in 2021, which was closer to the 2000 estimate of 12 percent of rice following soybeans found by McBride et al. (2018). Rice monoculture continued to be the most prominent production system in California, with 90 percent of California planted rice acreage in a monoculture system in 2013. Rice land in California tends to be well-suited for rice but not necessarily other crops due to poor drainage.

Rice and crawfish are commonly produced in an integrated production system in the Gulf Coast region. Gillespie et al. (2012) showed that 28 percent of crawfish producers used a rice-crawfish double-crop system, 27 percent used a rice-crawfish-fallow rotation, and 7 percent used a rice-crawfish-soybeans rotation. The 2021 ARMS rice version questionnaire included the following question: "Did you harvest both rice and crawfish from the selected field during 2021?" Results indicated that

both rice and crawfish had been harvested on 43 percent of Gulf Coast-planted rice acreage in 2021. In the case of rice-crawfish double crop, McClain et al. (2007) explained that neither crop can usually be managed such that the optimum yield in a single crop system can be obtained. ARMS rice version respondents who indicated they had harvested both rice and crawfish from the selected field in 2021 were asked whether they believed the crawfish harvest reduced the rice yield in the selected field during 2021. Ten percent responded “yes.” However, when Gulf Coast rice yields for farms that had harvested both rice and crawfish in the same field were compared to those that had not harvested crawfish in the field, no difference in yields was found at the 10 percent level of statistical significance.¹

Technologies and Input Use

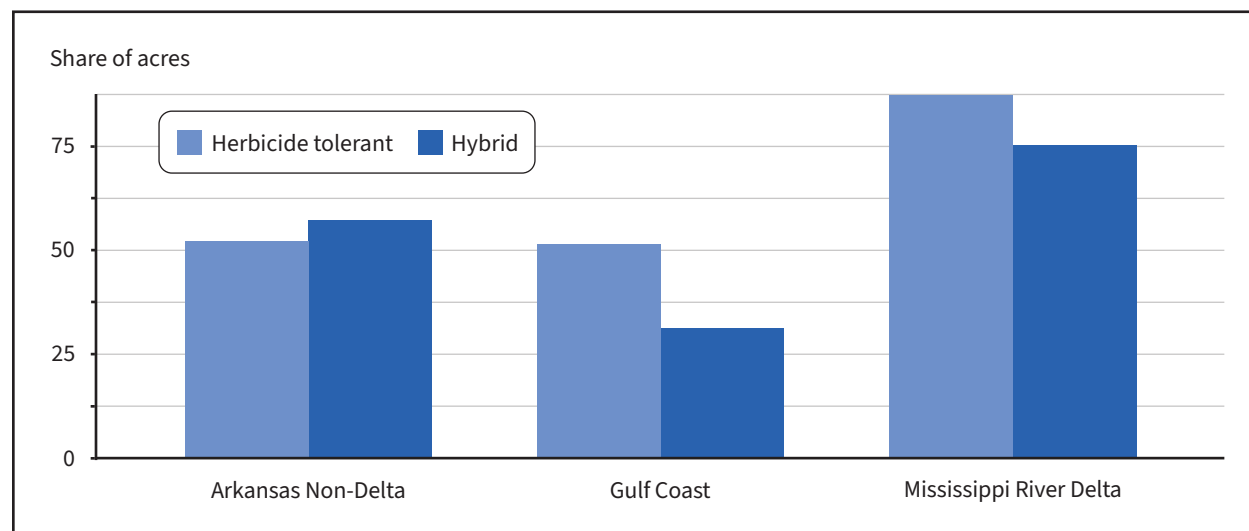
The following sections outline technology use on rice farms by region in 2021, and in some cases discuss how technology use has changed since 2013. They cover statistics on seed, irrigation systems, water usage, fertilizer, chemicals related to weed and pest (insects and disease) management, and tillage.

Seed

In the southern growing regions, rice growers commonly planted hybrid and herbicide-tolerant varieties in 2021 (figure 11; table 3). Hybrids are high-yielding varieties that are crossbred between distantly related parent varieties. The first hybrid rice variety to be sold in the United States was XL6 by RiceTec in 2000. A drawback of hybrid varieties, however, is that they can have low milling quality which can negatively affect the price that farmers receive for their rice (Lyman & Nalley, 2013; McBride et al., 2018).

Figure 11

Share of rice acres planted with hybrid and herbicide-tolerant rice seeds, 2021



Note: Herbicide-tolerant and hybrid seed are not cultivated in California.

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

¹ Insufficient data are available to further examine the characteristics of farms for which yields were reported to have declined when crawfish was harvested on the same field as rice. However, it is worthwhile to note that rice and crawfish are generally cultivated simultaneously in a rice-crawfish double crop system while they may be separated in a rice-soybean or rice-fallow rotation.

Herbicide-tolerant rice varieties can withstand specific herbicides, allowing farmers to kill weeds such as red rice after seedlings have emerged without harming the crop. Red rice is difficult to manage because it is genetically similar to cultivated rice and it competes with rice for light and nutrients, causing yield and quality losses (Durand-Morat et al., 2011). The first herbicide-tolerant rice varieties in the United States were Clearfield varieties CL121 and CL141 and were released in 2002. These varieties are tolerant to the active ingredients in the herbicide products Newpath and Beyond (imazethapyr and imazamox, respectively). While herbicide-tolerant varieties of other crops, including corn and soybeans, are often genetically modified, herbicide-tolerant rice has been developed using conventional breeding methods. The first hybrid rice with herbicide-tolerant traits was released in 2003. The adoption of herbicide-tolerant rice has allowed farmers to control red rice more easily than in the past. Before the release of the Clearfield varieties, farmers had to manage red rice via a complicated system of water seeding and water management, which could lead to soil erosion. With herbicide-tolerant varieties, seed can be dry seeded and less tillage is required (Benedict & Linscombe, 2013).

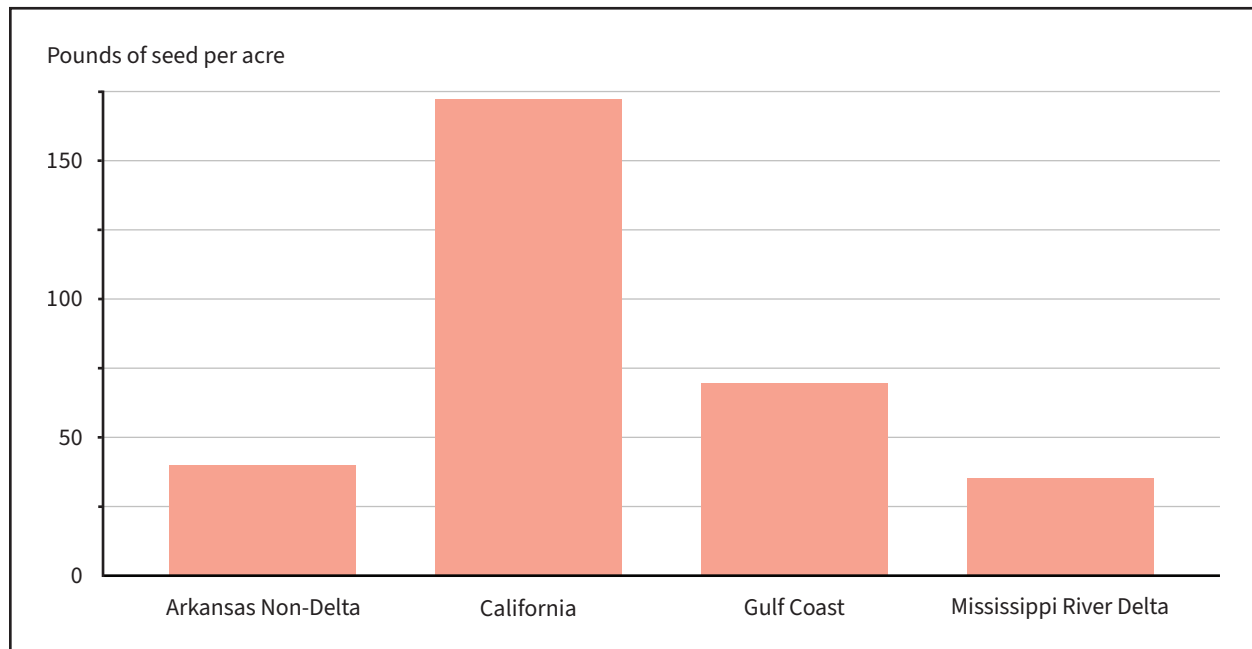
Adoption of hybrid and herbicide-tolerant varieties has grown over time; in 2013, 29 percent of rice acres nationally were cultivated under hybrid varieties, while 43 percent were cultivated under herbicide-tolerant varieties (McBride et al., 2018). This number has increased, particularly for hybrid varieties. In 2021, 48 percent of rice acres were planted with herbicide-tolerant rice varieties and 44 percent were planted with hybrids. In 2021, Clearfield varieties were the most popular herbicide-tolerant varieties, accounting for most herbicide-tolerant adoption, followed by newer Provisia varieties.

Adoption of hybrid and herbicide-tolerant seed was highest in the Mississippi River Delta, at 75 and 87 percent of acres, respectively. This region has experienced the most growth in hybrid and herbicide-tolerant adoption since 2013, when hybrids were cultivated on 37 percent of acres and herbicide-tolerant varieties were cultivated on 60 percent of acres (McBride et al., 2018). In the Arkansas Non-Delta, approximately 57 percent of acres were cultivated with hybrids and 52 percent with herbicide-tolerant varieties in 2021. In the Gulf Coast, about 31 percent of acres were cultivated with hybrids and 51 percent with herbicide-tolerant varieties. These varieties are not currently grown in California.

Rice seed can be drilled or seeded by air either into dry land or water. Drilling is the most common method, accounting for about 79 percent of U.S. acres. The share of acres drilled has increased since 2013, when 65 percent of acres were drilled. In the Arkansas Non-Delta region, 100 percent of acres were drilled in 2021. In the Gulf Coast, 71 percent of acres were drilled in 2021. Seeding by air has historically been highest in the Gulf Coast region and typically requires more seeds per acre than drilling (McBride et al., 2018; Baldwin et al., 2011).

The average rice seeding rate in the United States was 68 pounds per acre in 2021. This has declined over time: The average U.S. seeding rate was 123 pounds per acre in 2000 and 84 pounds per acre in 2013 (McBride et al., 2018). From 2013 to 2021, the average seeding rates fell in the Arkansas Non-Delta region (from 63 to 40 pounds per acre) and in the Mississippi River Delta region (from 59 to 35 pounds per acre). For the Gulf Coast region, seeding rates increased slightly from 63 pounds per acre in 2013 to 70 in 2021, although they fell over the previous decade (figure 12; table 3; McBride et al., 2018).

Figure 12

Rice seeding rate by region, 2021

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

The decline in seeding rate is due in part to the adoption of hybrid varieties, as hybrids have a lower seeding rate than non-hybrid varieties (McBride et al., 2018). The Mississippi River Delta had the largest increase in hybrid and herbicide-tolerant adoption and the greatest decline in seeding rates from 2013 to 2021. By contrast, California, which does not grow hybrid or herbicide-tolerant varieties, has the highest seeding rate which has not changed much over time. The seeding rate in California was 166 pounds per acre in 2013 (McBride et al., 2018) and 172 pounds per acre in 2021.

Table 3

Technology use on rice farms by production region

Technology	Arkansas Non-Delta (a)	Mississippi River Delta (b)	Gulf Coast (c)	California (d)	All U.S.
Herbicide-tolerant seed (percent of acres)	52.15 ^{bd}	87.20 ^{acd}	51.32 ^{bd}	0.00 ^{abc}	47.80
Hybrid seed (percent of acres)	57.28 ^{cd}	75.35 ^{cd}	31.30 ^{abd}	0.00 ^{abc}	44.25
Drilled seed (percent of acres)	100.00 ^c	D	71.06 ^a	D	78.62
Seed rate (pounds/acre)	39.98 ^{cd}	35.14 ^{cd}	69.68 ^{abd}	172.13 ^{abc}	67.73
Water (inches/acre)	24.12 ^d	19.64	23.40 ^d	52.41 ^{ac}	27.60
Share of acres irrigated with purchased water	0 ^{cd}	0 ^{cd}	11.63 ^{abd}	81.60 ^{abc}	15.92
Irrigation system type (percent of acres)					
Open discharge	78.11 ^d	69.91 ^d	77.57 ^d	14.29 ^{abc}	66.61
Portal pipe	D	0 ^d	D	46.21 ^b	11.02
Poly pipe	16.91	30.09	0	0	11.90
Gated	0	0	D	D	3.77
Other	D	0	D	D	6.70

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Technology	Arkansas Non-Delta (a)	Mississippi River Delta (b)	Gulf Coast (c)	California (d)	All U.S.
Nitrogen (percent of acres)	D	D	D	D	92.75
Phosphorus (percent of acres)	75.13 ^b	50.52 ^{acd}	81.86 ^b	81.29 ^b	74.42
Potassium (percent of acres)	58.82 ^b	36.88 ^{acd}	62.10 ^b	61.94 ^b	57.15
Nitrogen (pounds/acre)	199.53 ^d	218.31 ^d	167.87 ^d	127.03 ^{abc}	182.55
Phosphorus (pounds/acre)	96.93 ^d	119.35 ^d	75.72 ^d	46.46 ^{abc}	84.50
Potassium (pounds/acre)	81.93 ^d	67.32 ^d	71.51 ^d	42.11 ^{abc}	70.99
Number of tillage operations	2.36 ^d	2.37 ^d	2.73 ^d	4.80 ^{abc}	2.78
Reduced till (percent of acres)	35.32	D	24.16	D	25.60

D = insufficient data for disclosure.

Note: A lettered superscript denotes that the item mean reported in a column is statistically significantly different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 90-percent confidence level. Tests were conducted using a delete-a-group jackknife variance estimator, with 30 replicates provided by the USDA, National Agricultural Statistics Service for the Agricultural Resource Management Survey (ARMS) data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

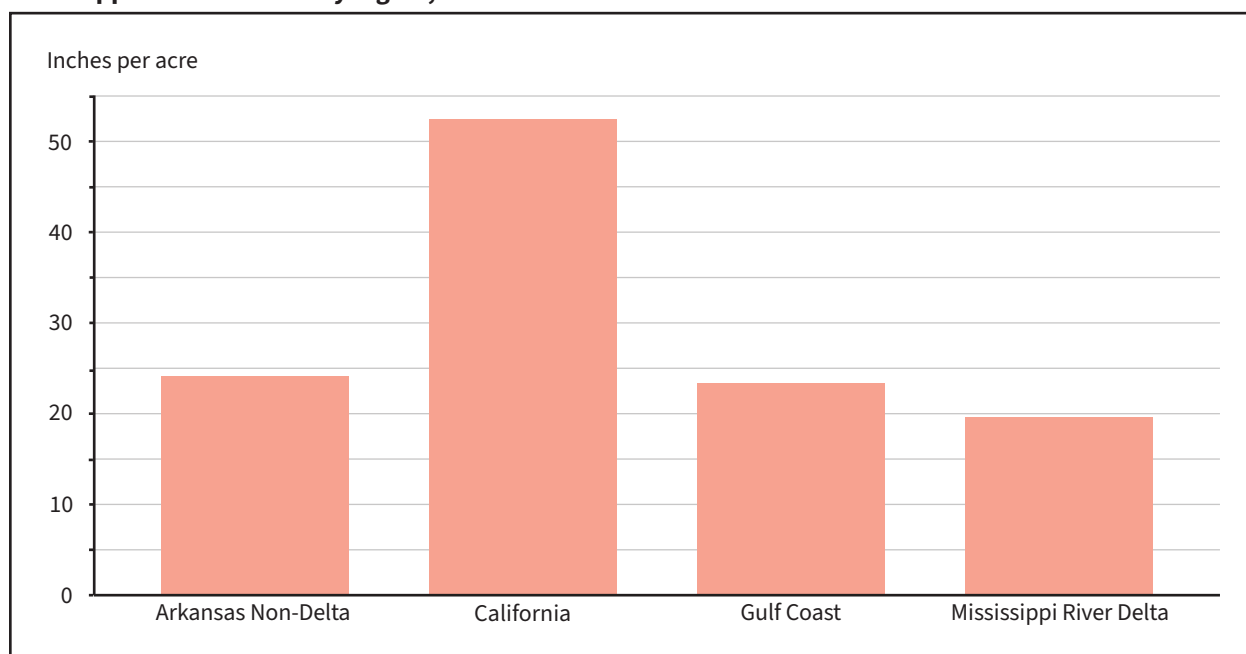
Irrigation System and Water Usage

Rice production is water intensive, as fields are typically flooded. The average per-acre quantity of water applied to rice fields in the United States has declined over time. In 2000, U.S. rice producers applied an average of 42 inches per acre. In 2006, this dropped 19 percent, to 34 inches, where it remained in 2013 (McBride et al., 2018). In 2021, this fell further to 28 inches per acre, an 18-percent decline from 2013.

The decline in irrigated water use from 2013 to 2021 is likely due in part to the relatively low rice acreage in California in 2021, as California rice farms apply more water than other regions (figure 13; table 3). This is partly because there is little to no rainfall in California during the rice growing season (University of California, Davis, 2020). However, water use declined within all regions from 2013 to 2021. The greatest percentage decline was in the Gulf Coast where water usage fell 18 percent, from 28 inches in 2013 to 23 inches in 2021. In California, water usage fell 16 percent, from 62 inches per acre in 2013 to 52 inches in 2021. This could be indicative of the drought California experienced that year. Water usage in the Mississippi River Delta fell by 13 percent (23 to 20 inches per acre) and by 11 percent in the Arkansas Non-Delta (from 27 to 24 inches). The Arkansas Non-Delta and Mississippi River Delta had larger declines in previous years; water usage fell by 37 percent and 41 percent, respectively, from 2000 to 2013 in these regions.

Most of the water used in California's rice production is purchased: 82 percent of acres were irrigated with purchased water in 2021. This is lower than in 2013, when 92 percent of acres in California were irrigated with purchased water. In the Gulf Coast, about 12 percent of acres were irrigated with purchased water in 2021, but water was not purchased in the remaining regions. This is consistent with prior years.

Figure 13

Water applied to rice acres by region, 2021

Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

The most common type of irrigation used in rice production is open discharge, accounting for 67 percent of rice acres nationally in 2021. This share was similar in 2013, when 61 percent of acres were irrigated using an open discharge system (McBride et al., 2018). In open discharge systems, there is only one point of discharge, such as a well or a pump. Levees, dikes, and land-forming are used to level water to an even depth throughout the field.

In the Arkansas Non-Delta and Gulf Coast regions, about 78 percent of acres were irrigated with an open discharge system in 2021, compared to 80 percent in the Arkansas Non-Delta region and 60 percent in the Gulf Coast region in 2013. In the Mississippi River Delta, 70 percent of acres were irrigated with an open discharge system in 2021, compared to 77 percent in 2013. In California, 14 percent of acres were irrigated with an open discharge system in 2021, compared to 20 percent in 2013 (McBride et al., 2018).

Other types of systems, such as portal, poly pipe, and gated systems, use ditches or pipes to direct water to a field. Nationally in 2021, 11 percent of rice acres were irrigated with a portal system, 12 percent with a poly system, 4 percent with a gated system, and 7 percent with a system classified as “other.” Portal systems are most common in California, covering 46 percent of acres. Poly systems were most common in the Arkansas Non-Delta (17 percent of acres) and Mississippi River Delta (30 percent of acres) regions.

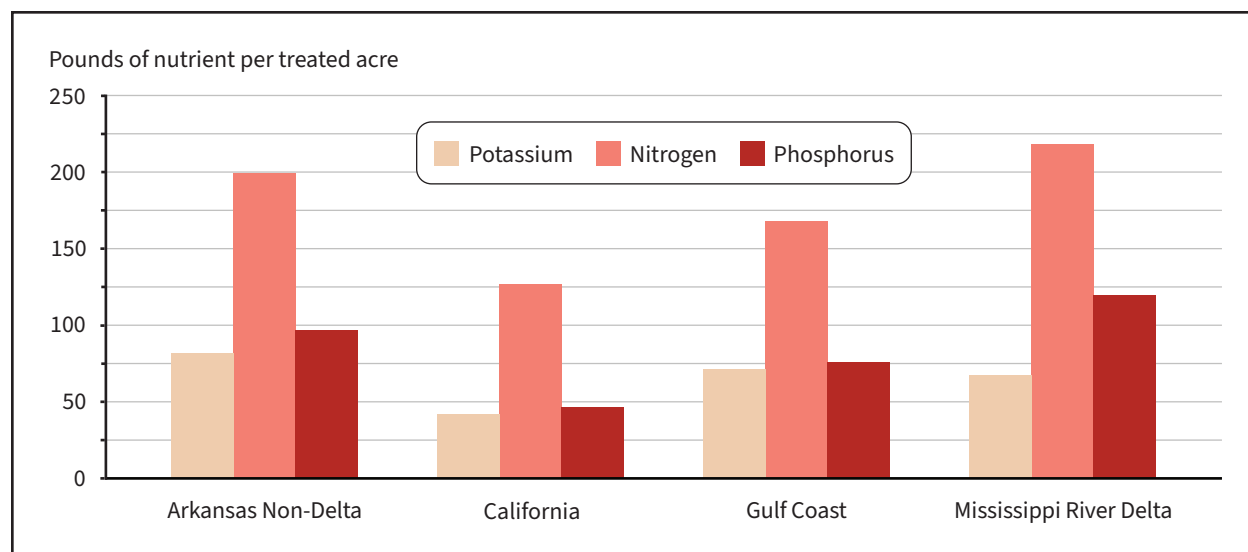
Fertilizer

Nearly all (93 percent) U.S. rice acres had nitrogen applied to them in 2021, while majorities were treated with phosphorus (74 percent of acres) and potassium (57 percent). These shares of acres were similar to those in 2013 (McBride et al., 2018). Phosphorus was applied to at least 75 percent of acres in every region in 2021, except for the Mississippi River Delta where it was applied to about 51 percent of acres. Potassium was applied to 37 percent of acres in the Mississippi Delta compared to at least 59

percent in all other regions. McBride et al. (2018) also showed that phosphorus and potassium were used on lower percentages of rice acres in the Mississippi Delta, relative to the other regions.

Figure 14

Quantity of fertilizer applied to rice acres, 2021



Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

On average in 2021, U.S. rice producers applied 183 pounds of nitrogen per treated acre, 85 pounds per treated acre of phosphorus, and 71 pounds per treated acre of potassium (figure 14; table 3). Application rates of nitrogen, phosphorus, and potassium were each lowest in California; application rates of each fertilizer type did not vary significantly across the other regions.

Chemicals and Pest Management

Pesticides are substances used to control pests such as weeds, which are controlled by herbicides; insects, which are controlled by insecticides; and fungi and other plant pathogens, which are controlled by fungicides. There are several factors that can influence pesticide usage on farms, including pest infestation levels, technical improvements in pesticide effectiveness, and use of other methods of pest control (Fernandez-Cornejo et al., 2014).

Nearly all rice acres (96 percent) had herbicides applied to them in 2021, consistent with previous survey years (McBride et al., 2018). Farmers applied insecticides to 18 percent of rice acres nationally and fungicides to 23 percent in 2021 (USDA, NASS, 2022c). This is less than in 2013, when insecticides were used on about 30 percent of U.S. rice acres and fungicides were used on about 50 percent of U.S. rice acres (McBride et al., 2018). The USDA, NASS Chemical-Use Survey Highlights Report categorizes pest management practices into four types: prevention, avoidance, monitoring, and suppression (USDA, NASS, 2022c). For rice production, monitoring (scouting for weeds) was practiced on 95 percent of acres in 2021, a similar share compared to 2006 and 2013 (USDA, NASS, 2014). Usage of the remaining practices was higher in 2021 compared to 2013. Prevention (chopped, sprayed, mowed, plowed, or burned field edges, ditches, or fence lines) was practiced on 76 percent of acres in 2021 compared to 65 percent in 2013. Avoidance (rotated crops during the past 3 years) was practiced on 61 percent of acres in 2021 compared to 46 percent of acres in 2013. Suppression (using pesticides with different mechanisms of action to keep pests from becoming resistant to pesticides) was used on 43 percent of acres in 2021 compared to 30 percent of acres in 2013 (USDA, NASS, 2014; 2022c).

Organic Production

USDA surveys organic rice producers as part of the Certified Organic survey. According to the USDA 2021 Certified Organic survey, there were 98 U.S. organic rice producers in 2021 who planted a total of 41,281 acres and produced 1.832 million cwt (USDA, NASS, 2022b). More than half of these organic producers (56) were in California, with most of the remaining organic producers (31) in Texas. The two previous organic surveys, from 2016 and 2019, reported slightly higher numbers of organic producers (109 and 114, respectively), with lower total acreage of organic rice (31,911 acres and 39,993 acres, respectively) (USDA, NASS, 2017b; 2020). Although Arkansas has the most total rice producers, it has relatively little organic rice production. Rice mills in Arkansas tend to be larger than in other southern States such as Texas, and it is typical for all rice to be pooled together, making it difficult for organic producers to preserve the organic identity of their rice (Ferreira & Raszap Skorbiansky, 2018).

Tillage

Tillage breaks up the soil to prepare land for planting and also serves as a method to control weeds; U.S. farmers often practice conservation tillage in order to reduce production costs and/or protect soil health. Conservation tillage can include no-tillage, in which the land is not tilled at all, and reduced tillage such as mulch or strip-till. There are many potential benefits of reduced till farming, including reduced soil erosion, increased yields, improved soil health, and reduced costs of some inputs. However, some input costs can increase with conservation tillage and yield gains are not guaranteed. The benefits and costs of reducing tillage vary by region according to factors such as soil type and climate; thus, adoption of conservation tillage varies by crop and region and changes over time (Classen et al., 2018; Bowman et al., 2025).

In 2021, the average number of tillage operations on U.S. rice fields was 2.78, which changed very little from 2.71 in 2013 (McBride et al., 2018). In 2021, the number of tillage operations was higher in California (4.80) than in other regions. Fewer than 3 percent of rice acres in 2021 were no-till acres (compared to 2 percent in 2013), though reduced tillage was more common, covering about 26 percent of U.S. rice acres. Adoption of herbicide-tolerant rice varieties allowed more farmers to use reduced tillage practices because they made farmers less reliant on water seeding. Reduced tillage planters do not work well in water seeding situations, which made practicing reduced tillage difficult (Levy & Kongchum, 2023). This may explain in part why adoption of no-till and reduced-till were relatively low for rice production in 2021 compared to other crops; for instance, 40 percent of corn acres were cultivated under reduced tillage and 30 percent were no-till in 2021 (Bowman et al., 2025). Reduced tillage was most common in the Arkansas Non-Delta Region in 2021, practiced on 35 percent of acres in the region (table 3).

Production Costs, Productivity, and Profitability

Technology use, inputs, farm size, and other trends ultimately affect both the cost of producing rice and influence the yields that farmers achieve. This section uses USDA, ERS Commodity Costs and Returns data and ARMS data to explore how production costs, productivity, and profitability have changed over the last decade and vary by region.

Per-acre Production Costs

The average total cost of producing 1 acre of rice in 2024 dollars, nationally, was \$1,343 in 2013 and \$1,296 in 2024, a 4-percent decrease (figure 15). Real costs declined 16 percent between 2013 and 2020 to \$1,133 per acre in 2024 dollars, after which they rose 9 percent from 2020 to 2021 and 15 percent from 2021 to 2022. Real costs fell slightly (2 percent) from 2022 to 2023 and a further 7 percent from 2023 to 2024. Most of the recent increase in cost came from operating costs, which grew 57 percent in real terms from 2020 to 2022, compared to allocated overhead costs which declined slightly during these years. The largest increase of an individual cost category in recent years was fertilizer. Real fertilizer costs for rice production rose by 135 percent from 2020 to 2022 (from \$110 per acre to \$258 per acre in 2024 dollars). Rising fertilizer prices had several contributing factors, including rising global demand at the end of the Coronavirus (COVID-19) pandemic, increasing energy prices, and conflicts involving countries that produce fertilizer (Williams et al., 2025). Fertilizer costs subsequently fell in 2023 to \$201 per acre in 2024 dollars and again in 2024 to \$168, contributing to a decline in operating costs from 2022 to 2024. From 2022 to 2024, real operating costs fell by 17 percent while real allocated overhead costs increased by 6 percent.

USDA, Economic Research Service Commodity Costs and Returns Data

Costs and returns estimates for U.S. rice production have been provided by USDA, Economic Research Service (ERS) since 1975 and are presented on the USDA, ERS website. Since 2000, these estimates have been based upon periodic Agricultural Resource Management Survey (ARMS) rice commodity surveys that are conducted every 6–8 years (2000, 2006, 2013, and 2021) using both Phase 2 (field-level) and Phase 3 (farm-level) ARMS rice version data, supplemented with price data from various sources as needed. During non-survey years (years between ARMS rice surveys) rice costs and returns are updated using the most recent survey-year estimate, adjusted with new annual price and production data from USDA, National Agricultural Statistics Service (NASS) sources.

The gross value of production included in the rice costs and returns estimates is the value of rice grain produced, determined as the product of the ARMS-reported quantity produced and the State market price reported by USDA, NASS for the harvest month. Operating costs include seed; fertilizer; chemicals; custom services; fuel, lube, and electricity; repairs; commercial drying costs; purchased irrigation water; and interest on operating capital, which is the opportunity cost associated with the short-term investment in operating inputs.

Allocated overhead costs included in the rice costs and returns estimates include costs that tend to be considered “fixed” in that they are not easily altered in the short run, for example land, machinery, and equipment. Allocated overhead costs include hired labor; the opportunity cost of unpaid labor, which is valued at wages the worker could have earned off the farm; capital recovery of machinery and equipment, which is an estimate of the value of the machinery and equipment used up in the production process plus the opportunity cost associated with the remaining value of the machinery and equipment; the opportunity cost of land, which is the rental value of the land; taxes and insurance; and general farm overhead. Total costs include both operating costs and allocated overhead costs. Net return over operating and total costs are estimated as the gross value of production less operating and total costs, respectively.

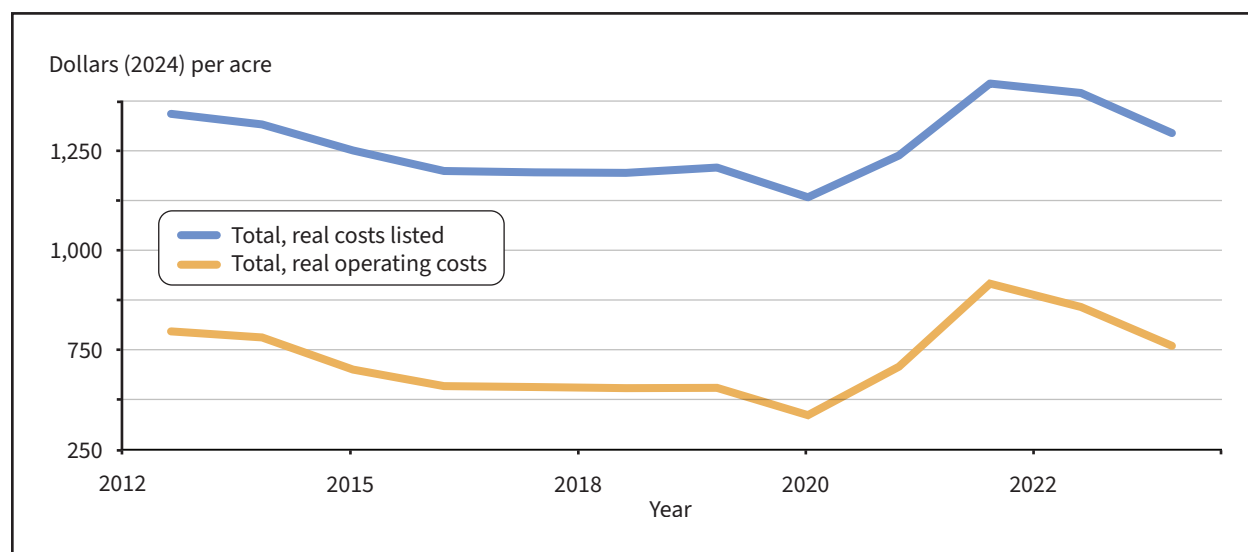
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USDA, Economic Research Service Commodity Costs and Returns Data (continued)

The commodity costs and returns estimates are considered sector accounts in that they include all costs and returns associated with production of the commodity, regardless of whether the cost is incurred or the return is realized by the farm operator, a landlord, a contractor, or another entity. Government program payments and commodity storage costs after harvest are not included in the estimates. For more information on how the USDA, ERS Commodity Costs and Returns data are estimated, see Gillespie et al. (2025).

Figure 15

Rice production costs over time

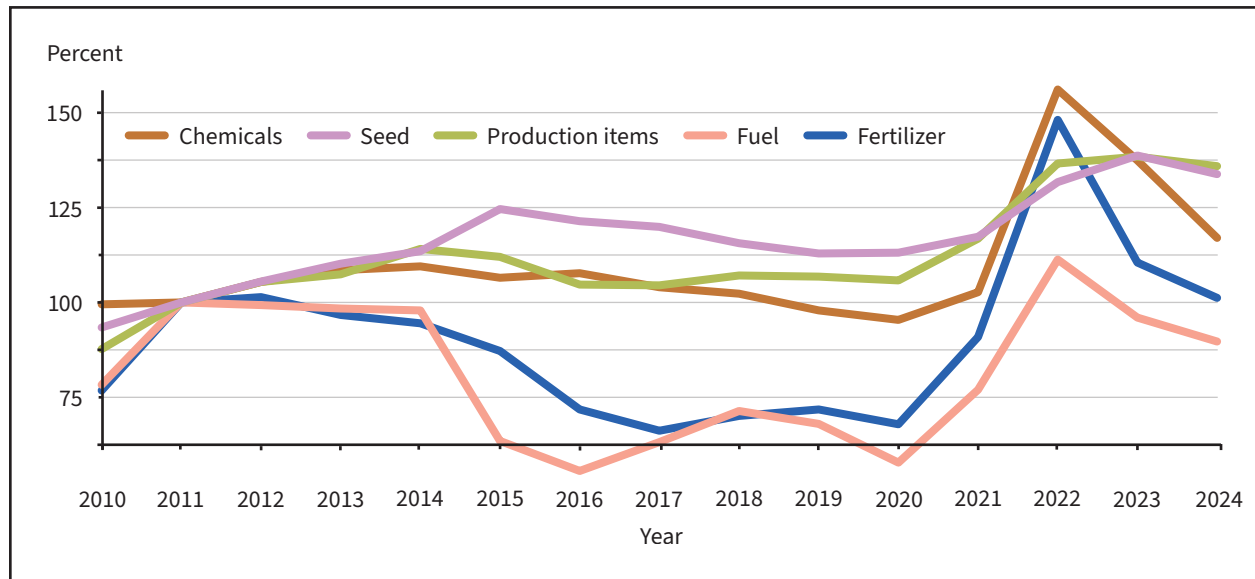


Note: Costs are deflated to 2024 dollars using the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) Gross Domestic Product Price Index (BEA Application Programming Interface series code A191RG).

Source: USDA, Economic Research Service, Commodity Costs and Returns.

A major contributing factor to rising input costs was the large increase in input prices beginning around 2021, including but not limited to fertilizer prices (figure 16). Price indexes published by USDA, NASS which compare the prices paid for production inputs over time (compared to 2011 prices) show steep increases for all production items, fuel, chemicals, and fertilizer after 2020, as well as a less steep increase in seed prices. In 2023, price indexes fell for chemicals, fertilizer, and fuel, although they remained high relative to years before 2022. The seed price index, and the index for production items more generally, continued to increase in 2023. In 2024, each price index (all production items, fuel, chemicals, fertilizer, and seed) fell relative to its 2023 value, though still remained higher than years prior to 2022. Increased input prices contributed to high input costs for farmers during these years.

Figure 16
Input price indexes, 2011 = 100



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service, Prices Paid Surveys and Indexes.

Production costs were highest in California in 2024 (table 4, figures 17–18). Most operating cost categories were higher in California compared to other regions. California chemical costs (\$249 per acre) were more than twice as high as in the Mississippi River Delta, which had the second-highest chemical costs at \$103 per acre in 2024. Purchased irrigation water costs were also much higher in California at \$94 per acre compared to about \$15 in the Gulf Coast and \$0 in other regions; this is expected, as California growers pay for most of their water and growers in other regions do not. By contrast, seed costs were lowest in California despite its relatively high seeding rate, likely, in part, because California growers do not use hybrid or herbicide-tolerant seed.

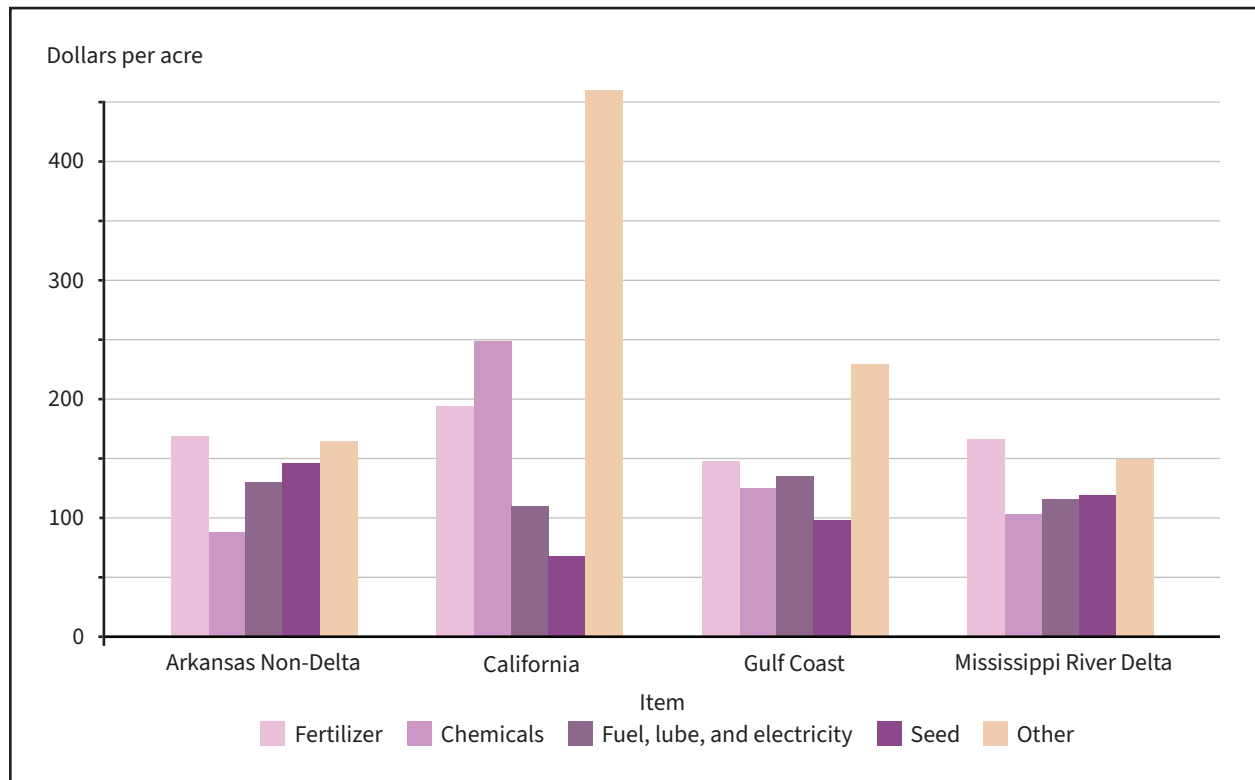
Table 4:

Commodity costs and returns by region, 2024

	Arkansas Non-Delta	Gulf Coast	Mississippi River Delta	California	United States
Gross value of production	1,259.18	1,181.43	1,162.99	1,588.27	1,281.80
Operating costs					
Seed	145.68	97.67	119.24	67.85	118.81
Fertilizer	168.50	147.58	165.96	193.93	167.81
Chemicals	87.66	124.61	103.38	248.88	124.16
Custom services	35.91	72.20	23.91	131.95	57.47
Fuel, lube, and electricity	130.27	134.95	115.98	109.56	125.74
Repairs	77.42	59.80	98.04	66.91	75.07
Commercial drying	35.58	66.83	12.67	144.95	56.60
Purchased irrigation water	0.00	14.91	0.00	94.46	18.57
Interest on operating capital	15.52	15.67	15.07	21.97	16.54
Total, operating costs	696.54	734.22	654.25	1,080.46	760.77
Allocated overhead					
Hired labor	30.97	18.73	43.12	50.91	33.45
Opportunity cost of unpaid labor	20.18	58.05	14.69	89.54	38.71
Capital recovery of machinery and equipment	208.93	174.35	255.66	194.39	206.25
Opportunity cost of land	154.78	106.64	196.12	379.16	187.34
Taxes and insurance	23.77	13.72	21.88	41.26	24.20
General farm overhead	29.35	47.17	57.28	80.91	45.75
Total, allocated overhead	467.98	418.66	588.75	836.17	535.70
Total costs	1,164.52	1,152.88	1,243.00	1,916.63	1,296.47
Net value of production					
Value of production less total costs listed	94.66	28.55	-80.01	-328.36	-14.67
Value of production less operating costs	562.64	447.21	508.74	507.81	521.03

Source: USDA, Economic Research Service, Commodity Costs and Returns.

Figure 17
Operating costs, 2024



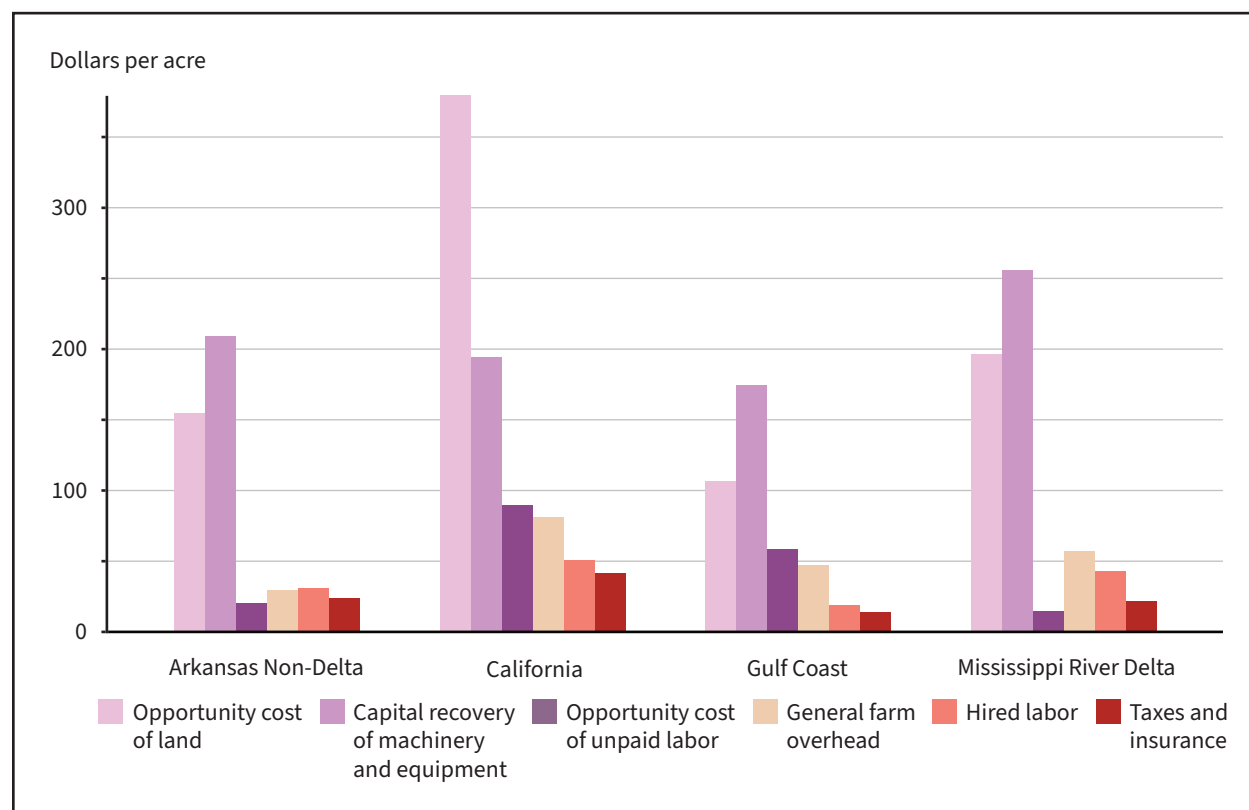
Note: “Other” includes repairs, commercial drying, custom services, purchased irrigation water, and interest on operating capital.

Source: USDA, Economic Research Service, Commodity Costs and Returns.

In 2024, the opportunity cost of land for California rice growers was \$379 per acre, compared to \$196 in the Mississippi River Delta, \$107 in the Gulf Coast, and \$155 in the Arkansas Non-Delta region. California also had a higher opportunity cost of unpaid labor, general farm overhead, and taxes and insurance compared to other regions. By contrast, the Mississippi River Delta had the highest capital recovery of machinery and equipment cost of any region.

Compared to other crops, rice has relatively high per-acre production costs. Of the nine crop commodities for which USDA, ERS produces commodity costs and returns estimates, rice had the highest total per-acre production costs on average in the United States in 2024 at \$1,296 per acre. The second highest total per-acre production costs were for peanuts, at \$1,156 per acre (USDA, ERS, 2025a).

Figure 18
Allocated overhead costs for rice production, 2024



Source: USDA, Economic Research Service, Commodity Costs and Returns.

Unit Costs

The unit cost of producing rice, or the cost in dollars spent per hundredweight of production, is another way to examine production costs while also serving as a measure of productivity. As productivity increases, the quantity of inputs needed to produce a hundredweight of rice declines: Thus, declining real costs (i.e., adjusted for inflation) per hundredweight can be used as an indicator of increased productivity. To more accurately control for rises in input costs, unit costs are deflated here using the USDA, NASS prices-paid index for farm production items, which serves as an indicator of price-level changes for agricultural inputs. This adjusts for increases in the price of farm inputs over time more precisely than deflating by the Gross Domestic Product (GDP) price index so that the cost of rice production can be compared more meaningfully across years. We examine the past 4 ARMS rice survey years (2000, 2006, 2013, and 2021) to identify long-term trends in productivity.

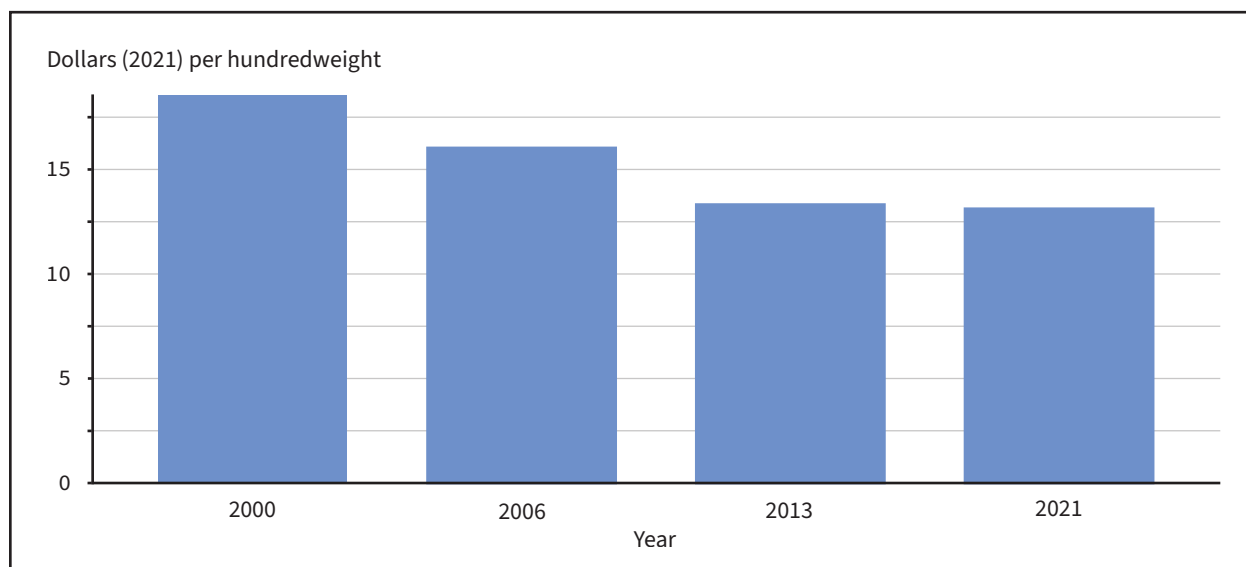
Nationally, the unit cost of producing a hundredweight of rice adjusted by the prices-paid index, expressed in 2021 dollars, fell from \$18.52 in 2000 to \$16.03 in 2006 and to \$13.32 in 2013 (figure 19). It subsequently fell slightly to \$13.12 in 2021. Thus, productivity in rice production has increased over time, with most of the increase occurring between 2000 and 2013.² Shifts in unit costs over time may be due to changes in technology use, such as increased usage of hybrid and herbicide-tolerant varieties. The disproportionate loss of small rice farms over the past two decades may also play a role, as

² As an alternative way to deflate costs, individual price indexes for their respective cost categories were used; for instance, the fertilizer cost category was deflated using the fertilizer price index. In addition, we checked whether leaving out cost categories not directly related to productivity (i.e., interest on operating capital, opportunity cost of land, and taxes and insurance) changed the main results. These alternate ways to adjust for inflation did not change the overall pattern of productivity: Adjusted unit costs fell from 2000 to 2013 and changed only slightly from 2013 to 2021.

past research has found larger farms typically have lower unit costs (McBride et al., 2018). Differences in water availability from year to year may also affect unit costs.

Figure 19

Unit costs of rice production



Note: Costs are deflated to 2021 dollars using the prices-paid index for production items from USDA, National Agricultural Statistics Survey, Prices Paid Surveys and Indexes.

Source: USDA, Economic Research Service (ERS) estimates based on USDA, ERS, Commodity Costs and Returns.

Unit costs fell from 2000 to 2013 in all four production regions (table 5). From 2013 to 2021, unit costs increased in all regions except for the Arkansas Non-Delta. Therefore, the small increase in productivity nationally since 2013 all stemmed from the Arkansas Non-Delta region. In each year examined, unit costs were highest in California. This is expected, as production costs are much higher in California than in other regions (table 4). In 2000 and 2021, unit costs were lowest in the Arkansas Non-Delta region. In 2006, unit costs were lowest in the Mississippi River Delta, while in 2013 unit costs were lowest in the Gulf Coast.

Table 5

Unit costs by region and year (2021 dollars per hundredweight)

	Arkansas Non-Delta	Gulf Coast	Mississippi River Delta	California	United States
2000	16.25	20.15	17.51	22.06	18.52
2006	14.33	17.65	13.71	20.50	16.03
2013	12.91	11.19	12.80	15.99	13.32
2021	11.40	12.79	13.26	18.16	13.12

Note: Costs are deflated to 2021 dollars using the prices-paid index for production items from USDA, National Agricultural Statistics Survey, Prices Paid Surveys and Indexes.

Source: USDA, Economic Research Service (ERS) estimates based on USDA, ERS, Commodity Costs and Returns.

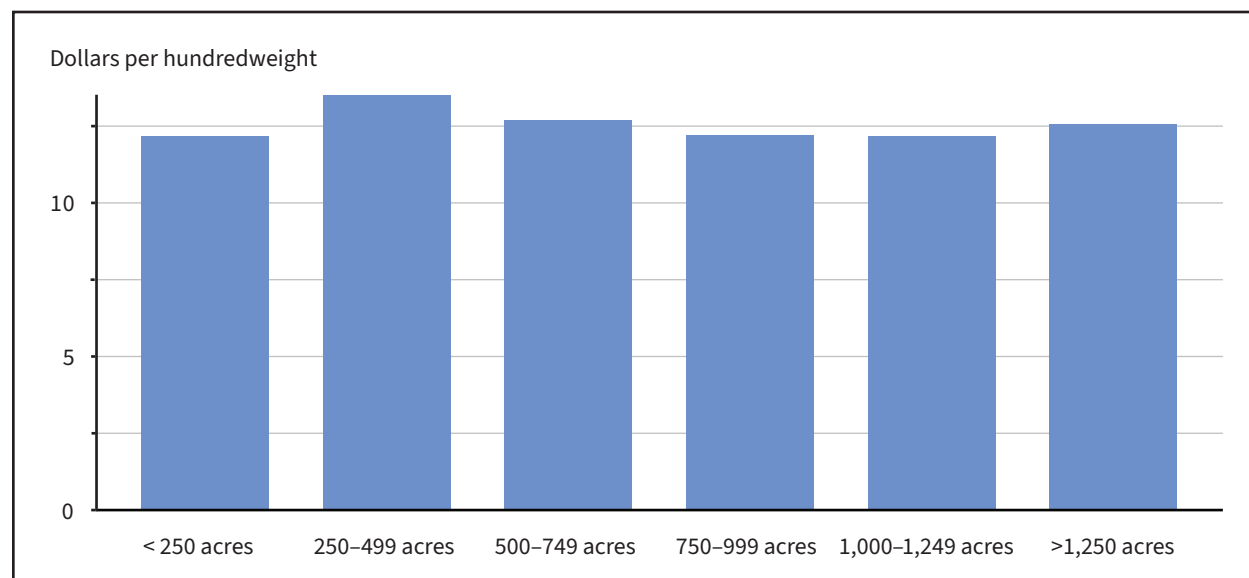
Economies of Size

If unit costs decline as the size of the farm operation increases, this indicates economies of size. To examine economies of size, rice farms were split into size categories based on total rice acreage. Unit costs (total cost per hundredweight of rice produced) were then compared between these size groups. For this analysis, farms in California were removed because of the different cost and size structure of California rice farms compared to those in the southern regions. An analysis was not conducted on California rice farms because the sample size of California rice farmers was too low to ensure reliable inference after splitting the sample into separate groups.

Farms were split into six categories based on total 2021 rice acreage: less than 250 acres, 250–499 acres, 500–749 acres, 750–999 acres, 1,000–1,249 acres, and more than 1,250 acres. These farm sizes were chosen so that each category had a sufficient number of observations to make comparisons. There is no strong pattern in unit costs across these size groups: Farms with 250–499 acres of rice had the highest unit costs in 2021 at \$13.50 per cwt while farms with less than 250 rice acres, farms with 750–999 rice acres, and farms with 1,000–1,249 acres each had the lowest unit costs at \$12.20 per cwt (figure 20). Although total per-acre allocated overhead costs tended to be lower for the larger farm size groups, yields were slightly higher for the groups of smaller farms and total per-acre operating costs did not have a clear relationship with farm size. McBride et al. (2018) found that in southern regions in 2000, larger farms had lower average unit costs. In 2013, unit costs increased as size increased for smaller cost categories (500–749 acres and below), after which unit costs fell as size increased. Over the past decade, the number of small and medium farms has fallen (figure 1); it may be the case that as smaller farms close, the ones that remain open have low unit costs relative to the farms that close. This could in part explain the apparent convergence of unit costs between small and large farms observed over time.

Figure 20

Unit cost of rice production by total rice acreage in southern regions, 2021



Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

Characteristics of High-unit Cost and Low-unit Cost Farms

To examine how farms with high and low unit costs differ in their characteristics, cost patterns, and technology use, farms were split into three groups of roughly equal size based on their 2021 unit costs: low-cost farms, medium-cost farms, and high-cost farms. Like the analysis for economies of size, California farms were excluded due to their many differences from southern rice farms.

In the lowest cost group, the average total cost of producing 1 cwt of rice in 2021 was \$9.83, in the medium cost group it was \$12.78, and in the high cost group it was \$16.07 (table 6). The low cost group had the highest yields (88.87 cwt) and the lowest total costs (\$872.77) per acre. Operating costs were almost \$200 lower per acre in the low cost group compared to the high cost group, while allocated overhead costs were about \$100 less per acre. In the low cost group, the acreage of the sampled field was higher than for the high cost group, but total rice acreage was about the same; this is consistent with the economies of size analysis, which found little difference in unit costs by varying rice acreage.

A higher share of Arkansas Non-Delta acres was in the low cost group compared to the high cost group, while a higher share of the Gulf Coast rice acres were in the high cost group compared to the low cost group. Mississippi River Delta acres were equally likely to be in any of the cost groups. Overall, there are few clear patterns regarding technology or input use across the cost groups. Adoption of herbicide tolerant and hybrid rice varieties was equally prevalent in all cost groups, as was drilled seed. The seeding rate was highest in the high cost group. Use of some fertilizers and pesticides varied by cost groups. Fewer inches of water were applied to rice acres in the low cost group compared to the medium-cost group.

Table 6

Farm characteristics and technology use by unit cost group, 2021

	Low cost (a)	Medium cost (b)	High cost (c)
Unit cost (dollars/hundredweight)	9.83 ^{bc}	12.78 ^{ac}	16.07 ^{ab}
Yield (hundredweight/acre)	88.87 ^{bc}	80.57 ^{ac}	73.02 ^{ab}
Total cost (dollars/acre)	872.77 ^{bc}	1,027.65 ^{ac}	1,161.71 ^{ab}
Allocated overhead cost (dollars/acre)	378.12 ^{bc}	418.65 ^{ac}	475.92 ^{ab}
Operating cost (dollars/acre)	494.65 ^{bc}	609.00 ^{ac}	685.79 ^{ab}
Net returns (dollars/acre)	286.63 ^{bc}	25.47 ^{ac}	-204.16 ^{ab}
Sampled field acreage	117.77 ^c	98.54	83.07 ^a
Total rice acreage	1,337.88	1,507.54	1,182.37
Region			
Arkansas Non-Delta	71.13 ^c	55.35 ^c	25.54 ^{ab}
Gulf Coast	19.78 ^c	24.99 ^c	52.72 ^{ab}
Mississippi River Delta	9.09	19.65	21.74
Herbicide-tolerant seed (percent of acres)	52.09	60.04	61.98
Hybrid seed (percent of acres)	57.16	53.05	41.74
Drilled seed (percent of acres)	94.16	89.38	89.55
Seed rate (pounds/acre)	40.76 ^c	48.27 ^c	59.74 ^{ab}
Nitrogen (percent of acres)	D	D	D

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	Low cost (a)	Medium cost (b)	High cost (c)
Phosphorus (percent of acres)	69.89	75.58	74.91
Potassium (percent of acres)	54.10	50.96 ^c	70.08 ^b
Nitrogen (pounds/treated acre)	201.67	192.46	186.92
Phosphorus (pounds/treated acre)	98.97	99.14 ^c	72.27 ^b
Potassium (pounds/treated acre)	70.41	87.37	76.56
Tillage operations (number/season)	2.39	2.50	2.60
No-till (percent of acres)	D	4.77	3.47
Water applied (inches/acre)	21.20 ^b	25.89 ^a	24.04
Open discharge irrigation (percent of acres)	80.30	73.78	76.32

D = insufficient data for disclosure.

Note: A lettered superscript denotes that the item mean reported in a column is statistically significantly different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 90-percent confidence level. Tests were conducted using a delete-a-group jackknife variance estimator, with 30 replicates provided by the USDA, National Agricultural Statistics Service for the Agricultural Resource Management Survey (ARMS) data, as discussed in Dubman (2000).

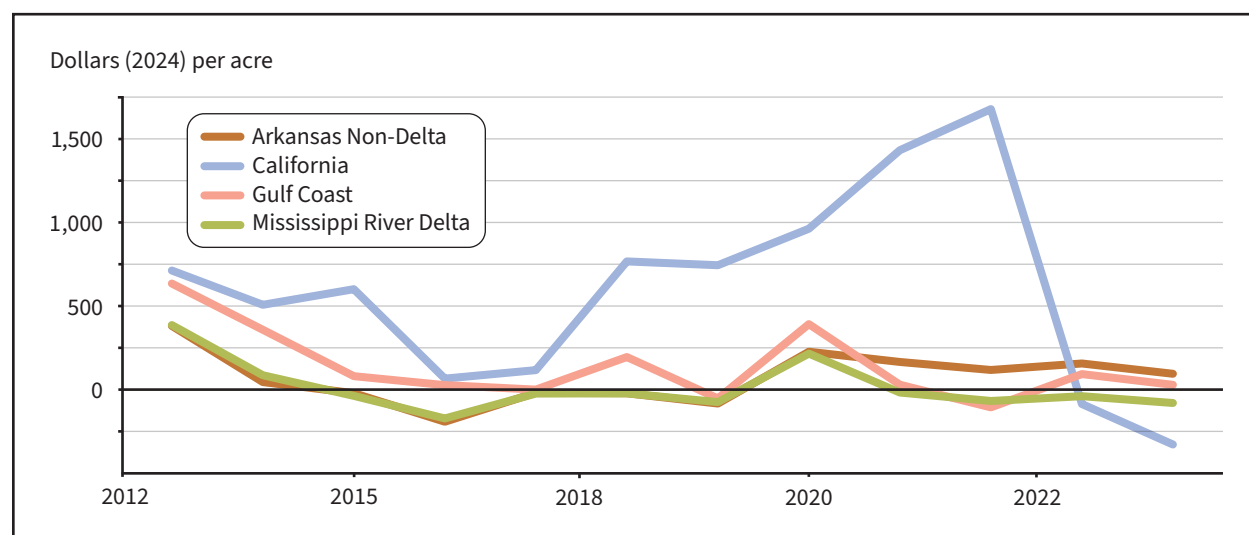
Source: USDA, Economic Research Service (ERS) estimates based on the 2021 Agricultural Resource Management Survey, jointly administered by USDA, ERS and USDA, National Agricultural Statistics Service.

Profitability

Shifts in yields, costs, productivity, and prices combine to affect the profitability of rice production. Although California has the highest production costs, in most years it also has the highest net returns (i.e., total gross returns minus total costs) due to higher prices for its rice (figure 21). Between 2017 and 2022, California net returns increased in most years, climbing much higher than in other regions; in 2022 California net returns reached a high value of \$1,678 in 2024 dollars. This corresponds to a period of rising prices for short- and medium-grain rice, particularly from about 2020 to 2022, when short- and medium-grain rice acreage fell due to drought in California. However, as California acreage rebounded and the price of short- and medium-grain rice fell in 2023 and again in 2024, net returns fell in both years.

In all three southern regions, real net returns in the past decade were highest in 2013: \$381 per acre (in 2024 dollars) in the Arkansas Non-Delta, \$635 in the Gulf Coast, and \$386 in the Mississippi River Delta. Net returns were lowest in 2016 for the Arkansas Non-Delta (-\$192) and Mississippi River Delta (-\$173) regions due to both relatively low yields and low prices. In the Gulf Coast region, net returns were lowest in 2022 due to low yields and high production costs. In all three southern regions, real net returns increased from 2022 to 2023 and then fell in 2024.

Figure 21

Net returns (total gross value of production minus total production costs) of U.S. rice production

Note: Returns are deflated to 2024 dollars using the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) Gross Domestic Product Price Index (BEA Application Programming Interface series code A191RG).

Source: USDA, Economic Research Service, Commodity Costs and Returns.

In the southern regions in 2021, net returns were highest in the low-unit cost group (\$287), followed by the medium-cost group (\$25.47) examined previously (table 3). The highest-cost group had negative returns (-\$204). This pattern indicates a relationship between productivity and profitability: The farms that can produce rice at a lower cost are able to achieve higher net returns.

Conclusion

This report details the production practices, costs, and returns of U.S. rice farmers from 2013 to 2024, a decade that saw many challenges and changes for rice growers. Severe weather in the form of drought in California and flooding in the southern production regions limited planted acreage in several years, particularly in California in 2022. The number of farms producing rice has fallen, although the number of farms producing more than 1,000 acres of rice has grown. U.S. rice exports have fallen, both in total quantity and as a share of total production while imports have steadily risen. In 2021 and 2022, U.S. farmers faced sharply rising input costs, including rice farmers.

Despite these challenges, U.S. rice yields (all types combined) and total production have slowly increased over the past decade, with some annual variation and differences by class. Southern rice farmers have increased their adoption of hybrid and herbicide tolerant seed and lowered their overall seeding rate. Per-acre water use also declined in every region between 2013 and 2021. In the past 2 years, rice acreage has rebounded from its low point in 2022 and per-acre production costs have begun to steady as well.

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