

White Paper – November 2023

The Ongoing Trend of Arkansas Farm Information Technology Usage and its Implications

Introduction

Information Technology (IT) has a significant role in the sustainability of rural communities. Technology enhances agricultural production and quality, environmental consideration, and the welfare of community members and animals (Cox, 2002). Similarly, a well-developed IT infrastructure supports community members’ digital literacy (i.e., ability to understand and utilize various digital information sources), community activities, and economic growth (Ko et al., 2019). Therefore, supporting IT and its infrastructure in rural communities directly affects their sustainability.

Accordingly, the state of Arkansas is actively working to distribute broadband internet to rural areas. The Arkansas State Broadband Office (ARConnect) submitted its [Five-Year Action Plan](#) to the U.S. Department of Commerce/National Telecommunications and Information Administration (NTIA) on Aug. 28, 2023, outlining Arkansas’ aims to design an IT infrastructure grant program, such as Broadband Equity, Access, and Deployment (BEAD), to foster a competitive IT environment in Arkansas by 2028.

In this paper we explore how Arkansas’ technology usage on farms compares to other states to provide insight into potential grant programs of the ARConnect as well as potential extension education programs. Identifying IT usage characteristics on Arkansas farms is required for the successful launch of grant and extension education programs. To fulfill this goal, we examine the U.S. Department of Agriculture’s (USDA) bi-annual [Technology Use \(Farm Computer Usage and Ownership\) Report](#) that estimates the level of IT usage on farms. Based on these reports, we analyze the IT usage characteristics of Arkansas farmers and suggest implications for supporting rural Arkansas communities.

The Current IT Status of U.S. Farms Shows the Importance of Precision Agriculture

While the average number of farms in the United States and Arkansas have been on a downward trend, farm internet access has continuously increased (Figure 1). The average farm internet access rate is at 85%, according to the USDA’s report, while in Arkansas the rate is 80%.

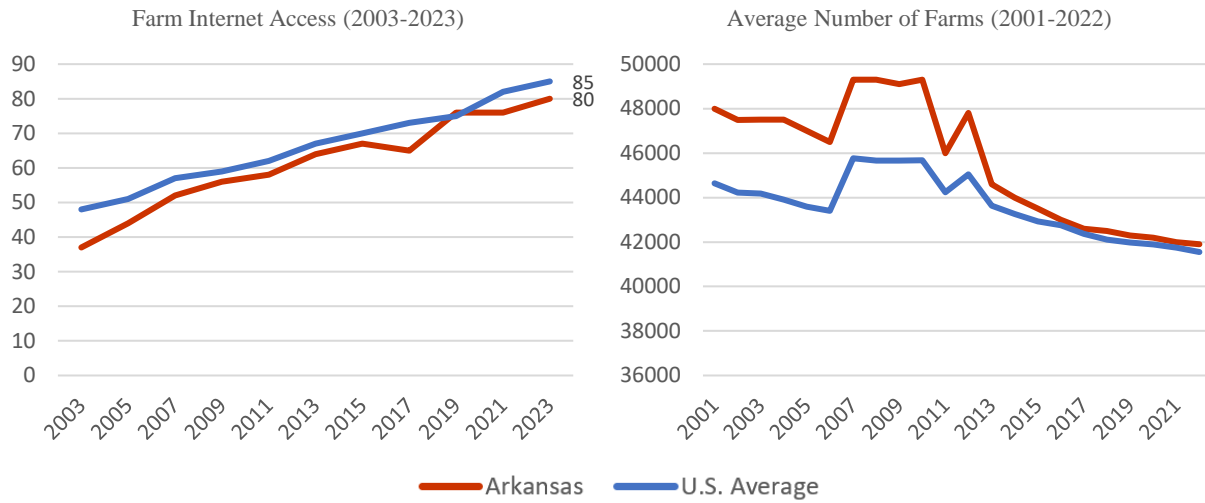
As we can see in Figure 2, the total number of U.S. farms has drastically decreased since peaking in 1935. However, the average farm size increased while the acres of land in farms stayed constant. This

reflects the integration or merger of small farmers into larger farms (Ahl, J., 2021; Robbins, O., 2023; Semuels, A., 2019). This reformatting of farmland in the United States emphasizes the importance of IT.

Accordingly, the growing importance of precision agriculture practices, such as GPS, drones, electronic tagging, precision feeding, and robotic milking, are becoming essential to monitor and control extensive land.

Figure 1. Farm Internet Access Rate and Average Number of Farms

Unit: %, ea



Source: USDA NASS (2003-2023), Technology Use (Farm Computer Usage and Ownership).

Figure 2. Number of Farms, Land in Farms, and Average acres per Farm in the U.S. (1850-2022)

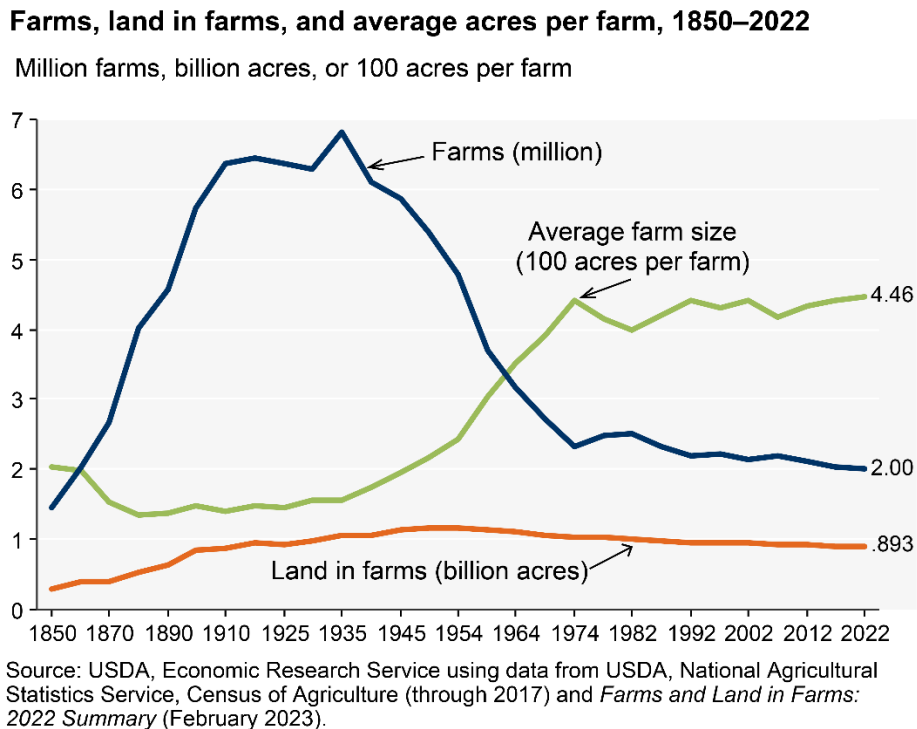


Figure 3 depicts an increasing trend of diverse technology usage for U.S. farms and the emergence of precision agriculture practices. While farms mostly use the internet for conducting business with non-agricultural websites, time series data reveals that the usage of other items is also gradually increasing.

In 2021, USDA added the Farm Precision Agriculture Practice survey to its [Technology Use \(Farm Computer Usage and Ownership\) Report](#) as a way to estimate demand for precision agriculture. The 2023 report shows precision agriculture technology is the third most popular IT usage.

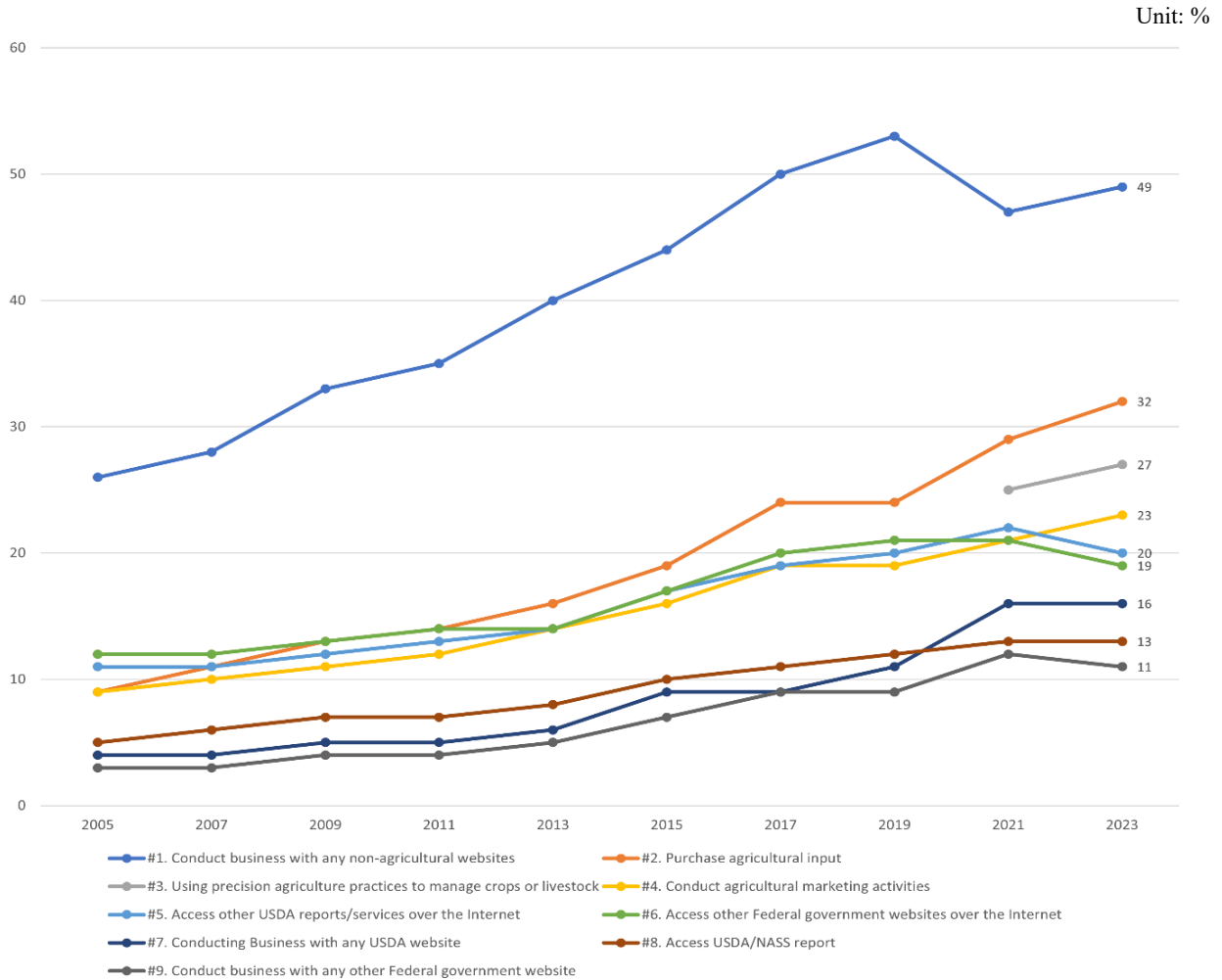
The report shows that farms with internet access use it to:

- Conduct business with any non-agricultural websites (49%)
- Purchase agricultural input (32%)
- Use precision agriculture practices to manage crops or livestock (27%)
- Conduct agricultural marketing activities (23%)
- Access other USDA reports/services over the Internet (20%)
- Access other Federal government websites over the Internet (19%)
- Conduct Business with any USDA website (16%)

- Access USDA/NASS report (13%)
- Conduct business with any other Federal government website (11%)

Therefore, we expect that increasing average farm size would accelerate the adoption of precision agriculture practices for U.S. farmers in order to manage and control larger farms.

Figure 3. U.S. Farms' Technology Use (2005-2023)



Source: USDA NASS (2005-2023), Technology Use (Farm Computer Usage and Ownership).

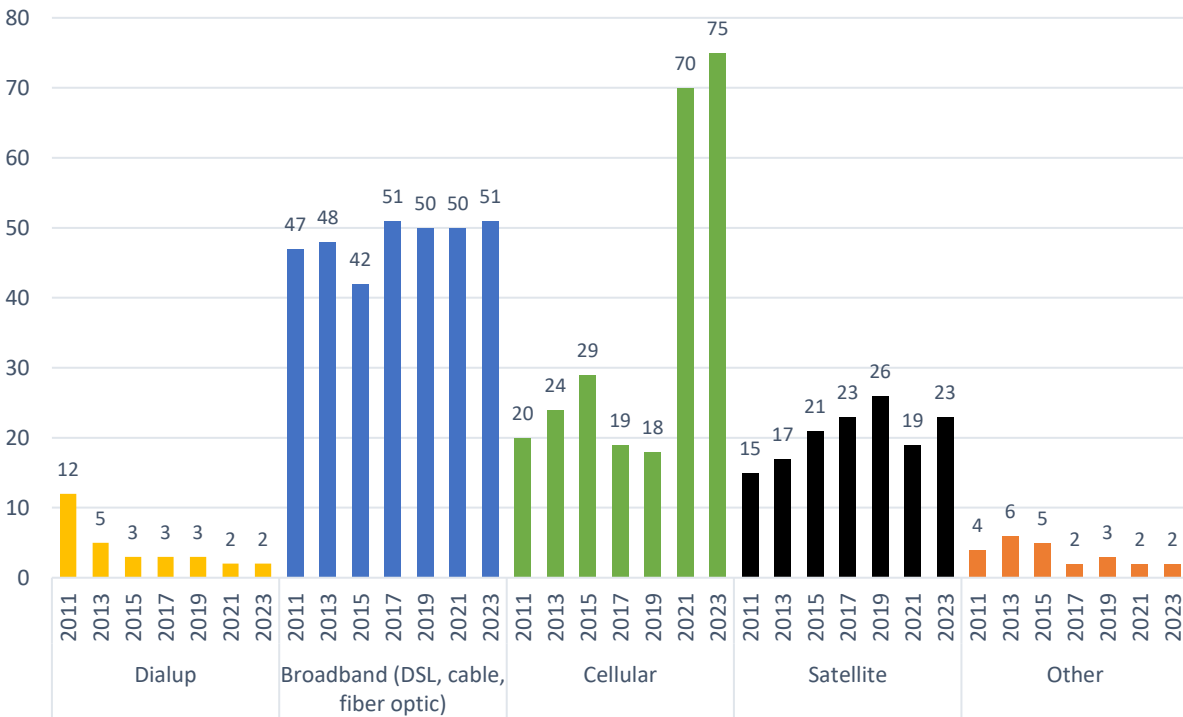
Lastly, Figure 4 shows the methods of farm internet access from 2011 to 2023. The use of dial up decreased from 2011 to 2023, while broadband and satellite use grew slowly. Cellular use increased from 20% in 2011 to 75% in 2023.

This survey item was originally focused on the “Primary Method of Internet Access” from 2011 to 2019, then it was replaced with “Methods of Internet Access” in 2021. Because of this shift, analyzing the trend of farm internet access methods from this figure may not be appropriate.

For example, the percentage of cellular data phone use drastically increased since the survey question was modified, while others mostly stayed constant. However, we can also assume that the increasing demand for precision agriculture will affect increasing mobile internet access (U.S. Federal Communications Commission, 2022). Therefore, we expect to see an upward trend in the importance of mobile connectivity as farms’ IT usage evolves.

Figure 4. Methods of Internet Access (2011-2023)

Unit: %



Source: USDA NASS (2011-2023), Technology Use (Farm Computer Usage and Ownership).

Note: The “Primary Method of Internet Access” survey item was replaced with “Methods of Internet Access” in 2021.

Arkansas Farmers are Actively Utilizing IT, Especially Government Information Services

Arkansas is leading the way in the development of farm internet access (Table 1). While the U.S. average farm internet access rate has increased by 77% since 2003, Arkansas has increased 116.2% and is now ranked as the seventh highest change in the United States. However, Arkansas' current internet access rate (80%) is still lower than the national average (85%), which suggests that more improvement remains.

Nevertheless, farm IT usage comparison results show that Arkansas farmers actively utilize IT for their business (Figure 5). Besides “*Conducting business with any non-agricultural website*,” Arkansas’ farm IT usage rates are generally higher than the U.S. average. In particular, the usage rates for “*Conduct business with USDA website*” and “*Conduct business with any other federal government website*” are noticeably higher than the U.S. average, which indicates that Arkansas farmers are actively participating in government business programs.

Table 1. The Top Ten States that Have the Highest Farm Internet Access Rate and the Percentage Changes (2003-2023)

Unit: %

Ranking	Highest Internet Access Rate (2023)	Most Increased States (from 2003 to 2023)
1st	New Hampshire*: 98	Georgia: 26 → 95 (+265.4)
2 nd	Utah: 97	Kentucky: 24 → 85 (+254.2)
3 rd	Idaho: 96	Mississippi: 29 → 80 (+175.9)
4 th	Georgia: 95	South Carolina: 35 → 83 (+137.1)
5 th	South Dakota: 93	Alabama: 39 → 86 (+120.5)
6 th	Montana: 93	Oklahoma: 39 → 85 (+117.9)
7 th	Kansas: 92	Arkansas: 37 → 80 (+116.2)
8 th	New Jersey: 92	South Dakota: 45 → 93 (+106.7)
9 th	Oregon: 92	Tennessee: 41 → 84 (+104.9)
10 th	Illinois: 91	Maryland ^{**} : 42 → 85 (+102.4)
U.S. Average ^{***}	85 (Arkansas is 80)	48 → 85 (+77.1)

Source: USDA NASS (2003-2023), Technology Use (Farm Computer Usage and Ownership).

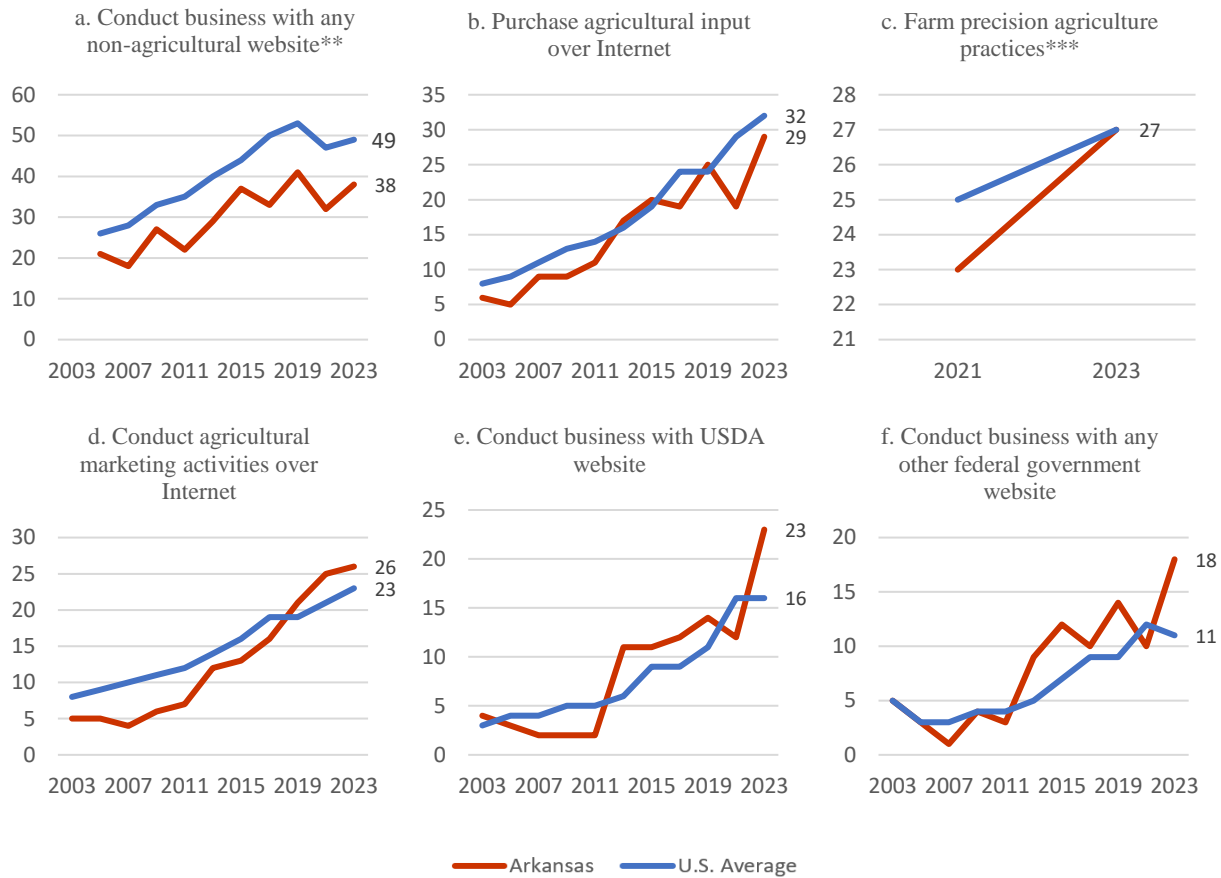
* Includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

** Includes Delaware and Maryland.

*** Excludes Alaska and Hawaii.

Figure 5. Farm IT Usage Comparisons Between Arkansas and the U.S. (2003-2023)*

Unit: %



Source: USDA NASS (2003-2023), Technology Use (Farm Computer Usage and Ownership).

* Three different survey categories, “Use of Internet,” “Conducting Business on the Internet,” and “Precision Agriculture Practices,” are included.

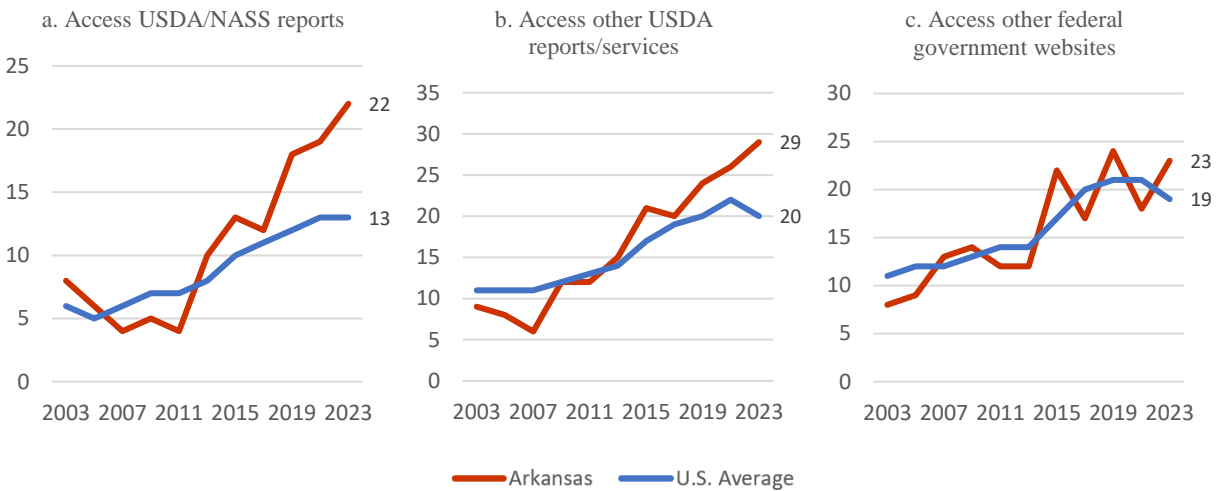
** 2003 data is excluded.

*** This item was added in 2021.

In addition, the comparisons of Internet access rates to government reports, services, and websites show that Arkansas farmers have distinctly higher access rates than the U.S. average (Figure 6). For example, the access rates for USDA/NASS reports and other USDA reports/services for Arkansas farmers are 22%, the fourth highest in the U.S., and 29%, the eighth highest in the U.S., respectively. Similarly, Arkansas farmers’ access rate to other federal government websites is 23%, while the national average is 19%. These reports/services provide unbiased information, such as market conditions, trends, price patterns, subsidy opportunities, etc., to the public. The comparison results suggest Arkansas farmers constructively utilize government services for decision-making, which is propitious for Arkansas agriculture.

Figure 6. Internet Access to Government Reports, Services, and Websites Comparisons Between Arkansas and the U.S. (2003-2023)

Unit: %



Source: USDA NASS (2003-2023), Technology Use (Farm Computer Usage and Ownership).

Implications for Arkansas Rural Development

The data reveals an emerging demand for precision agriculture practices based on the reformation of U.S. farms. Regardless of farm size, U.S. farmers have hesitated to adopt new technologies for various reasons, such as the high cost of technology, low willingness to pay, unclear Return on Investment (ROI), and high ROI expectations (Ahmad, A., 2022; Miller, D. 2023; Fiocco et al., 2023). However, the ongoing farm reformation has accelerated farmers to adopt advanced IT. In addition, lawmakers have been pushing grants for affordable precision agriculture practices (Panetta, J., 2023). Therefore, we expect to observe a steady increase in the adoption of precision agriculture practices for U.S. farmers.

Consequently, the emerging demand for precision agriculture practices presents a pertinent challenge for Arkansas agriculture. According to *HighSpeedInternet.com*, Arkansas has the 9th slowest internet speed nationwide, with median and average download speeds of 63.18Mbps and 140.81Mbps, respectively. Similarly, Arkansas has placed 45th in Broadband Subscription Rate, which affects the quality of remote work (U.S. News, 2023). Those below-average IT infrastructures may impede Arkansas farmers' adoption of precision agriculture practices in the future because precision agriculture practices require a quality Internet system for proper operation (Fowler, 2023). Therefore, maintaining and enhancing IT infrastructure in Arkansas is an essential task for Arkansas rural development.

Lastly, the data shows that Arkansas farmers are favorable towards government services and are actively involved in government-driven businesses, which is encouraging for both potential grant

programs of the ARConnect and extension education. For example, Arkansas farms' online marketing activities rate exceeded the national average in 2019 and has been continuously increasing (Figure 5). Accordingly, online marketing education programs, such as social media marketing (i.e. Search Engine Optimization strategy), marketing strategies (i.e. Marketing Mix or Storytelling techniques), or web design, would be welcome for those who conduct online marketing for their farm business. Similarly, introductory business programs for farms that seek new business opportunities, such as agritourism, farm-to-table restaurants, or agri-education, would also be beneficial for future extension education in order to expand Arkansas farmers' agribusinesses.

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APPENDIX - Example of Survey Questions

**U.S. Department of Agriculture – National Agricultural Statistics Service
2023 June Area Survey**

SECTION O - TECHNOLOGY USE

The next group of questions relates to the use of precision agriculture, computers, and the internet. These questions will help us measure trends and changes in the use of these technologies in farm and ranch businesses.

1. In the last 12 months, did this farm or ranch use precision agriculture practices to manage crops or livestock? This would include the use of global positioning (GPS) guidance systems, GPS yield monitoring and soil mapping, variable rate input applications, use of drones for scouting fields or monitoring livestock, electronic tagging, precision feeding, robotic milking, etc.

Yes No

2. For this farm or ranch, do you (operator or partner(s)) own or use any of the following types of computers?

a. Desktop or laptop..... Yes No

b. Smartphone..... Yes No

c. Tablet or other portable wireless computer..... Yes No

d. Some other type of computer, specify type: _____ Yes No

3. For this farm or ranch, have you (operator or partner(s)) had access to the internet in the last 12 months?

Yes, this operation has access to the internet.

No access to the internet either on the operation or at an operators residence, SKIP to Section P.

4. For this farm or ranch, in the last 12 months have you (operator or partner(s)) had access to the internet using a:

a. Cellular data plan for a smartphone or other mobile device?..... Yes No

b. Broadband (high speed) internet service (cable, fiber optic, DSL service)?..... Yes No

c. Satellite internet service?..... Yes No

d. Dial-up internet service?..... Yes No

e. Some other service, specify type:7661 _____ Yes No

5. For this farm or ranch, did you (operator or partner(s)) use the internet for any of the following in the last 12 months?

- a. Purchase agricultural inputs such as seed, fertilizer, chemicals, veterinarian supplies, feed, machinery, replacement parts, farm supplies, farm or ranch office equipment, etc.?..... Yes No
- b. Conduct agricultural marketing activities such as direct sales of commodities, on-line crop and livestock auctions, on-line market advisory services, commodity price tracking, etc.?..... Yes No
- c. Conduct any non-agricultural business such as making airline reservations?..... Yes No

6. For this farm or ranch, did you (operator or partner(s)) access the National Agricultural Statistics Service (NASS) website to review reports or research information in the last 12 months?

Yes No

7. For this farm or ranch, did you (operator or partner(s)) access United States Department of Agriculture (USDA) websites, excluding the NASS website, in the last 12 months:

- a. To review reports or research information?..... Yes No
- b. To conduct agricultural or farm business (USDA service center eForms, access your USDA customer statement, etc.)? Yes No

8. For this farm or ranch, did you (operator or partner(s)) access Federal government websites, excluding all USDA websites, in the last 12 months:

- a. For any reason?..... Yes No
- b. To conduct agricultural or farm business (Federal Disaster relief, etc.) ?..... Yes No

Accessed:

https://www.nass.usda.gov/Publications/Methodology_and_Data_Quality/Computer_Usage/08_2023/June%20Area%20Questionnaire.pdf