



Beneficial Farming Practices and Assistive Technologies for Veterans and Limited Resource Farmers

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Abstract

Farmers need support. Along with financial support, there is a need to receive knowledge, skills, and resources to address how to perform safe farming practices, including physical and mental health limitations. This study assessed participants' knowledge and beliefs related to critical farming practices needed to live safe and sustainable lifestyles. Workshops were delivered face-to-face and online, covering a range of farming practice topics such as assistive technologies and mental health. Data was collected via online surveys. Results found that respondents needed more information on Farm Safety and Health, and many reported little energy and feelings of hopelessness. It was concluded that participants would benefit from more specialized training to be sustainable. Recommendations for future studies include more workshops and training programs based on education and demonstrations on how best to live healthy and safe lifestyles.

Keywords: Limited resource farmers, mental health, physical challenges, technology skills, sustainability

Introduction

Agriculture relies on global trade. The human population is on track to approach 10 billion people by 2050; agriculture is poised to continue growing to meet high food demands. In addition, farming creates more jobs, beginning with farmers and with farm equipment makers, food processing plants, transportation, infrastructure, and manufacturing (Dotson, 2018). While farming has many benefits for farmers there are risks, such as extensive labor in order to meet farming production demands. Farm operators' demand is even greater in rural areas, who often rely on family members and farm workers.

In recent years, it has been reported how economic factors, climate, natural disasters, and trade policies have taken a toll on farmers' lifestyles, physically and mentally. In addition, the 2020 coronavirus pandemic and related COVID-19 financial strains have added to farmers' existing stressors and mental distress (American Psychological Association, 2020).

To address these challenges, today's farmers must be more empowered to improve their incomes, which can be complex, as farming families rarely earn money from a single source. Ultimately, improving incomes is to improve one's quality of life. Farming communities also rely on access to essential public services such as water, health, and education (Sustainable Food Lab, 2020). In North Carolina, rural residents often lack access to information to allow them to live sustainable lifestyles. Researchers, educators, and rural health providers are encouraged to collaborate on projects like this study to address farmers' needs.

Individuals living in rural areas often face limited access to resources and information, allowing them to lead sustainable lifestyles.

Watkins (2018) shared that many rural counties in the United States—including North Carolina—are on life support. They are struggling with shrinking and aging populations, shuttered businesses, disappearing job bases, and a general sense of hopelessness. Nevertheless, while their plight may be common knowledge, there is little consensus about how this situation can be resolved.

Training programs and site visits have often proven popular for educating farmers on how to develop business plans and marketing tools and increase crop yields. However, training programs regarding types of proper farming practices and the use of assistive technologies are often overlooked or limited, which can often lead to severe results such as injuries.

Olabisi, et al., (2020) conducted a study with beginning farmers to understand their farm operation management and technology use as well as other challenges faced during farming. They reported that while training programs for farmers have worked, more is needed to help address rural food insecurity, and to recruit and train younger farmers. They also found that

evaluating training programs and evidence for individual or collective impact is sparse. In a similar study conducted by Weingarten, it was found that “farming has always been a stressful occupation because many of the factors that affect agricultural production are largely beyond the control of the producers” (2018, p. 1).

Another topic of interest related to farmers would be assistive technologies. Rose et al. (2005) shared, “Over the years, evolving technologies have revolutionized the way we do business, communicate, make war, farm, and provide medical treatment” (p.1). For instance, farmers and ranchers with disabilities who seek assistive technologies can face even more challenges because of their work statuses, farm or ranch assets, and the accommodations they may need to continue working in production agriculture (Tachau, 2022).

In 2005, the Canadian Agricultural Safety Association identified financial insecurity, changing government policies, disease epidemics, expectations by family members, physical health changes, balancing on- and off-farm work, and relationship difficulties as farmers' stressors that can influence overall mental health (Hagen et al., 2021). Many farmer stressors are related to pressing financial and legal challenges. In addition, farmers face situations that are often out of their control, such as fluctuating market prices, which lead to financial concerns and instability; pressures due to uncertainty over trade and tariff policies; ongoing consolidation of the farming industry, which limits the number of options available to farmers for buying and selling products; and constantly changing production conditions, including weather, natural disaster, floods, droughts, pests, and diseases (American Psychological Association, 2020). Regarding technology and assistive technologies, many organizations have developed adaptable tools and materials that could be used among farm and ranch families.

According to a 2019 American Farm Bureau Federation survey, a substantial majority of farmers/farmworkers think financial issues (91%), fear of losing the farm (87%), and farm or business problems (88%) impact the mental health of farmers. The emotional well-being of farmers and their families is intimately intertwined with farming needs. It is important to note that while sensitive to discuss, the suicide rates of Americans in all demographics have been on the rise over the last 30 years, and farmers have the highest rate of suicide than any other occupation – five times that of the rest of the U.S. population (Perdue, 2018).

Alarmingly, at least 15 million rural residents struggle with mental illness, substantial substance addiction, and or psychiatric conditions (Mohatt, n.d.). While farmers have among the highest suicide rates in the U.S., they typically fail to seek help when struggling with mental health. Common reasons include 1-Feelings that they should handle any situation on

their own, including emotional distress or personal struggles; 2-Concerns that mental health professionals would not understand their needs or the types of problems they face due to the nature of their work as farmers; and 3-Concerns that mental health care services cost too much or that nobody will be able to help them “fix” what’s wrong.

While veterans and limited resource farmers in North Carolina began as the main focus of this project, the researchers found a need to expand the study to individuals outside of North Carolina as it is important to note that these issues within agriculture are nationwide, such as the U.S. facing food security and food diversity (Akhrum-Lodhi & Kay, 2009). Along with farmers, military veterans are becoming increasingly interested in agricultural endeavors. The correlation between agriculture and the military is regarded as a "deep historical heritage" (Besterman-Dhah et al., 2015; Kyle, 2018). Additionally, it [addressing farmer’s needs] is most pertinent since North Carolina’s highest ranked industry is agriculture. North Carolina’s hardworking farmers produce cotton, soybeans, peanuts, hogs and pigs, nursery products, aquaculture products, and others (Stroop, 2015).

Due to the state’s high ranking in producing agricultural products and the manual work involved, farmers are prone to increased injuries and other concerns (i.e., physical, mental, and health). We understand that educational training and site visits to conduct demonstrations are popular for showing farmers how to develop business plans, increase crop yields, and use marketing tools. However, information and resources regarding proper farming practices and types of and uses of assistive technologies are often overlooked or limited, which can result in higher incidences of injuries.

Purpose and aims of the study

The study's primary purpose was to assess participants’ knowledge and beliefs related to critical farming practices needed to live safe and sustainable lifestyles. The following aims guided the study:

Aim 1-Assess participants’ self-reported knowledge and beliefs related to farming practices.

Aim 2-Determine participants’ self-reported educational training and resource needs to live sustainable lifestyles.

Methods

This descriptive quantitative study was conducted from September 2020 to June 2021. The study’s targeted audience was veterans who are either currently farming or have expressed an interest in farming, limited resource farmers, and others with farming interests in North Carolina.

Participants were recruited using a variety of methods. Flyers and emails were sent to members of veteran farmer groups, farm cooperative

groups, cooperative extension listservs, and small farmer groups, with assistance from farm-related organizations' social networks, as well as Word-of-mouth. The use of the word-of-mouth communication method for recruiting farmers was beneficial and continues to be successful (Mattern, 2023), who used the method for recruitment purposes in various farmer networks. As a result, individuals interested in participating in the workshops were required to pre-register by a set deadline using their full name and email. Once registered, the workshop Zoom link was emailed. Two one-day workshops were delivered via face-to-face (F2F) and online (Zoom). The first workshop was held on May 1, 2021 (F2F, Zoom) with 35 participants, and the second workshop was held on June 22, 2021, via online (Zoom) with 45 participants who had not attended the first workshop with the exception of speakers and the researchers.

During the two one-day workshops, speakers covered a range of topics related to safe farming practices. Table 1 includes a brief description of each workshop topic presented. The selection of topics was based on previous workshops for the targeted group and a review of literature and researchers' awareness of needed educational topics most expressed by farmers. For example, assistive technology (AT) was covered and is defined as any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities (U.S. Department of Education, 2019).

An IRB-approved online survey (Study #19-0117) was then sent to the 80 individuals who participated in any of the two workshops. These participants were from various farming and non-farming backgrounds, with various levels of knowledge, skills, and needs for farm safety and sustainability. The online survey (Qualtrics) was developed with closed-ended, 4-point Likert type (1=Always, 2=Sometimes, 3=Never, 4=Unsure) questions and open-ended questions allowing participants to self-report their knowledge and beliefs on farming practices and future topics for educational and resource needs with the best methods of receiving information.

Table 1. Workshop Topics Aligned with the Study Aims

Workshop Topic	Study Aim Addressed	Description
Assistive Technology	Aim 1	Any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities. (U.S. Department of Education, 2019).
Agromedicine	Aim 1	Involves the study and treatment

		of human health related to agriculture. The application of medical and agricultural sciences to promote the health and safety of farm families, agricultural workers, and consumers of agricultural products.
Heirs' Property/Land utilization	Aim 2	Refers to a home or land that passes from generation to generation. This unstable form of ownership limits a family's ability to build generational wealth and hampers the efforts of nonprofits and cities to revitalize neighborhoods.
Mental health	Aim 2	Is "a state of well-being in which the individual realizes their own abilities, and can cope with the normal life stresses, to work productively, while being able to make a contribution to their communities.

Data Collection and Analysis

Upon completion of the workshops, the survey was distributed to the 80 participants via email. After one week of the first delivery, non-respondents were sent follow-up reminder emails to encourage survey completion. In a study conducted to gain farmers' input by Sufi and team (2018), they used follow-up emails and reported the benefit of collecting feedback soon after workshop completion. The data were analyzed using IBM SPSS v 27, and findings were reported primarily using descriptive statistics such as frequencies and percentages. Analyses also included t-tests and Chi-square tests where appropriate, and conclusions were based on a 5% level of significance.

Results

Of the 80 participants who were sent the online survey, 37 (46% response rate) completed the survey. Demographic information of the respondents is displayed in Table 2.

Most (78%) respondents self-reported as female and African American. The respondents were also older adults; most (62%) were over the age of 45. The majority (68%) of the participants reported residing in North Carolina, with the remaining residing in Alabama, Georgia, New Mexico, and Virginia.

Table 2. Respondents' demographic information

Characteristic	Item	F N=37	%
Gender	Female	29	78.4
	Male	8	21.6
Ethnicity/Race	African American	29	78.4
	Caucasian	2	5.4
	Multi-Ethnic	2	5.4
	Prefer not to answer	2	5.4
Age	18-24	1	2.7
	25-35	8	21.6
	36-45	4	10.8
	46-55	11	29.7
	56-65	6	16.2
	66+	6	16.2
	Prefer not to answer	1	2.7
State of Residence n=28	North Carolina	19	67.9
	Non-North Carolina residents	9	32.1

Table 3 below gives the distribution of respondents' farming status and the types of crops they grew or the types of farming they currently practice. When we asked respondents if they currently farm or not, a majority (59.5%) reported not currently farming. Over 60% of females and 50% of males reported that they do not currently farm. Their farming status was not related to their gender ($p>0.05$). Similarly, ethnicity did not appear to farming status (distribution was similar across ethnic groups, $p>0.05$). Types of crops and production reported include most respondents indicating field crops (42.9%), followed by livestock, trees, and vegetables (21.4% each), and fewer (2%) reporting swine, dairy, poultry, agritourism/value-added, and worms. Many respondents reported more than one type of crop/production.

Table 3. Respondents' Farming demographics

Demographic	Item	F	%
Farming Status n=37	No	22	60
	Yes	7	19
	Missing	8	22
Crops and Production types n=14	Field Crops	6	42.9

	Livestock	3	21.4
	Trees	3	21.4
	Vegetables	3	21.4
	Swine	1	7.1
	Dairy	1	7.1
	Poultry	1	7.1
	Agritourism & value added	1	7.1
	Worms	1	7.1

Results for Aim 1

We asked respondents about their knowledge and beliefs for the use of Assistive Technologies. It was found that most (over 70%) were mostly aware of the term and state and federal agencies providing assistive technologies. Many (40%) respondents reported difficulty performing daily activities, and most (over 50%) said they would benefit from equipment to assist with mobility and apps to organize and remember daily tasks.

Table 4. Respondents' Reports on Assistive Technologies

Question n=37	Always f(%)	Sometimes f(%)	Never f(%)	Unsure f(%)
When I hear the term "assistive technology," I am familiar with its purpose.	14 (43.8)	11(34.4)	1(3.1)	6(18.8)
I am aware that there are state and federal agencies that provide assistive technology.	18(56.3)	12(37.5)	-	2(6.3)
I often experience difficulty performing daily activities without receiving needed assistance.	3(9.4)	10(31.3)	19(59.4)	-
I would benefit from equipment to assist with mobility (climbing, bending, stepping, walking).	8(25.0)	9(28.1)	13(40.6)	2(6.3)
I would benefit from apps to assist with organizing and remembering daily tasks.	8(25.0)	15(46.9)	9(28.1)	-

Table 5 provides respondents' knowledge and beliefs on Agromedicine. With a few exceptions, almost everyone (over 80%) reported a need for someone to check on them while they work on the farm, either always or sometimes. Similarly, almost everyone reported the importance of having a farm emergency plan (100% always or sometimes), wearing hearing protection and eye protection (over 90% always or sometimes), and visiting the doctor for routine and preventive check-ups (100% always or sometimes).

Table 5. Respondents' Reports on Agromedicine

Question n=31	Always f(%)	Sometimes f(%)	Never f(%)	Unsure f(%)
How often should someone check on how you are working on your farm?	12(38.7)	14(45.2)	3(9.7)	2(6.5)
How important is it for you to have a plan in place in case of a farm emergency?	29(93.5)	2(6.5)	-	-
How important is it for you to wear hearing protection when operating farm machinery?	26(83.9)	3(9.7)	1(3.2)	1(3.2)
How often do you believe you should wear eye protection when working on the farm?	26(83.9)	5(16.1)	-	-
How often do you believe it is necessary to visit a doctor for routine or preventive check-ups during a year?	27(87.1)	4(12.9)	-	-

Results for Aim 2

When asked to share their knowledge and beliefs on heirs' property and land utilization, most (over 75%) respondents reported being aware (Always or sometimes) of the meaning and had an understanding of the land utilization rules. Some (about 25%) reported being unaware that the selling of their land requires a unanimous decision by all legal owners (See Table 6).

Table 6. Respondents' beliefs and understanding of Heirs' Property

Question n=31	Always f(%)	Sometimes f(%)	Never f(%)	Unsure f(%)
I believe land owned by multiple people, each of whom inherited their share, is considered Heirs' Property.	26 (83.9)	2(6.5)	2(6.5)	1(3.2)
If one sells their land, it is Heirs Property and requires a unanimous decision by all legal owners.	18(58.1)	5(16.1)	4(12.9)	4(12.9)
The Uniform Partition of Heirs' Property is helpful for all Heirs' property landowners to know.	26(83.9)	2(6.5)	1(3.2)	-

Table 7 provides respondents' thoughts on Mental Health. Most respondents did not have concerns regarding alcohol or being easily startled. However, some (about 20%) reported feeling numb or detached from their surroundings, being down, or depressed. Many (over 60%) reported experiencing little energy or being tired (always or sometimes) during the past month. When asked about their feelings of hopelessness during the past month, several (30%) responded Always or Sometimes. The distributions were similar for males and females.

Table 7. Respondents' Reports on Mental Health

Question n=31	Always f(%)	Sometimes f(%)	Never f(%)	Unsure f(%)
Over the past month, had nightmares about or thoughts about drinking alcohol when you did not want to?	1(3.2)	1(3.2)	28(90.3) (F-75.9%, M-75.0%)	1(3.2)
Over the past month, were constantly on guard, watchful or easily startled?	1(3.2)	4(12.9)	25(80.6) (F-69.0%, M-62.5%)	1(3.2)
Over the past month, felt numb or detached from others, activities, or your surroundings?	1(3.2)	6(19.4)	22(71.0)	2(6.5)
Over the past month, how often have you been bothered by feeling down, depressed, or hopeless?	1(3.2)	8(25.8)	20(64.5)	2(6.5)
Over the past month, how often have you been bothered by feeling tired or having little energy?	3(9.7)	16(51.6)	12(38.7)	-
Over the past month, how often have you been bothered by feeling bad about yourself – or that you are a failure or have let yourself or yourself or your family down?	2(6.5)	5(16.1)	24(77.4)	-

We asked respondents to share their preference for receiving new information, and the majority (90.6%) reported a preference for face-to-face, followed by conferences (78.1%), Field Days (65.6%), and Computers (email) (62.5%). Very few (9.4%) preferred Zoom meetings (see Table 8).

Table 8. Respondents' Reported Preference for receiving new information

Response n=32	F	%
Face-to-Face	29	90.6
Conferences	25	78.1
Field Days	21	65.6
Computers (email):	20	62.5
Media (news, radio, podcast)	13	40.6
Social media (Facebook, Twitter)	12	37.5
Letters (US Postal Service)	6	18.7
Zoom	3	9.4
Mixture of several types	1	3.1

Table 9 displays preferred need of training topics by respondents. Most (24%) shared drones for farm surveillance, followed by tax preparation

(20%) and farm safety (12%). Fewer (8%) reported the need for health and the use of technology.

Table 9. Respondents' Reported Preference for training topics

Response n=25	<i>f</i>	%
Drones for (farm surveillance, education)	6	24
Tax preparation	5	20
Farm safety	3	12
Health, use of technology in agriculture	2	8
Beekeeping	20	80
Use of Zoom	1	4
Funding	1	4
Computer Use	1	4
Insurance	1	4
Business Plans	1	4
Marketing	1	4
Grant Writing	1	4
Applying for Loans	1	4
USDA Programs	1	4
Women in Farming and Agriculture	1	4
Land Ownership	1	4
Heir's Property	1	4
Forest Management	1	4
Pesticide Certification	1	4
Care for handicapped Adults and Children	1	4
Farming Equipment	1	4
Farmland Utilization	1	4
Financial Planning	1	4
Use of social media	1	4

Table 10 details what resources respondents would like to receive to assist with their farming operations. Most (50%) reported grant writing and developing business plans for African American female farmers, followed by applying for loans (25%) and hemp production (20%). Few (10%) reported a need for tax preparation.

Table 10. Respondents' Reported Need for Resources for their Farming Operations

Response n=20	<i>f</i>	%
Grant writing, business plans for (African American female farmers)	10	50
Loans	5	25
Hemp production	4	20
Business plans	3	15
Tax preparation	2	10
Operating community gardens for nonprofits	6	30
Hiring Workers	1	5
Latest Technology	1	5
Heirs' Property	1	5
Government Networking	1	5
Selecting best crops to grow	1	5

Discussion

The current study assessed participants' knowledge and beliefs related to critical farming practices and gained their input on training and resources needed to live safe and sustainable lifestyles. This study will add to the body of literature on how best to plan educational events based on the specific needs of this population, especially since few studies have been conducted. While most respondents reported knowledge of the topics covered during the workshops, it is apparent that more training is needed based on responses for training topics and resources for farming operations. For instance, technology use, grant writing, tax preparation, and hemp production was most preferred to gain training and resources to operate farm operations.

Regarding mental health, although we gathered some information from our respondents, in general, individuals are less likely to share their feelings or beliefs. This apprehensiveness to communicate can lead individuals living without help with addressing mental health conditions, including suicide, depression, anxiety disorder, and stress which is high among the farming population. Individuals, living in rural communities, often have less privacy and anonymity than their counterparts living in urban communities, which may cause them to feel embarrassed or ashamed to be seen seeking mental health treatment. The Farming culture also often celebrates stoicism and a do-it-yourself mentality, which can discourage individuals from asking for help when they are having problems (RHHub, 2021). In a similar study on mental health barriers for seeking treatment for rural veterans, it was found that little research has targeted specific behavioral health treatment needs of the rural Reserve Component veteran and the barriers they may experience accessing treatment (Bennett et al., 2011).

This study has several limitations. First, the planning and implementation of the study was impacted by the COVID-19 pandemic. For instance, while initially, the workshops were planned to be face-to-face (F2F) to deliver speakers and equipment, and tool demonstrations, the first workshop was delivered face-to-face (F2F) and online (Zoom). Due to issues experienced with technology at the F2F site, which disrupted the delivery for all participants, the need to deliver the second workshop was made to be online (Zoom) only.

Conclusion

The researchers concluded that more resources and trusting environments would benefit individuals interested in addressing mental health needs. While financial concerns are a major factor impacting farmer stress, they are not the only concerns. In addition to the ongoing challenges

and stressors of farm life, farmers and their businesses have been impacted by the COVID-19 pandemic (RHIhub, 2021). Because programs must take into consideration the unique lifestyle of farmers and ranchers, especially due to their strong sense of pride associated with their farming operation, (RHIhub, 2021), the researchers recommend other researchers conduct studies specifically that ask participants what training and resources they need for their farming operations or to begin a farm operation.

It is also concluded that more studies should be conducted to gain more input from farmers on the types of educational training programs and resources needed. The delivery of these programs and resources within a trusting environment is essential to encourage more farmers to share their personal thoughts related to physical and mental health needs. The researchers of this study are aware that more resources should be provided since 60% of rural areas are designated mental health professions shortage areas (Bensen, 2013.), and because farmers often do not like to ask their neighbors for help because they do not want to feel like a burden on their community members; however, finding out that they are not alone can provide reassurance (RHIhub, 2021).

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