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Labor Use and Labor Challenges Faced by Small Fruit and Vegetable Farms: The Case of Tennessee

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Justin L. Cross

An Undergraduate Thesis Presented for
The Haslam Scholars Program and the
Smith Global Leadership Scholars Program
The University of Tennessee, Knoxville

**Labor Use and Labor Challenges Faced by Small Fruit and Vegetable Farms:
The Case of Tennessee**

Abstract:

United States (U.S.) fruit and vegetable farms depend heavily on labor for the production of the crops they grow and sell. In recent years, it has become increasingly difficult for farms to obtain the labor they need to produce their crops. Therefore, labor management strategies have become critical in determining the profitability and long-term sustainability of farms specializing in the production of fruits and vegetables. These strategies are even more significant for smaller farms that face resource constraints that inhibit their use of alternative labor sources (e.g., migrant workers) or their ability to reduce their reliance on labor through mechanization. Using secondary data from the U.S. Department of Labor and primary data collected through a survey of fruit and vegetable farms located in the middle and west Tennessee regions, this study investigates the use of labor, specifically the use of migrant labor through the H-2A guest worker program, the labor challenges faced, and the labor strategies used to address these challenges by Tennessee fruit and vegetable farms. Results suggest that the use of H-2A workers among Tennessee fruit and vegetable farms is low compared to other states due to farm size and farm-specific labor needs. The survey data suggest that the number of workers per farm increases with the size of the operation and that smaller farmers are more likely to rely on unpaid workers (e.g., family, volunteers) compared to larger operations. The majority of survey respondents indicated that difficulty finding reliable workers and failure to generate enough revenue to hire employees are the most important labor challenges they face. Among respondents, the most common labor management strategies used to address these challenges are the adoption of mechanized technologies and the decision to forego potential expansion plans.

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LABOR USE AND LABOR CHALLENGES FACED BY TENNESSEE FRUIT AND VEGETABLE PRODUCERS: BACKGROUND

Introduction

Most U.S. fruit and vegetable farms depend heavily on labor for planting, growing, and harvesting the crops. Expenses associated with wages, salaries, and contract labor can represent up to forty percent of the total variable costs for farms specializing in labor-intensive crops, like fruits and vegetables (USDA, ERS, 2018). Thus, labor management strategies are fundamental to ensuring the long-term sustainability of farms specializing in labor-intensive crops. In recent years, however, it has become increasingly difficult for farms to obtain the labor they need to produce their crops. Farmers aim to hire laborers for the lowest possible cost, and they first aim to do so in their local labor market (Yale-Loehr, 1987). However, these jobs are intensely physical in nature and generally offer lower wages compared to other industries, making them unappealing to most domestic workers (Calvin and Martin 2010; SARE, 2017). As a result, farmers look for alternative solutions to their labor needs, such as employing unauthorized laborers, participation in a federal guest worker program, mechanization of their production, transition to producing less labor-intensive crops, and scaling back their operations, among others (Charlton et al., 2019; Thompson and Blank, 2000; Bampasidou and Salassi, 2019).

However, some of these solutions are not feasible for all U.S. farmers, particularly small farms (i.e., those with gross sales between \$1,000 and \$250,000 per year (USDA Cooperative Extension Service, 2019)). First, some regions do not have unauthorized laborers in the local labor pool available to be hired, and hiring unauthorized laborers has legal consequences for the farm businesses. While there has not been evidence of a nationwide shortage of agricultural labor, there are likely localized areas that are undersupplied in available unauthorized workers,

referred to as spot labor shortages (Levine, 2010). Likewise, federal guest worker programs can be inaccessible due to the high costs associated with participation in them. For the H-2A program, a federal program that allows U.S. employers to bring non-immigrant foreign workers to the United States to fill temporary agricultural jobs, there are high costs due to recruitment, housing, and transportation (Roka, Farnsworth, Simmitt, 2017). Although the H-2A program could alleviate labor shortages in the agricultural sector, it is still unclear whether this program is the solution to the decreasing U.S. agricultural labor force (Bampasidou and Sallasi, 2019). Lastly, mechanization options for small farms may be limited due to high investment costs and because these options are not likely to fit small farm production systems.

In the short run, labor shortages for small fruit and vegetable farms become costly as, for example, fruit and vegetable crops must be harvested in a short interval, or they will be over-mature or rot in the field (Ribera and Knutson, 2013). Therefore, smaller farms are more vulnerable to the risks posed by intermittent or chronic labor shortages.

Information is limited about the labor challenges faced by small fruit and vegetable farms and the strategies these farms use to overcome these challenges. The purpose of this study is to explore the use of labor among small fruit and vegetable farms, the labor challenges faced by these farmers, and the labor management strategies they use to overcome these challenges. We will focus on the Tennessee case.

The next section discusses a theoretical framework that will help us understand labor issues associated with the agricultural sector in general. In this section, we discuss conditions specific to the agriculture industry that help us better understand the labor challenges faced by small-scale fruit and vegetable farms. The following section discusses U.S. farm labor and, specifically, the farm labor situation in Tennessee. Then, we discuss the H-2A guest worker

program, and the use of the H-2A program among Tennessee fruit and vegetable farmers. We conclude by presenting results from a survey of Tennessee fruit and vegetable farms administered in February 2020. This survey gathered information about the labor challenges faced and the strategies used by these farmers to overcome these challenges. In the last section, we conclude and share how these labor challenges may threaten the long-term sustainability of small fruit and vegetable operations.

Review of literature

Existing literature examining the labor management strategies used by fruit and vegetable producers has primarily focused on the use of these strategies among growers in the top fruit and vegetable producing states, such as California, Washington, and Florida. Additionally, existing literature on this topic has primarily evaluated the use of labor management strategies among large fruit and vegetable operations.

Bampasidou and Salassi (2019) analyze recent trends in the usage of the H-2A program and guest labor attainment among U.S. fruit and vegetable producers by examining national trends in H-2A applications, H2-A certifications, and offered wages. Using data from the Department of Labor and Census of Agriculture, this paper identifies three national trends in foreign labor usage: a decline in the number of farmworkers, a rise in real farm wages, and an increase in the usage of the H2-A program (Bampasidou and Salasi, 2019). These findings provide a context for the farm labor situation nationally, but they do not capture the use of the H2-A program across all U.S. regions. For example, Bampasidou and Salassi demonstrate the increase in H2-A applications annually between 2008 and 2018 on the national level; yet, over the same period, H2-A applications decreased from year-to-year three times in Tennessee (USDOL, OFLC, 2018). This, paired with the fact that there are no studies evaluating the use of

foreign labor among fruit and vegetable growers in the U.S. Southeastern region, excluding top fruit and vegetable producing states like Florida, implies a gap in the literature regarding the use of labor management strategies, particularly pertaining to foreign labor utilization, among small fruit and vegetable producers in this region.

Another gap in the literature exists for research analyzing labor management strategies for small fruit and vegetable operations. For example, Huffman (2012) considers mechanization as a potential solution to labor problems associated with the harvesting of fruits and vegetables. Huffman demonstrates how the adoption of the Johnson Tomato Harvester, a piece of farm equipment used in tomato production, has increased output substantially while decreasing labor dependency of tomato producers in California (Huffman, 2012). Yet, the cost of this harvester is over \$450,000, making it economically unfeasible for small operations to adopt this piece of equipment to reduce their labor needs. Current research fails to capture the mechanization strategies used among small farm operations.

Calvin and Martin (2010) demonstrate the relevance of the research presented in our study. In a crowded global market, U.S. fruit and vegetable producers are having an increasingly difficult time producing fruits and vegetables at competitive prices as labor costs increase. Mechanization has primarily been undertaken by larger operations, which could result in fewer and larger fruit and vegetable farm operations in the future (Calvin and Martin, 2010). At the same time, those who cannot mechanize are likely to face import threats as labor costs continue to rise (Calvin and Martin, 2010). These two trends threaten the long-term sustainability of small-sized farms if appropriate labor management strategies are not implemented. Existing literature does not offer extensive insight into what strategies are currently being implemented among these farms.

The farm labor problem

There are several defining characteristics of agricultural production that determine how labor economics principles apply to the understanding of farm labor supply and demand. First, agriculture production is largely seasonal in nature. Because of this, the demand for labor is largely seasonal, too. Labor is primarily needed during sowing and harvesting periods, which for most farms will only occur once or twice per year (Rudra and Biswas, 1973). While farms will require some labor throughout the growing period of a crop, sowing and harvesting periods mark the peak of labor demands (Rudra and Biswas, 1973). This seasonality in demand complicates labor attainment for producers, who have increasingly turned to foreign labor as American laborers move away from temporary, physical jobs (Martin, 1983). However, using foreign-born labor for seasonal jobs also presents challenges, as there are fewer working hours to spread the attainment costs across. A twelve-month manufacturing job, for example, may have upwards of 2,000 working hours to spread the total attainment costs across. A four-month seasonal agriculture job, on the other hand, may only have 700 total working hours to spread the total attainment costs across. Furthermore, since labor is primarily needed only during sowing and harvest periods, a producer may not have enough work to justify employing a seasonal laborer for the full four months. This causes migrant laborers to have to string together multiple jobs at multiple farms to remain employed during the lifetime of their guest worker visa (Martin, 1983). This task, too, becomes more difficult for agriculture as demand is difficult to aggregate. For farms located in the same region, they are likely to produce similar crops that will be sowed and harvested at similar times. This complicates aggregation since the labor demands coincide with each other. Producers and laborers alike struggle to coordinate arrangements whereby a worker

can string together multiple jobs to reach full-time employment for the full four months (Taylor and Charlton, 2018).

Another key characteristic that is unique to farm labor economics is the high risk associated with agricultural production. Uncertainty is high in agriculture, as farmers face high production risk and high market risk. Severe weather events, drastic price swings, and changes to geopolitical circumstances, among other risks, can affect the labor needs of producers. Additionally, agriculture is an extremely time-sensitive industry. Farmers may only have a period of days or weeks to harvest their crops before they over-mature or rot, and missing this window could be costly for the producers due to lost contracts and reduced income. The increased risk, uncertainty, and time sensitivity make hiring decisions more difficult for farmers (Martin, 2018).

Agricultural labor in the U.S. and TN

History of farm labor in the U.S.

The agriculture industry has faced significant changes in its labor circumstances. Since 1950, the share of agricultural labor supplied through family farmworkers has consistently decreased, with the number of self-employed and family farm workers declining from 7.6 million to 2.1 million between 1950 and 1990 (USDA, ERS, 2018). While this has caused the portion of agricultural labor supplied through hired farm labor to increase, the actual number of hired farm laborers has also decreased. There were over 2.3 million hired farm laborers in 1950, but only 1.2 million hired farm laborers as of 2016 – a fifty percent decrease (USDA, ERS, 2018). This decrease in the total agricultural workforce, from nearly 10 million workers in 1950

to just over 3 million workers in 2016, likely contributed to localized agricultural labor shortages across the nation (Levine, 2009).

The most widely implemented solution to these shortages has been the rollout of various federal guest worker programs. The first of these – the Bracero Program – was an agreement reached between the United States and Mexico in the wake of World War II that brought nearly 5 million Mexican workers into the U.S. agricultural labor supply (Bickerton, 2001). In the 1980s, the Immigration Reform and Control Act (IRCA) established the Special Agricultural Worker (SAW) Program and the Replenishment Agricultural Worker (RAW) Program. These programs added millions of more Mexican laborers to the U.S. agricultural labor workforce, and they established the foundation for what would later become the H-2A guest worker program (Martin, 1994). However, as SAW and RAW programs concluded and immigration control has tightened since the 1990s, the percentage of the agricultural workforce made up of newcomer migrant laborers, those who have not previously been a part of the U.S. agricultural workforce, has decreased. In 1999, newcomer migrant workers represented 22.3% of hired farmworkers; by 2016, newcomer migrant labor only comprised 3% of the total hired farm workforce (USDA, ERS, 2018).

Meanwhile, as the number of newcomer migrant workers has decreased, the existing farm labor workforce – both migrant laborers who have settled in the U.S. and native-born farmworkers – are aging (USDA, ERS, 2018). The average age of foreign-born workers is increasing, as the large majority of hired farm labor (nearly 80%) is made up of migrant laborers who have lived in the U.S. for over 10 years (USDA, NASS, 2017). Foreign-born farm laborers have, on average, lived in the U.S. for 18 years (USDA, NASS, 2017). The increasing age of the

total farm workforce is alarming, as laborers age out of the labor supply and the percentage of newcomer migrant labor decreases.

Combined, these conditions have decreased the total agricultural labor supply. As more workers exit the agricultural workforce than enter it, U.S. producers will have increasing difficulty fulfilling their labor needs, particularly as non-farm wages significantly exceed farm wages (USDA, ERS, 2018).

The H-2A Program

The H-2A program “allows U.S. employers or U.S. agents who meet specific regulatory requirements to bring foreign nationals to the United States to fill temporary agricultural jobs” (USDHS, USCIS, 2019). The H-2A program authorizes legal resident status to foreign-born individuals on a temporary basis, and the usual term for H-2A authorization is twelve months. An extension may be requested for stays beyond twelve months, and authorizations do not exceed three years (Yale-Loehr, 1987).

To qualify for H-2A labor, employers must first prove that there are no local workers willing to fill the desired position and that filling the position with a foreign-born worker will not have adverse effects on the wages of existing farmworkers (Yale-Loehr, 1986). To prevent adverse effects on current workers, IRCA requires that farmers pay H-2A guest workers an hourly adverse effect wage rate- AEW (Yale-Loehr, 1986). The 2019 U.S. average AEW was \$12.96 per hour (USDOL, ETA, 2019). Additionally, producers obtaining workers through the H-2A program must cover all costs associated with the guest workers’ stay, including transportation costs, housing costs, and the provision of benefits (Roka, Farnsworth, and Simnitt, 2012). On top of these stated costs, there are several indirect costs associated with obtaining H-

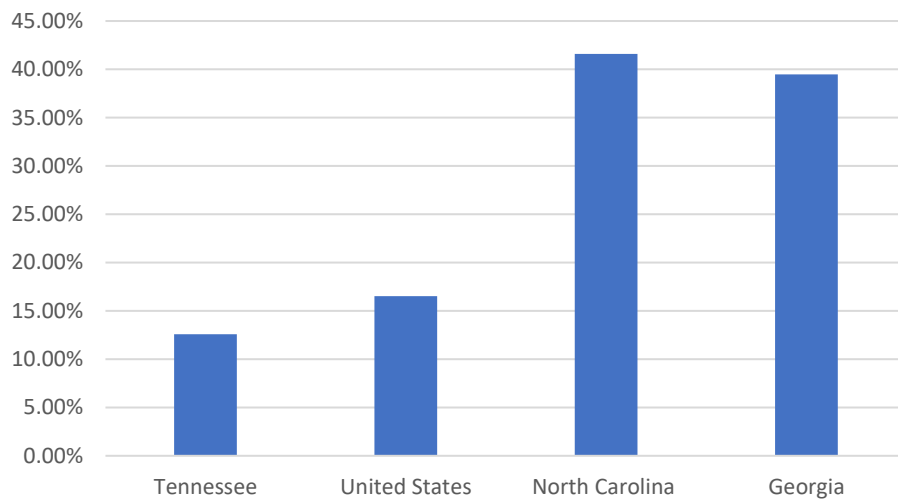
2A labor, including: recruitment and training costs, application and filing costs, and the provision of guaranteed minimum contract hours (Roka, Farnsworth, and Simnitt, 2012).

The role of the H-2A Program in Tennessee agriculture

According to the U.S. Department of Labor, the demand for H-2A guest workers has steadily increased since 2011. In 2011, there were 90,420 H-2A guest workers requested, while there were 262,736 guest workers requested in 2018 (US DOL 2018). This represents a 191% increase in total demand nationwide for H-2A guest laborers. Several factors have driven this increased demand. Chiefly, the number of undocumented migrants entering the U.S. has decreased since it reached its peak in 2007 (Luckstead and Devadoss, 2019). This decrease can be attributed to the Great Recession and increased enforcement actions against undocumented migrants by both the U.S. Border Patrol and U.S. Immigration and Customs Patrol (Luckstead and Devadoss, 2019).

While the H-2A program plays an increasingly vital role in the U.S. agricultural industry overall, its role in Tennessee agriculture is less pronounced, specifically in the production of fruits and vegetables. Of the 262,736 total H-2A laborers requested nationwide in 2018, only 3,673 were requested by Tennessee-based farm operators (USDOL, 2018). This represents less than 1.4% of the total guest workers requested nationwide. Furthermore, only about 804 were requested by farm operators to work on fruit and vegetable producing farms (USDOL, 2018). The percentage of total farm laborers that are migrant workers is lower in Tennessee when compared to the national average and the most H-2A-dependant states (Figure 1). Only 12.57% of Tennessee's total farm laborers were migrant laborers (USDA, NASS, 2017). This is 3.94% lower than the national average of 16.51% of the total farm workforce being migrant laborers.

Tennessee’s lower relative dependence on foreign-born labor is even more apparent when compared to North Carolina and Georgia, two of the states with the highest number of H-2A workers certified annually. Migrant laborers comprised 41.58% of North Carolina’s total farm workforce and 39.47% of Georgia’s total farm workforce. This shows how Tennessee farm operators are not as dependent on migrant labor as some of its southeastern counterparts, but also suggest a lower production of labor-intensive crops in Tennessee. For example, according to the 2017 Census of Agriculture, while Georgia and North Carolina have more than 100,000 acres in vegetable production, Tennessee has less than 30,000 acres in vegetable production (USDA, NASS, 2017).

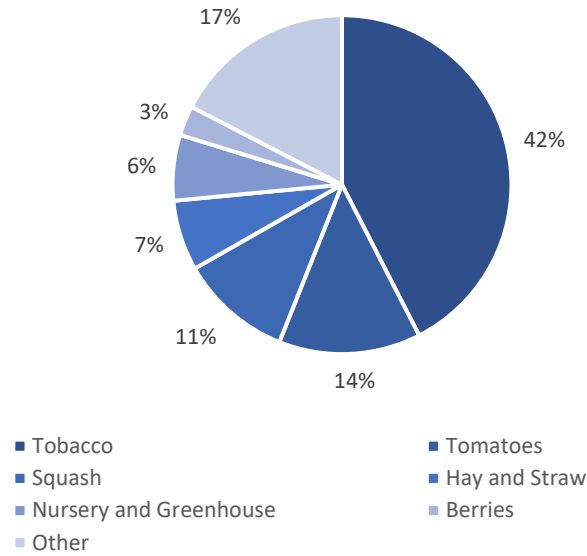


Source: USDA/NASS 2017 Census of Agriculture

Figure 1. Percentage of Total Farm Workforce Comprised of Migrant Laborers, 2018

The primary industries employing migrant labor also deviate from the norm in Tennessee. Nationally, most H-2A laborers are employed on fruit, vegetable, and dairy operations (Luckstead and Devadoss, 2019). However, in Tennessee, the top farm businesses employing H-2A laborers are tobacco farms (USDOL, 2018). Employing 1,560 of Tennessee’s

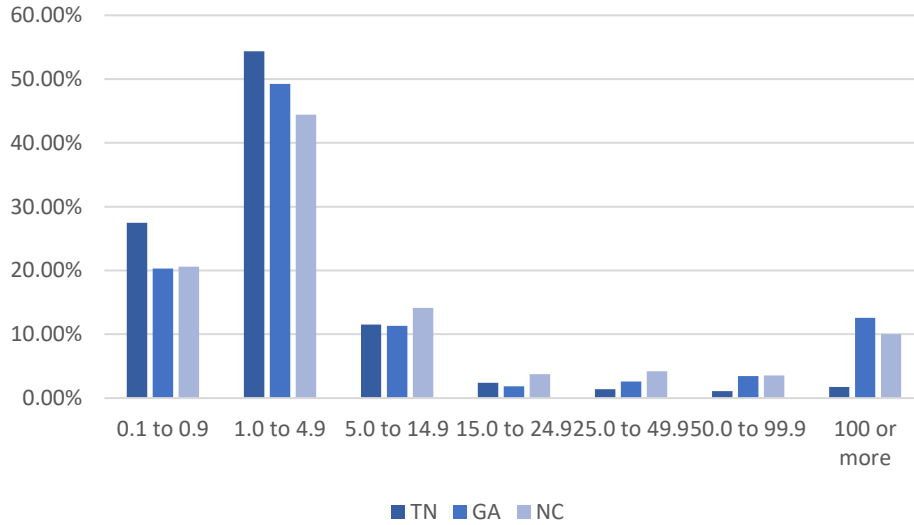
total 3,673 certified H-2A guest workers, the tobacco industry is the most dependent on migrant labor and accounts for over 42% of H-2A worker certifications in the state (Figure 2).



Source: USDA/NASS 2017 Census of Agriculture

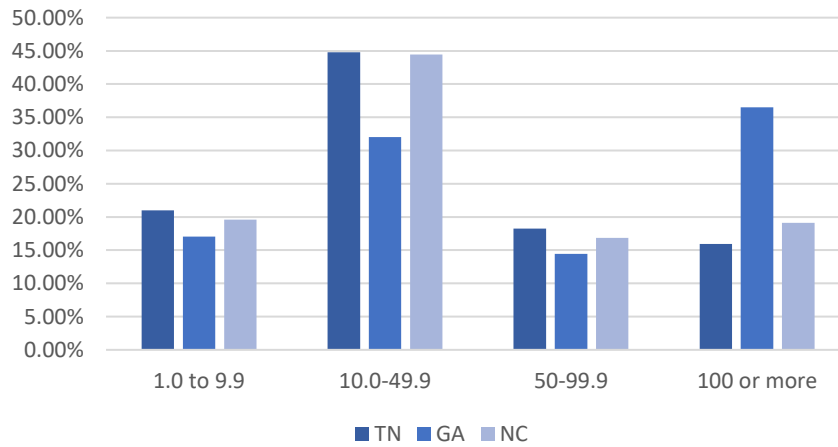
Figure 2. TN H-2A Guest Workers Certified by Primary Crop, 2018

Potential reasons for the relatively low use of H2-A workers among Tennessee growers, specifically fruit and vegetable operations, is the size of operations in Tennessee compared to the average size of operations in North Carolina and Georgia. According to the 2017 Census of Agriculture, in Georgia and North Carolina, the share of fruit and vegetable operations that are below 50 acres is less than it is in Tennessee (Figures 3 and 4). Likewise, North Carolina and Georgia have a significantly larger percentage of fruit and vegetable operations that have 100 acres or more in production (Figures 3 and 4).



Source: USDA/NASS 2017 Census of Agriculture

Figure 3. Percentage of farms in each farm size category based on acres in vegetable production



Source: USDA/NASS 2017 Census of Agriculture

Figure 4. Percentage of farms in each farm size category based on acres in fruit and nut production

Table 1 shows the breakdown of H2-A certifications based on the crop produced among some of the highest H2-A requesting states, as well as for Tennessee, Louisiana and Kentucky. This data confirms that among the states with the highest H2-A certified workers, fruit and vegetable operations are the primary requesters of foreign labor. In Tennessee, on the other hand, tobacco operations are the highest recipients of H2-A certified guest workers. This is also the case in North Carolina and Kentucky. This reveals that the usage rate of H2-A labor among fruit and vegetable producers in the mid-South is lower compared to states that have larger fruit and vegetable industries. Whereas fruit and vegetable operations account for over 53% of all H2-A guest worker certifications nationally, fruit and vegetable operations only account for 33% of all certified H2-A guest workers in Tennessee.

Table 1. Occupations of Certified Guest Workers in Selected States, 2018

Type of Work	US	FL	NC	WA	GA	CA	KY	LA	TN
Fruits and Nuts	77,503	18,020	5,402	16,591	10,130	8,435	70	309	551
Vegetables Grains & Row Crops (excl. Tobacco)	59,118	9,987	2,198	297	14,625	8,907	161	1,481	733
Tobacco	23,591	4,470	942	474	1,064	671	435	4,360	345
Tobacco	27,998	591	17,709	-	247	51	6,013	-	1,619
Meat & Dairy Crawfish & Seafood	5,344	15	3	23	6	420	218	114	59
Other	2,117	9	-	5	3	-	-	1,787	-
Other	62,157	11,308	4,597	10,588	789	2,192	672	1,457	493

Source: USDA/NASS 2017 Census of Agriculture

LABOR USE AND LABOR CHALLENGES FACED BY TENNESSEE FRUIT AND VEGETABLE PRODUCERS: THE SURVEY

Methodology

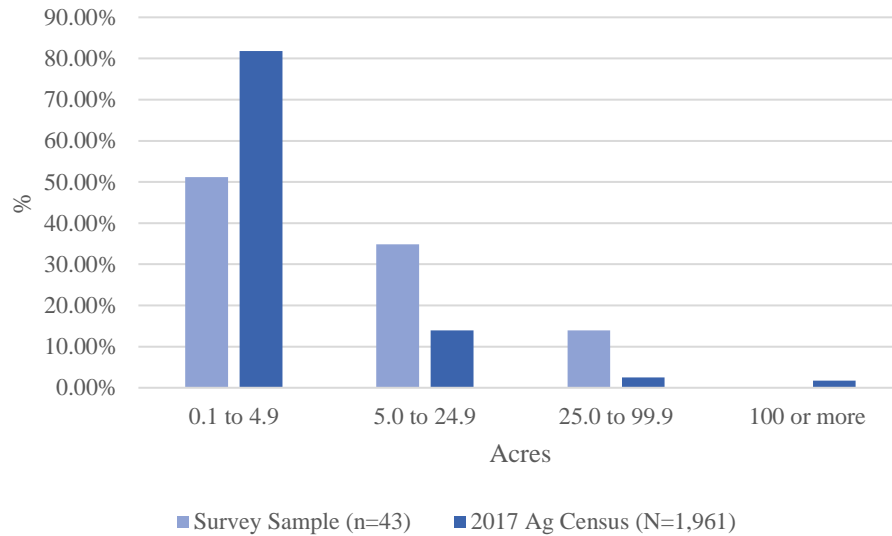
A survey of Tennessee fruit and vegetable growers was administered between February 1 and February 20, 2020. The survey instrument was approved by the University of Tennessee Institutional Review Board (IRB) (UTK IRB-19-05570-XM). The survey was Web-based and was administered through Qualtrics. The survey was initially distributed on February 1, 2020 to individuals in a contact list made available by the Tennessee Department of Agriculture. The survey was only sent to fruit and vegetable producers in the middle and west Tennessee regions. Farmers from the east Tennessee region were excluded from the distribution of this survey because there was a survey of these growers being distributed at the same time as part of a research funded project focusing on the use of market outlets with a food justice mission. The inclusion of these farmers would have threatened the response rate of the abovementioned survey. Participation in the survey was voluntary, and no incentives were offered for participation. Following the tailored design method (Dillman, Smyth, and Christian, 2009), reminder emails were sent on February 5, 12, and 20, 2020.

The survey included 22 questions. The estimated time of completion of the survey was 15 to 22 minutes. Survey questions were associated with respondent perceptions of farm labor availability for their farm in 2019, labor challenges they faced, strategies used to overcome those challenges, information needs related to farm labor, current labor use, and familiarity with and use of the H-2A program. Additionally, the survey instrument included questions to elicit general farmer and farm business characteristics, such as acres in fruit and vegetable production, farm revenue, farming experience, age, occupation, household size, and education.

The contact list was provided by the Tennessee Department of Agriculture and included farmers with farm operations located in middle and west Tennessee who participated in 2018 in either a program that aims to assist Tennessee farmers in marketing (i.e., Pick Tennessee Products) or a program that provides cost-share for farm improvements (i.e., Tennessee Ag Enhancement). The final contact list after removing duplicate email and incorrect email addresses included 464 fruit and vegetable farmers. From this initial list, five farmers indicated they do not farm or that they do not operate a fruit and vegetable farm. There were 47 completed surveys, representing a survey response rate of 10%.

We evaluated the representativeness of the survey sample by comparing the distribution of the survey sample based on acres in vegetable production to the distribution of Tennessee vegetable farms by farm size category in terms of vegetable acres in production based on the 2017 Census of Agriculture data (USDA, NASS, 2017). The 2017 Census of Agriculture reports acres in vegetable, fruit and nuts, and berry production, separately, and does not report the number of farms by size for fruit and nuts, and berry farms. Therefore, the distribution of Tennessee vegetable farms by farm size category is the best data available to evaluate the representativeness of the survey sample.

A 2019 survey of Tennessee fruit and vegetable farmers focusing on the use of plastic mulch among these growers indicated that a large percentage of the respondents stated growing vegetables or fruits and vegetables (Velandia et al., 2020). Our survey instrument did not allow us to identify this information, but we assume our sample is likely to have similarities with the 2019 survey sample (Velandia et al., 2020). Similar to Velandia et al. (2020), we assume acres in vegetable production to be a good basis for comparison.



Source: USDA/NASS 2017 Census of Agriculture

Figure 5. Percentage of farms in each farm size category based on acres in vegetable production according to the 2017 Census of Agriculture data (USDA, 2019) and based on the average acres in fruit and vegetable production in 2018 and 2019 according to data from the 2020 survey of Tennessee fruit and vegetable farmers

As shown in Figure 5, the survey sample tends to overrepresent larger operations (i.e., 5 to 99.9 acres), and underrepresent farms with reported acres in vegetable production below 5 acres.

Compared to the 2017 Ag Census, the percentage of survey respondents with 5 to 24.9 acres in vegetable production was 23% higher, and the percentage of survey respondents reporting between 25 and 99.9 acres in vegetable production was 11% higher than the percentage of vegetable farms in these size categories according to the 2017 Census of Agriculture (USDA, NASS, 2017).

Survey results

Farmer and farm business characteristics

Respondents to the survey were 57 years old, on average, and had an average of 21 years of farming experience. Approximately 45% of respondents indicated having a four-year college

degree. The average farm size was 8.5 acres, which is slightly below the average size of vegetable operations in Tennessee (12.5 acres) and well above the average size of fruit and nut operations in Tennessee (2.9 acres), according to data from the 2017 Census of Agriculture (USDA, NASS, 2017). Approximately 52% of survey respondents reported on-farm revenue of less than \$25,000. Less than half of respondents, 46%, indicated that farming is their full-time profession. Finally, about 60% of the survey sample reported being a one- to two-person household.

Table 2. Summary statistics for selected variables in the survey sample

	n	Mean	Std dev	Min	Max
Age – Age in years	45	57.02	13.77	25	82
Experience farming (years)	45	21.18	15.88	2	50
Education					
High school diploma or equivalent = 1 if a farmer has a high school diploma or equivalent	47	0.09		1	0
Some college, but no degree = 1 if a farmer has a some college, but no degree	47	0.13		1	0
2-year college or technical degree = 1 if a farmer has a 2-year college or technical degree	47	0.11		1	0
4-year college degree = 1 if a farmer has a 4-year college degree	47	0.45		1	0
Some graduate school = 1 if a farmer has a some graduate school	47	0.06		1	0
Graduate degree = 1 if a farmer has a graduate degree	47	0.13		1	0
Other = 1 if a farmer selected this option for level of education	47	0.04		1	0
Farm Size_F&V^y – Acres in fruit and vegetable production	43	8.51	12.20	0.07	50
Farming f&v revenue below \$25k = 1 if 2019 gross on-farm revenue from f&v sales is below \$25,000	44	0.52		0	1
Full-time farmer = 1 if a farmer is a full-time farmer	46	0.46		0	1
Employed full-time off the farm = 1 if a farmer is employed full-time off the farm	46	0.20		0	1
Employed part-time off the farm = 1 if a farmer is employed part-time off the farm	46	0.13		0	1

Table 2. Summary statistics for selected variables in the survey sample (continuation)

	n	Mean	Std dev	Min	Max
Retired and farming part-time = 1 if a farmer is retired and farming part-time off the farm	46	0.13		0	1
Prefer not to disclose = 1 if a farmer marked the no disclosure option	46	0.09		0	1
One to two people in household = 1 if 1 or 2 people are reported living in household	47	0.60		1	0
More than two people in household = 1 if 3 or more people are reported living in household	47	0.40		1	0

Labor use, labor challenges, and labor strategies to overcome these challenges

Survey respondents indicated they employed an average of 9 workers in 2019 for the production of fruits and vegetables. Farms with acres in fruit and vegetable production between 25 and 100 acres employed about twice as many workers as those farms with less than 5 acres in fruit and vegetable production. The average number of hired farmworkers for the survey sample was 4.3, with farms between 25 and 100 acres in size employing over seven times as many hired farm workers as farms smaller than 5 acres in size. The survey results indicate that those farms with less than 25 acres in fruit and vegetable production were more likely to employ unpaid workers like family members and volunteers. Survey respondents, reporting less than 25 acres in fruit and vegetable production, employed, on average, one unpaid worker in 2019.

The survey results associated with the use of contract labor are surprising, as contract labor could be expensive because an intermediary (i.e., farm contractor) is used to hire the workers. Therefore, it is surprising that only farms with less than 5 acres in vegetable production were the ones reporting the use of contract labor. We suspect that survey respondents could have been confused by the term “contract labor”. Also, the averages reported in Table 3 for contract

labor, are affected by the number of zeros in the sample, and that explains why the calculated average for the whole sample is smaller than the average for the farms between 0.1 and 5 acres.

Survey respondents in the 0.1- and 5-acres category, reported employing anywhere between one and five contract workers.

Table 3. Average paid and unpaid number of workers involved in the production of fruits and vegetables in 2019, as reported by the respondents to the 2020 Tennessee fruit and vegetable survey.

	Sample	Farm size in acres		
		0.1 to 4.9	5.0 to 24.9	25.0 to 99.9
Total workers	8.72	7.09	8.47	15.33
Hired labor	4.30	1.68	4.93	12.33
Contract labor (workers indirectly hired through farm labor contractors)	0.28	0.55	0.00	0.00
Paid family labor	1.07	0.82	0.80	2.67
Paid interns	0.00	0.00	0.00	0.00
Unpaid family labor	1.16	1.23	1.40	0.33
Volunteers	0.91	0.86	1.33	0.00
Others	1.00	1.95	0.00	0.00

Slightly over half of all respondents (53.2%) indicate that they definitely or probably had enough labor to operate their farms in 2019. Approximately 17% of respondents indicate uncertainty about the sufficiency of their labor to operate their farms, indicating that they might or might not have had enough labor in 2019. Nearly 30% of respondents indicate that they probably or definitely did not have enough labor in 2019 to operate their farms.

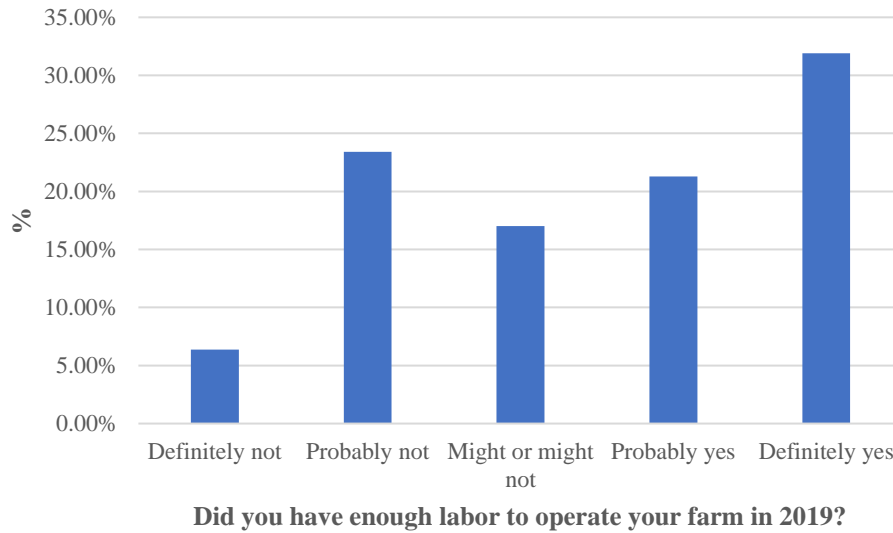


Figure 6. Survey respondents’ answer to the question, “Did you have enough labor to operate your farm in 2019?” (n=47)

The top reported labor challenges among respondents were difficulty finding employees, particularly reliable and/or productive employees, and inability to generate enough revenue to hire employees. Over 61% of respondents indicate that they do not feel like they can find reliable and/or productive employees. Nearly a third of respondents (31.9%) stated that they do not generate enough revenue to hire employees.

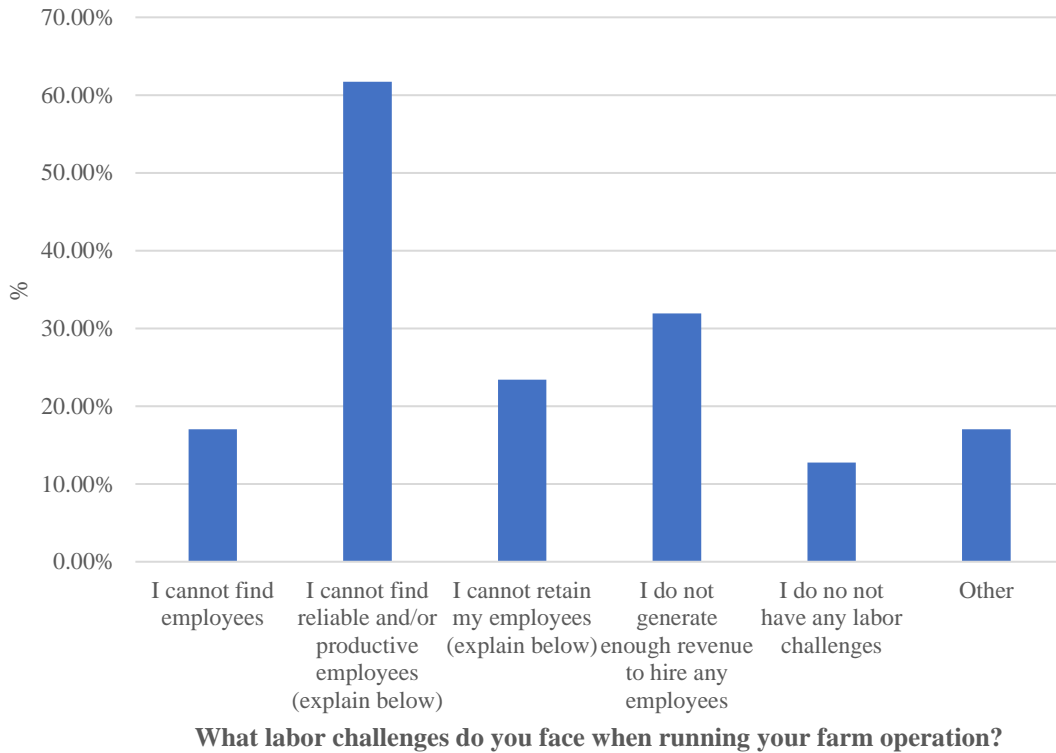


Figure 7. Survey respondents’ answer to the question, “What labor challenges do you face when running your farm operation?” (n=47)

Respondents indicate that a variety of decisions have been made to mitigate challenges associated with obtaining labor. Among these strategies, the most common decisions were placing expansion plans on hold, which 38.6% of respondents report doing, and adopting mechanized technologies, which 34% of respondents report doing. Over 27% of respondents admit that they have had to scale back their operations. The decisions to forego otherwise-feasible expansions and scale back operations could reflect inefficiencies occurring due to labor challenges. In these situations, ongoing labor challenges may be resulting in lost productivity, lost revenue, and lost economic activity. Approximately 31.8% of respondents report that they have used some other strategy to address labor challenges, including the addition of a You-Pick

operation, paying by the task (instead of per hour), and providing room and board to recruit employees.

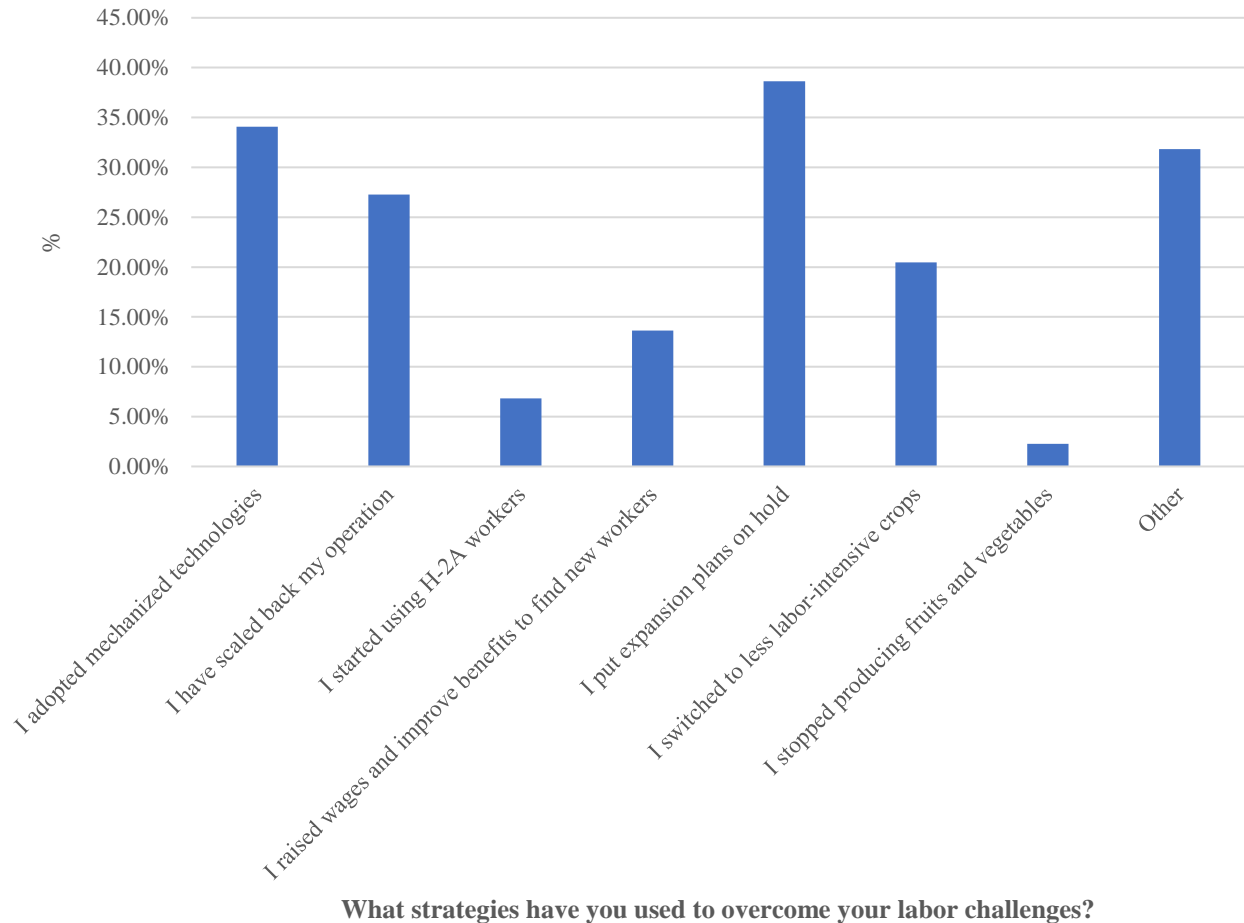


Figure 8. Survey respondents’ answer to the question, “What strategies have you used to overcome your labor challenges?” (n=44)

Familiarity with and use of the H-2A program

Figures 9 and 10 illustrate respondents’ familiarity with the H2-A program and usage rate of the program among the survey sample. Nearly half of respondents (48.9%) report having no

familiarity with the H2-A program, while 37.8% report some level of familiarity with the program. Only 13.3% of respondents describe themselves as “very familiar” with the H2-A program. It follows, therefore, that very few of the respondents report utilizing H2-A labor. Only 6.7% of respondents report having H2-A workers on their operation’s payroll in 2019.

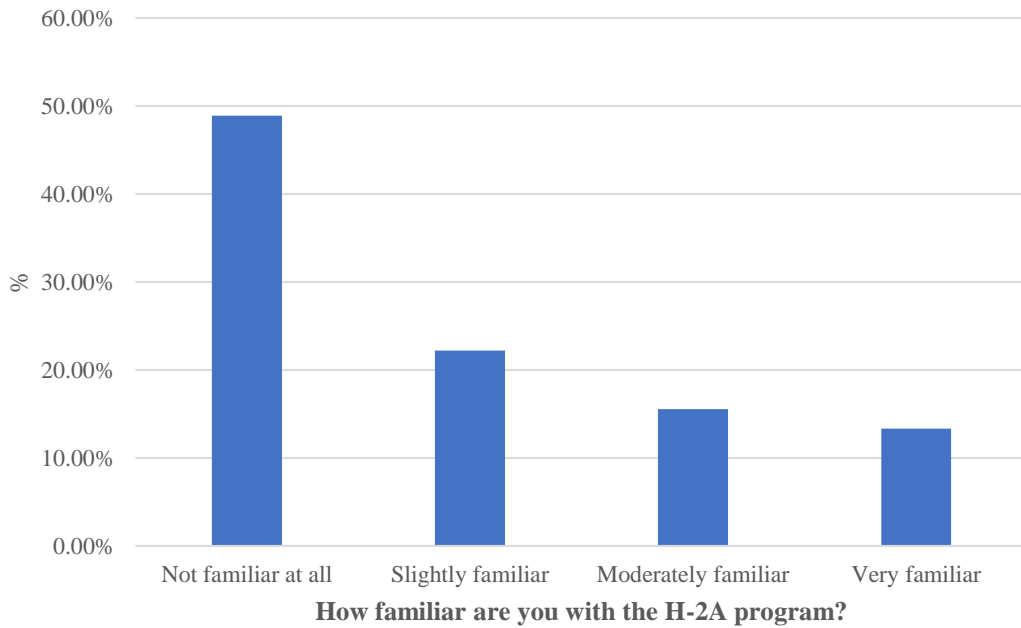


Figure 9. Survey respondents’ answer to the question, “How familiar are you with the H-2A program?” (n=45)

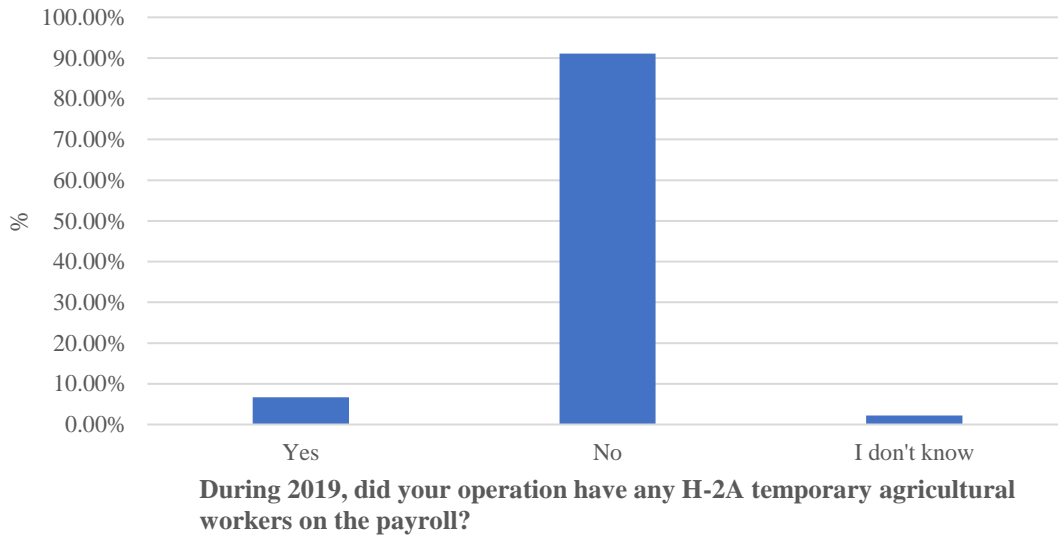
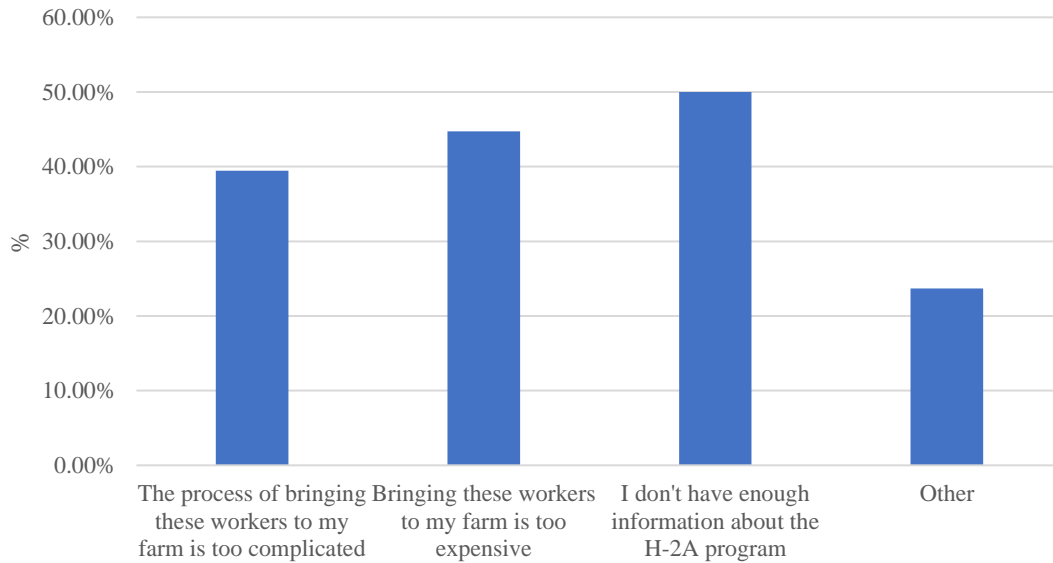


Figure 10. Survey respondents’ answer to the question, “During 2019, did your operation have any H2-A temporary agricultural workers on the payroll?” (n=45)

Given the low reported utilization rate of the H2-A program, it was important to understand the challenges producers perceive to be associated with using the program. Half of respondents (50%) state that they do not have enough information about the H2-A program, 44.7% report that obtaining H2-A labor is too costly, and 39.5% feel that the process of obtaining H2-A labor is too complicated. Among the “Other” responses, which 23.7% of respondents selected, producers report that they cannot offer enough hours to justify obtaining H2-A labor and that they are concerned about annual wage increases – likely due to established adverse effect wage rates.

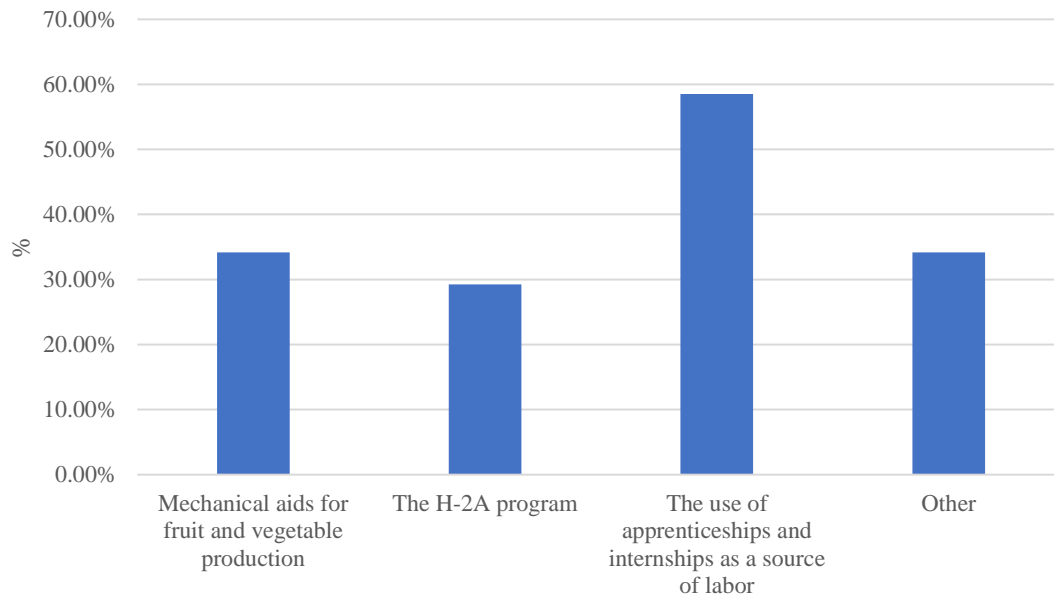


What are the major challenges associated with the use of H-2A temporary agricultural workers on your farm?

Figure 11. Survey respondents’ answer to the question, “What are the major challenges associated with the use of H-2A temporary agricultural workers on your farm?” (n=38)

Information respondents need to overcome labor challenges

Respondents indicate that they are most interested in receiving additional information from the University of Tennessee regarding the use of internships and apprenticeships as a source of potential labor – 58.5% of respondents expressed interest in receiving information on this subject. More than a third – 34.1% – of respondents feel they could better address labor challenges if they had more information on using mechanical aids for fruit and vegetable production.



What information could the University of Tennessee provide you to help you overcome the labor challenges you are currently facing?

Figure 12. Survey respondents’ answers to the question “What information could the University of Tennessee provide you to help you overcome the labor challenges you are currently facing?” (n=44)

Conclusions

This study analyzes the unique labor challenges of small-sized fruit and vegetable producers in Tennessee. Specifically, this paper presents the top concerns expressed among a selected group of fruit and vegetable producers in Tennessee and outlines the labor management strategies these producers are implementing to address these challenges.

The results indicate that difficulty finding reliable workers and the inability to generate enough revenue to afford workers are the top labor challenges faced by Tennessee fruit and vegetable producers. The most common solutions to these challenges are to forego otherwise-feasible expansion opportunities or adopt mechanical aids to reduce labor dependency. Unlike

other states, Tennessee fruit and vegetable producers are unlikely to turn to H2-A foreign guest labor, as evidenced by the very small percentage of respondents who reported having used H2-A labor in 2019. The top concerns producers report having about H2-A labor are unfamiliarity with the program and high costs of participating in it. Furthermore, results demonstrate that, on average, the number of workers employed increases with the size of the operation. This does not occur across-the-board, however, as some respondents of similar sized farms reported employing significantly different numbers of hired workers and total laborers. Lastly, the survey results show that small farms depend more on unpaid labor compared to larger farms.

As labor costs continue to rise, and they represent a growing share of the total cost of production for fruits and vegetables, producers will face an increasing threat from imported produce competition. Producers will need to adopt mechanization and labor management strategies that enable them to lower the costs of labor and reduce the costs associated with the production of fruit and vegetable crops to remain competitive. This is particularly difficult for small farms, as they struggle to locate necessary labor and have difficulty turning to mechanization due to capital constraints, as evidenced by the results of this research. Ultimately, the long-term sustainability of small-sized fruit and vegetable operations may be in jeopardy if producers are not able to address the labor challenges discussed in this study.

The survey respondents to the 2020 Tennessee fruit and vegetable survey believe the University of Tennessee (UT) could help them overcome labor challenges by providing them with information about the use of apprentices and interns as a source of labor, and the use of mechanical aids in the production of fruit and vegetables. Currently, UT does not have educational programs addressing these needs, and therefore, should consider developing such educational programs.

References

- Bampasidou, M., & Salassi, M. E. (2019). Trends in U.S. farm labor and H-2A hired labor. *Choices*, 34(1), 1-6.
- Calvin, L., & Martin, P. L. (2010). *Labor-intensive U.S. fruit and vegetable industry competes in a global market*. Amber Waves, U.S. Department of Agriculture, Economic Research Service. (pp. 24-31).
- Charlton, D., Taylor, J. E., Vougioukas, S., & Rutledge, Z. (2019). Can wages rise quickly enough to keep workers in the fields? *Choices*, 34(2), 1-7.
- Dillman, D.A., Smyth J.D., & Christian, L.M. (2009). Internet, mail, and mixed-mode surveys. The tailored design method. Wiley, Hoboken, NJ.
- Hertz, T., & Zahniser, S. (2013). Is there a farm labor shortage? *American Journal of Agricultural Economics*, 95(2), 476-481.
- Huffman, W.E (2012) The status of labor-saving mechanization in U.S. fruit and vegetable harvesting. *Choices*, 27(2), 1-7.
- Levine, L. (2009). The effects on U.S. farm workers of an agricultural guest worker program. *CRS Report for Congress No. 95-712*, Congressional Research Service, Library of Congress.
- Luckstead, J. & Devadoss, S. (2019). The importance of H-2A guest workers in agriculture. *Choices*, 34(1), 1-8.
- Martin, P. (1983). Labor-intensive agriculture. *Scientific American*, Vol. 249, No. 4 (October 1983), pp. 54-59.
- Martin, P. (1994). Good intentions gone awry: IRCA and U.S. agriculture. *The Annals of the American Academy of Political and Social Science*, 534(1), 44-57.
- Martin, P. (2002). Does the U.S. need a new Bracero Program? *UC Davis Journal of International Law & Policy*, 9, 127.
- Martin, P. (2018). Agriculture and international labor flows: Agricultural and business conditions, tenth federal reserve district. *Economic Review - Federal Reserve Bank of Kansas City*, 55-74.
- Ribera, L., & Knutson, R. (2013). Labor issues in agriculture. *2013 Risk Publication Series*. Washington, DC: United States Department of Agriculture – National Institute of Food and Agriculture.
- Roka, F., Farnsworth, D., & Simnitt, S. (2017). Estimating costs of employing citrus harvesters through the H-2A Guest Worker Program. 2017 Annual Meeting, February 4-7, 2017, Mobile, Alabama 252784, Southern Agricultural Economics Association.

- Rudra, A., & Biswas, R. (1973). Seasonality of employment in agriculture. *Economic and Political Weekly*, A91-A100.
- Sustainable Agriculture and Research Education – SARE (2017). Labor input substitution decisions and business sustainability strategies under changing farm labor market conditions: comparative economic viability analyses of organic and conventional farming systems. Project overview. Available online: https://projects.sare.org/sare_project/ls07-194/ (accessed on December 20, 2019).
- Taylor, J. E., Charlton, D., & Yúnez-Naude, A. (2012). The end of farm labor abundance. *Applied Economic Perspectives and Policy*, 34(4), 587-598.
- Taylor, J.E., and D. Charlton. (2018). *The Farm Labor Problem: A Global Perspective*. Amsterdam, Netherlands: Elsevier.
- Thompson, J., & Blank, S. (2000). Harvest mechanization helps agriculture remain competitive. *California Agriculture*, 54(3), 51-56.
- U.S. Department of Homeland Security (USDHS) – Citizenship and Immigration Services (2019). *H2-A temporary agricultural workers*. Washington, DC: U.S. Department of Homeland Security. Available online: <https://www.dhs.gov/h-2a-temporary-agricultural-worker-program> (accessed on March 1, 2020).
- U.S. Department of Agriculture (USDA) – Cooperative Extension Service (2019). *Farm classification system*. Washington, DC: U.S. Department of Agriculture. Available online: <https://lpeic.org/usda-small-farm-definitions/> (accessed on November 12, 2019).
- U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS) (2017). 2017 Census of Agriculture. Census Data Query Tool (CDQT). Available online: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Census_Data_Query_Tool/index.php (accessed on November 16, 2019).
- U.S. Department of Agriculture (USDA). Multiple years. *Farm labor*. Washington, DC: U.S. Department of Agriculture, Economic Research Service (ERS). Available online: <https://www.ers.usda.gov/topics/farm-economy/farm-labor/> (accessed on January 26, 2020).
- U.S. Department of Labor (USDOL) – Employment and Training Administration. (2019). Prevailing wage data. Washington, DC: U.S. Department of Labor. Available online: <https://www.foreignlaborcert.doleta.gov/wages.cfm> (accessed on December 12, 2019).
- U.S. Department of Labor (USDOL) – Office of Foreign Labor Certification. (2018). *Foreign Labor Certification: OFLC Performance Data*. Washington, DC: U.S. Department of Labor. Available online: <https://www.foreignlaborcert.doleta.gov/performance.cfm> (accessed on July 16, 2019).
- Velandia, M., DeLong, K.L., Wszelaki, A., Schexnayder, S., Clark, C., and Jensen, K.(2020). Use of polyethylene and plastic biodegradable mulches among Tennessee fruit and vegetable growers. *HortTechnology*.

- Yale-Loehr, S. (1986). Foreign farm workers in the U.S.: The impact of the Immigration Reform and Control Act of 1986. *NYU Rev. L. & Soc. Change*, 15, 333.
- Zahniser, S., Hertz, T., Dixon, P., & Rimmer, M. (2012). Immigration policy and its possible effects on U.S. agriculture and the market for hired farm labor: a simulation analysis. *American Journal of Agricultural Economics*, 94(2), 477-482.