5-2022

# Evaluating Factors Influencing Tennessee and Kentucky Farmers' Willingness to Sell Produce Through Fresh Stop Markets

Riley A. Denton
*University of Tennessee, Knoxville*, rdenton5@vols.utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Riley A. Denton entitled "Evaluating Factors Influencing Tennessee and Kentucky Farmers' Willingness to Sell Produce Through Fresh Stop Markets." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural and Resource Economics.

Margarita M. Velandia, Major Professor

We have read this thesis and recommend its acceptance:

Margarita M. Velandia, Carlos Jose Omar Trejo-Pech, Xuqi Chen, Jacqueline N. Yenerall

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

# Evaluating Factors Influencing Tennessee and Kentucky Farmers' Willingness to Sell Produce Through Fresh Stop Markets

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Riley A. Denton
May 2022

## ABSTRACT

The mission of the food justice movement is related to addressing societal inequality and disparity issues through food-system restructuring. The food justice mission not only entails addressing unequal access to food among households but also involves addressing issues related to farmers' wellbeing and the economic, social, and environmental sustainability of their farm business. The Kentucky-based non-profit organization New Roots Inc. has organized Fresh Stop Markets (FSM) that are markets aiming to cover multiple aspects of the food justice mission. FSM provide farm fresh produce access to low-income, food-insecure households on a sliding scale and serve as a market outlet for small- and medium-sized, limited-resource farmers. The FSM have been relatively successful in providing farm fresh produce to low-income, food-insecure households, as they have been in business for 13 years. Farmers willing to sell produce through FSM play a major role in the success of these market models. Therefore, the ability of other communities to replicate this market model is in part determined by their understanding of the factors influencing farmers' willingness to sell produce through FSM. The goal of this study is to evaluate the factors correlated with farmers' willingness to sell produce through markets with a food justice mission, specifically FSM.

To accomplish this goal, we used data from a 2020 survey of Tennessee and Kentucky fruit and vegetable farmers and a bivariate probit regression to evaluate the factors correlated with farmers' willingness to sell produce through FSM at different price discount levels from retail prices. Results from the bivariate probit regression suggest that farmer and farm business characteristics including farm operator age, farm operator gender, farm size in terms of annual gross farm revenue, and dependence on farm income are correlated with farmers' willingness to sell produce through FSM. Additionally, farmers' engagement with certain food justice activities

such as running on-farm education programs related to sustainable agriculture and/or food systems to the community, offering produce at a discounted price to low-income households, and experience as a leader or volunteer in organizations with a food justice-related mission are also correlated with farmers' willingness to sell produce through FSM.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

# CHAPTER ONE

## INTRODUCTION AND PROBLEM JUSTIFICATION

The Food and Agricultural Organization of the United Nations states that food is a necessity and a human right (FAO, 2020). In the context of local food systems, some non-profit organizations focusing on the food justice mission, such as Kentucky-based New Roots, Inc., define fresh food as a basic human right (New Roots, 2022). Considering food, specifically fresh food, as a human right means that all human beings should have access to an adequate, nutritious diet that is affordable and in line with religious and cultural customs (FAO, 2020). Regardless of a somewhat common agreement that food, specifically access to fresh food, should be considered as a basic human right, not all households in the United States have access to an adequate and nutritious diet. According to the United States Department of Agriculture (USDA), low-income families, on average, eat less nutritious diets than other households and usually do not meet federal guidelines for the consumption of fruits, vegetables, whole grains, and low-fat dairy products (USDA-ERS, 2008). Furthermore, the USDA-ERS (2008) states that low-income families eat less of the previously listed food products when compared to other households.

Increasing access[1] to food is one of the missions on which the food justice movement has focused. Nonetheless, the food justice movement goes beyond increasing access to food and entails restructuring food systems to allow them to focus on inequality and disparity issues among society (Gottlieb and Joshi, 2010). This characterization means that the food justice mission focuses not only on households but also on vulnerable individuals involved in food

[1] Food access, according to the USDA, is commonly measured by accessibility to healthy food (e.g., the distance traveled to a food store and the number of food stores available to an individual) and by individual-level resources that affect accessibility to healthy food such as income (USDA-ERS, 2021).

production (e.g., farmers, farmworkers). In this study, we will focus on three major aspects of food justice, which involve low-income, food-insecure[2] households' access to farm-fresh products, connecting small- and medium-sized, limited-resource farms to markets, and community engagement that promotes and supports sustainable agriculture, sustainable food systems, and healthy eating (Velandia et al., 2021). Although this study has discussed disparities related to food access, this study has not mentioned disparities related to farmers' access to markets that guarantee profitable and economically sustainable farm businesses. Part of the food justice mission, as defined above, is to ensure that small- and medium-sized, limited-resource farms have access to markets that provide fair prices for their products.

An example of a market model supported by a non-profit organization (New Roots, Inc.) covering various aspects of the food justice mission as described above are Fresh Stop Markets (FSM). FSM are collaborative "pop-up"[3] markets that are organized on a bi-weekly basis for 20 weeks during the growing season and provide local produce to customers on a sliding scale (Hyden, 2017). This means that households get access to the same amount of food at different costs based on their income. Therefore, higher-income households will pay a higher amount for a share (i.e., a box of fresh produce) than lower-income families so that these families can have access to fresh food at an affordable cost. On the production side, New Roots, Inc. has tried to guarantee that fresh produce available for FSM comes from small, limited-resource, minority farmers. Nonetheless, this aspect of the FSM' mission has been difficult to fulfill because New Roots, Inc. has transitioned to working with fewer larger farmers to reduce human resources

[2] The USDA defines food insecurity as having unreliable or restricted access to adequate food due to individuals' household-economic status or other social factors (USDA-ERS, 2021).
[3] "The term "pop up" simply means that the markets appear or are set up every two weeks at a specific location in a neighborhood" (Velandia et al., 2021, p. 66).

needs to guarantee the long-term financial sustainability of the organization (Velandia et al., 2021). Working with fewer farms reduces time and personnel needs related to the logistics of coordinating produce needs for markets, produce delivery, and payments.

Communities in other states might be interested in replicating the FSM model. Since one of the key components of the FSM model is the farmers selling fresh produce through FSM, there is a need to explore the factors influencing farmers' willingness to sell products through markets with a food justice mission like FSM. This is the purpose of this study.

# CHAPTER TWO

## LITERATURE REVIEW

Previous studies related to farmers' willingness to sell produce through markets with a food justice mission and the factors that influence their participation are reviewed in this section. The literature included in this section is categorically organized according to the specific type of information they convey. The criteria used to systematically determine which studies to include in this review are listed below.

1. The research work must be written in English.
2. The research work must be associated with geographical locations in the United States, Canada, and the European Union.
3. Topics in the research work must be directly or indirectly associated with issues related to food justice, low-income households' food access, farmers' willingness to participate, or factors that influence farmers' willingness to participate in markets with a food justice mission.
4. The research work preferable should be related to small- and medium-sized fruit and vegetable farms.
5. The literature reviewed can include published or in-the-process of being published peer-reviewed articles, case studies, theses, dissertations, and reports.
6. The research work must utilize known research and analysis tools that are accepted in social sciences.

Research studies that satisfied the search requirements listed above were identified through the University of Tennessee's subscription to the Web of Science and Scopus library catalogs. A complementary search was also conducted to identify additional articles that were

not listed in the library catalogs identified above and satisfied the search criteria. Search entries that provided the best results utilized combinations of keywords and phrases such as agriculture markets, alternative markets, factors affecting willingness to participate, farm economic viability, farmer experience, farmers market participation, food insecurity, fruits and vegetables, sustainable agriculture, and willingness to participate. Unsuccessful search entries utilized keywords and phrases such as community food systems, local food systems, food supply chains, and Fresh Stop Market. The initial search entries resulted in hundreds of journal articles being found; however, very few articles are related to the research topic investigated in this study. The search results consisted of six articles that satisfied the search criteria.

As stated in the introduction section, in the context of local food systems and for the purpose of our study, the goals of the food justice mission are narrowed down to three: (1) facilitating low-income, food-insecure households' access to healthy foods; (2) connecting small- and medium-sized, limited-resource farms to markets; and (3) supporting community engagement that promotes and supports sustainable food systems and healthy eating (Velandia et al., 2021). The majority of the literature related to food justice in the context of local food systems focuses on strategies to increase consumer access to fresh fruits and vegetables at market outlets such as farmers markets, Community Supported Agriculture markets (CSA), and food hubs (Bradford et al., 2019; Cotter et al., 2017; Hanson et al., 2019; Kaiser et al., 2020; Kasprzak et al., 2021; McGuirt et al., 2020; Pershing and Hendrickson, 2017; Quandt et al., 2013). There are very few studies evaluating farmers' experiences with food justice activities. Most of them focus on farmers selling or willingness to sell produce to low-income consumers and the impact of these activities on the economic viability of their business (Hodgins and Fraser, 2018; Kaiser

et al., 2020; Montri, Chung, and Behe, 2021; Newsome, 2020; Pershing and Hendrickson, 2017; Pilgerman, 2011; Sitaker et al., 2020; Trauger et al., 2010).

### *Farmers' Participation or Willingness to Participate in Food Justice Related Activities*

According to Pershing and Hendrickson (2017), for increased food access (one of the main goals of food justice) to be strengthened, research on farmers' viability to meet this goal needs to be conducted.

Farmers must account for multiple factors that contribute to their farm business's viability which, in turn, could influence their participation or willingness to participate in food justice activities. As indicated in Pershing and Hendrickson (2017), the price of products is a primary barrier for farmers selling products in low-income areas or to low-income households. Farmers with small profit margins may not participate in markets that serve low-income communities.

A study by Kaiser et al. (2020) evaluated the underlying values both producers and consumers had regarding participating in an online food hub in an extremely impoverished Franklinton neighborhood in Columbus, Ohio. The study selected 15 small-scale farms (i.e., producers with $350,000 or less in annual sales) within a 150-mile radius of this city and invited them to participate in a semi-structured interview. Farmers were asked questions related to their willingness to participate in the online food hub, products they would like to grow to be sold through the online food hub, experience with wholesale marketing, opportunities and challenges associated with selling products through the online food hub, and third-party certifications they currently had at the time. Among the 15 farms invited to participate in the interviews, only eight participated.

Results related to the willingness to participate in the online food hub suggest that producers saw that participating in the online food hub was an opportunity to increase sales without increasing marketing efforts. Results from the interviews also suggested that some farmers were motivated to participate in the online food hub because of the opportunity to serve low-income communities.

Price and order reliability (e.g., long-term contracts that guarantee consistent orders) were mentioned by producers as one of the factors that would affect their willingness to sell products through the online food hub. Producers also indicated the need to be informed about large wholesale orders in advance as the production expansion to fulfill this demand would entail planning, investment, and risk. Farmers further expressed that farm expansion costs associated with fulfilling product volume needs from the online food hub could prevent them from entering the market. However, they mentioned that up-front deposits and consistent orders and payments could help offset the expansion costs mentioned above.

Regarding the impact of selling products through the online food hub on the farm business's economic viability, farmers expressed concern about the ability to obtain price premiums when selling products to low-income individuals and the ability to move large volumes when competing with other producers to fulfill online food hub demand. They also mentioned the challenges associated with accepting Supplemental Nutrition Assistance Program (SNAP) payments and the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) payments when selling products to low-income individuals, such as payment processing times.

In general, results from Kaiser et al. (2020) suggest that price and order reliability and farm business economic viability associated with participating in the online food hub play an

important role in determining farmers' willingness to sell produce through an online food hub serving low-income communities. Therefore, we can infer these might be factors that would influence farmers' willingness to participate in market outlets, similar to the food hub described in this study, with a food justice mission.

Hodgins and Fraser (2018) investigated businesses within the alternative food networks' (AFN) positions related to social and food justice and barriers preventing small businesses within these networks from creating market spaces to provide food access to minority or low-income communities. Food businesses within the AFN seek to reduce the social and environmental impacts of large-scale, more traditional food networks. This study identified 141 food businesses in British Columbia, Canada that used or sold alternative food and were not members of a franchise or chain, which constitute the eligible population. A total of 46 food businesses participated in a telephone survey that asked questions related to their businesses' operations and general priorities and motivations at the management level related to food justice. The survey captured information related to businesses' concerns associated with food justice, as well as efforts to increase food access to low-income individuals. Each participant received a "social-justice engagement" score based on their concern with and implementation of activities related to food justice. Hodgins and Fraser then selected 13 of the participants with the highest "social-justice engagement" score to conduct semi-structured interviews about barriers preventing them from expanding their customer base to include low-income customers and strategies associated with overcoming those barriers. Study results showed that participants identified five major constraints related to providing food access to low-income consumers. The number one constraint mentioned by 77% of participants was the business's lack of concern about food justice in general, which could be explained by respondents' beliefs that supporting local food

economies will automatically result in food justice or the lack of awareness of food insecurity issues in their communities. The next most important barrier cited by participants was operational constraints. About 53% of survey respondents reported pressure to balance profit margins to ensure economic viability. In comparison, 49% of participants listed business labor constraints as a barrier to widening access to low-income consumers. The final three barriers mentioned by businesses participating in this study included low-income customers' shopping and cooking habits that do not match the type of products sold by AFN businesses (mentioned by 31%), respondents' beliefs about stigmas surrounding alternative food network market spaces where individuals believe mainly high-income customers attend (22%), and respondents' beliefs about the ability of AFN businesses to provide foods that are appropriate for the needs of low-income consumers (17%) (e.g., price discounts for high volume purchases, non-perishable products, prepared or semi-prepared meals). We could infer from this study's results that, as in the case for AFN businesses, factors influencing a farm business's willingness to participate in market outlets with a food justice mission could be related to farm business managers'/owners' awareness about food justice-related issues in their communities, operational constraints, and beliefs about their ability to meet low-income consumers' needs.

Using data from interviews conducted with 12 farms across New York, North Carolina, Vermont, and Washington, Sitaker et al. (2020) evaluated how farmer participation in a cost-offset CSA program (CO-CSA) (i.e., programs that offer subsidized CSA shares) impact farm business cash flow and profitability and farm business challenges and benefits associated with these programs. Results from this study indicated that the 12 farms participating in the CO-CSA program agreed to participate because this program aligns with their farm business goals and because this program gave them the opportunity to expand their businesses into new locations

and market segments. Eight out of the 12 farms participating in the study reported a positive economic effect of the CO-CSA program on their farm business, while four farms saw a minimum to no change at all. Nonetheless, even those farms reporting a negligible economic impact of participating in the CO-CSA program indicated a positive impact associated with encouraging more people to join their CSA. Farmers also experienced non-economic impacts related to their participation in the CO-CSA program, which included increased community engagement. Farmers mentioned that participating in the program helped create a sense of community and allowed the producer to build relationships with the consumer. On the other hand, farmers participating in the CO-CSA program mentioned that they often had to make special accommodations for the low-income consumer, such as special delivery, late payment tracking, and consumer responsibility reminders. These accommodations represented additional time and resources for their farm businesses. It can be inferred from this study's results that farmers' participation or willingness to participate in market outlets with a food justice mission is influenced by the alignment of these market outlets with their farm business goals and values and the potential economic impact that participating in these markets would have on their farm business.

Pilgerman (2011) explored the social sustainability aspect of sustainable agricultural systems in the US Pacific Northwest region using farmer interviews and farm observations from eight farms that self-identified as sustainable. We can infer from Pilgerman's findings that sustainable farms find it difficult to make choices that are socially responsible (i.e., choices that consider the common good of their communities) while still making enough money to support their farm business. For example, a farmer may not be able to sell produce at a price attainable by low-income customers because their farm business is already being subsidized by off-farm

income or cheap labor. Additionally, we can infer from Pilgerman's findings that the increased costs of producing sustainably and the resources needed to practice sustainable farming can prevent farms from selling to some customers, such as low-income consumers. In general, findings from this study suggest that farmers' willingness to participate in markets with a food justice mission is likely to be influenced by the farm business's revenue and prices paid at these markets.

An individual's motivation for farming may also influence his or her participation in markets with a food justice mission. For example, Montri, Chung, and Behe (2021) found that farmers' participation in farmers markets in low-income, urban areas (LIUA) is influenced by their motivations for farming. They defined LIUA as metropolitan areas with lower income, higher poverty and unemployment rates, and a higher number of households receiving unemployment benefits than the state average. Using information from interviews conducted with 27 farmers participating in recently established LIUA farmers markets in three Michigan cities with a population greater than 100,000 people, they explored farmer decisions regarding participation in these markets. The study identified four different types of farmers based on their motivation for farming: 1) Full-time farmers for whom farming is the primary or only source of household income; 2) Part-time farmers who are exploring business opportunities to grow sales or business, or are exploring opportunities to make farming a full-time job; 3) Farmers who farm for recreation purposes, who enjoy gardening, and are not sales driven; and 4) Farmers for whom farming is part of a broader social mission. Montri, Ching, and Behe (2021) concluded that those farmers in the first category make decisions about market participation based on sales opportunities and their ability to fulfill their financial goals. When joining newly established LIUA farmers markets, they are looking for opportunities to expand sales, and because of that,

when those financial goals are not fulfilled, they are most likely to stop selling at these markets. In contrast, those farmers in categories three and four, whose farming motivations are more lifestyle-driven, are likely to join these markets because it aligns with their farming motivations. Finally, those farmers in category two join the newly established LIUA farmers markets because they see it as a business opportunity to grow sales, gain farming experience, or participate in an entry market to gain marketing skills. In general, results from this study suggest that when exploring farmers' willingness to participate in or sell products through market outlets with a food justice mission, it is important to evaluate motivations for farming that include but are not limited to the financial goals.

# CHAPTER THREE

# CONCEPTUAL FRAMEWORK

Fruit and vegetable farmers are assumed to be rational decision-makers that maximize their farm business's profit. Uncertainty surrounding fruit and vegetable farms' income may encourage producers to identify marketing strategies to reduce risk and improve or maintain their farms' economic viability. With this in mind, prior research studies have used the expected utility model framework to model farmers' decisions related to the adoption of new marketing or production strategies, (Dong, Campbell, and Rabinowitz, 2019; Edge et al., 2018; Walton et al., 2008; Wolf and Widmar, 2014). These studies suggest that farmers choose a new marketing or production strategy when the expected utility of profit from adopting these strategies is greater than the expected utility of profit from not adopting them.

Different from previous studies that assume farmers' decisions to participate in market outlets are mainly profit driven, we are assuming that farmers' decision to participate in markets with a food justice mission such as FSM might be related to other factors. These factors include spreading out the risk among multiple market outlets, and participating in a market that aligns with their farm's values (Kaiser et al., 2020; Montri, Chung, Behe, 2021; Sitaker et al., 2020). Specific values cited in the literature review that farms and food justice markets could have in common include serving low-income communities and promoting community engagement (Kaiser et al., 2020; Sitaker et al., 2020). Therefore, in the case of FSM, the expected utility model framework associated with a farmer's decision to market products through FSM can be represented as:

(1) $$E_{FSM}[U(nfi, \pi_{FSM}, z)] \geq E_{No\ FSM}[U(nfi, \pi_{No\ FSM}, z)],$$

where *No FSM* represents the decision to not sell produce through FSM; $nfi$ represents non-farm income such as wages from non-farm occupations, income earned by a spouse, income from non-farm investments, and pensions; $\pi_{FSM}$ and $\pi_{No\ FSM}$ represent total net profits associated with selling produce through FSM and other market outlets, and net profits associated with selling produce through market outlets excluding FSM, respectively; and $z$ represents all other factors, that could be non-monetary, contributing to a farmer's willingness to sell produce through FSM, such as farm business values (e.g., serving low-income communities and promoting community engagement), farm size, farmer's age, farmer's gender, and farmer's education (Kaiser et al., 2020; Montri, Chung, and Behe, 2021; Newsome, 2020; Sitaker et al., 2020; Trauger et al., 2020).

Net profits associated with selling produce are defined as revenue minus variable costs and fixed costs (i.e., costs associated with marketing and production). Following previous studies' approach related to net farm profits (Chase, 2020; Conner and Rangarajan, 2009: Dong, Campbell, and Rabinowitz, 2019; Hardesty and Leff, 2010; Kay, Edwards, and Duffy, 2008), total net profits associated with products' sales that include FSM sales, and through market outlets excluding FSM can be represented as:

(2) $$\pi_{FSM} = p * (Q(l,e)w_{RT1}) + p(1-d) * (Q(l,e)w_{FSM}) + p_{other}(Q(l,e)w_{other1}) - C_{FSM}$$

(3) $$\pi_{No\ FSM} = p * (Q(l,e)w_{RT2}) + p_{other}(Q(l,e)w_{other2}) - C,$$

where $p$ and $p_{other}$ represent output price received by farmers at their retail market outlet[4] (e.g., farmers markets) and at other markets different than the retail market and FSM that align with

[4] We assume that farmers most likely receive the highest price for their produce when selling through retail market outlets.

their current marketing strategy, respectively; $d$ represents the price discount that a farmer may receive for his or her crops when selling through FSM; $w_{RTj}$, $w_{FSM}$, and $w_{otherj}$ represent the percentage of produce quantity sold through the retail market, FSM, and other market outlets, respectively (the sum of weights on equations (2) and (3) should equal 1); $Q(l, e)$ represents total quantity produced, which depends upon inputs $l$ (e.g., seed, fertilizer, and labor) and random variables $e$ (e.g., weather events); $C_{FSM}$ and $C$ represent variable and fixed costs for when the farmer is using FSM marketing strategy and when he or she is not, respectively.

Just like in previous studies evaluating the factors influencing farmers' decisions to sell products to low-income communities (Kaiser et al., 2020; Pershing and Hendrickson, 2017; Pilgerman, 2011), we assumed the price farmers receive when selling produce through FSM will influence their decision to sell produce through this market outlet. Furthermore, we assumed the produce volume they can sell through FSM, marketing strategies they use, and costs would influence their decisions to sell produce through this market outlet. These assumptions are captured in equation (1) through $\pi_{FSM}$. Furthermore, these assumptions are aligned with the design of the questions we used to assess farmers' willingness to sell produce through FSM, as we will explain in the data section (Chapter 4).

Farmer *i* will sell produce through FSM when the expected utility from participating in FSM is greater than or equal to the expected utility from not selling produce through FSM. This difference can be represented by $y_i^*$:

$$y_i^* = E_{FSM}[U(nfi, \pi_{FSM}, z)] - E_{No\ FSM}[U(nfi, \pi_{No\ FSM}, z)], \quad (4)$$

where $y_i^*$ represents the difference between the expected utility from selling produce through FSM and the expected utility associated with not selling produce through FSM for farmer *i*.

It is important to note that $y_i^*$ is an unobservable latent variable; however, farmer *i* willingness to sell produce through FSM is observable and represented by $y_i$:

(5) $$y_i = \begin{cases} 1 & if\ y_i^* \geq 0 \\ 0 & if\ y_i^* < 0 \end{cases},$$

where $y_i$ equals one if farmer *i* is willing to sell produce through FSM and zero otherwise.

# CHAPTER FOUR

# DATA

## *Survey*

This study used data from a survey of Tennessee and Kentucky fruit and vegetable farmers conducted between February and May 2020. The main objective of this survey was to evaluate the factors influencing fruit and vegetable farmers' willingness to sell produce through FSM, specifically farmers who have not sold produce through FSM. We obtained a contact list of 961 farms from the Tennessee and Kentucky Departments of Agriculture. The survey was sent to farmers located in 32 counties across East Tennessee and 14 counties near the Lexington and Louisville, Kentucky areas. The survey was a mixed-mode survey consisting of mail [paper] and web versions. The web version was sent to 245 Tennessee farmers for whom we have e-mail addresses between February and March 2020. There were 58 Tennessee farmers for whom we only had mailing addresses but not e-mail addresses. Tennessee farmers who did not complete the web version of the survey by April 2020 (n=222) and those for whom we only had mailing addresses were sent a mail version of the survey. A mail version was also sent to Kentucky farmers (n=658) in the contact list. We only have access to the mailing addresses of Kentucky farmers in the contact list; therefore, Kentucky farmers did not receive a web version of the survey. Out of 961 survey recipients, 161 completed the survey, for a 17% response rate. After eliminating respondents who did not produce fruits and vegetables for sale in 2019 (n=40) and have sold produce through FSM managed by New Roots Inc. (n=9), there were 112 observations for analysis. The length of the survey was 22 to 27 questions depending upon farmers' survey answers, covering food justice activities farmers are engaged with, willingness to sell produce through FSM, market outlets used, and farmer and farm business characteristics. Food justice

topics covered in the survey instrument included farmers' SNAP or WIC acceptance, participation as leaders or volunteers in food justice initiatives, running educational programs, food product donation, providing low-income family discounts, and selling produce at farmers markets in low-income neighborhoods. Other topics for the remaining three sections included but were not limited to gross farm revenue, household income, acres in fruit and vegetable production, market outlets used, and farmer age. A copy of the paper-version survey instrument is included in the Appendix section.

***Survey Sample Representativeness***

Similar to Velandia et al. (2020a, 2020b), we assessed the representativeness of the survey sample used in the regression analysis[5] by comparing the regression sample's average acres in fruit and vegetable production in 2019 to the average vegetable acres harvested in the Kentucky and Tennessee counties included in the survey according to the 2017 United States Census of Agriculture (U.S. Department of Agriculture, 2021). As stated in Velandia et al. (2020a, 2020b), the 2017 United States Census of Agriculture does not contain information about combined acres in fruit and vegetable production but about acres in vegetable, fruit and nuts, and berry production separately. Given that we used the same contact list in Velandia et al. (2020a, 2020b) to conduct the surveys (at least for the Tennessee farms), we can assume that just as in these previous studies, the majority of Tennessee respondents in our survey either grow only vegetables or vegetables and fruits and berries.

Since the survey only collected acres of fruits and vegetables combined, we validated the assumption that the Kentucky farms included in our survey sample are more likely to grow

[5] Due to missing values of the variables included in the regression analysis, the regression sample contains only 70 out of the 112 observations included in the survey sample.

vegetables only or vegetables and fruits than fruits only by assessing the percentage of Kentucky farms in our contact list that produce vegetables only, vegetables and fruits, and fruits only. We took a random sample of 150 farms from the Kentucky farm contact list, which represents 23% of the farms included in the contact list and determined the percentage of Kentucky farms producing vegetables only (41%), fruits and vegetables (53%), and only fruits (5%).

Furthermore, given IRB protocols, we cannot connect survey responses with names and addresses, and therefore, we cannot identify the farms included in the survey sample. Finally, we only took a random sample of the 658 farms included in the contact list given that the process of identifying which farms produce vegetables only, vegetables and fruits, and fruits only is labor-intensive because it requires going to the Kentucky Department of Agriculture website (http://www.kyproud.com/) and searching for information of each individual farm. We also estimated the number of vegetable acres, the number of acres in fruit (excluding berries), and berry production in the Kentucky counties included in the regression sample using data from the 2017 United States Census of Agriculture to assess the likelihood of having fruit growers only in our survey sample. On average, the number of vegetable acres harvested by farms located in the Kentucky counties included in the regression sample (4.43 acres) was larger than the average acres in fruit (excluding berries) (2 acres), and berry production (0.84 acres). We also estimated farm vegetable, and fruit and nuts[6] (including berries) sales for the Kentucky counties included in the regression sample using data from the 2017 United States Census of Agriculture. Average vegetable sales in the Kentucky counties included in the regression sample ($15,628.14) were nearly four times higher than the average fruit and nut sales in the same counties ($3,868.30). The information presented above suggests that vegetable production is more common than fruit

[6] Only combined fruit and nuts sales are reported in the United States Census of Agriculture.

production in the Kentucky counties included in the regression sample. Therefore, it is more likely for us to have received responses from vegetable farms (those growing vegetables only or vegetables in combination with fruits) than farms producing only fruits.

Results presented in Table 4 (see appendix) suggest that farms in the regression sample located in Kentucky are on average larger in terms of acres (6.60 acres) compared to the population of vegetable farms located in the same Kentucky counties according to the 2017 United States Census of Agriculture (4.43 acres). Farm outliers (i.e., larger farms in terms of acres in vegetable production) within the subsample of Kentucky farms included in the regression sample could possibly explain a biased regression sample toward larger farms. We calculated median acres in production for the regression sample and the median of the average acres in vegetable production for all counties included in the regression analysis using the 2017 United States Census of Agriculture. The median acres under production for the Kentucky farms' regression sample was 2 acres, compared to 2.60 acres for the population of Kentucky farms located in the 13 counties[7] under study according to the census data. Based on this information, we could infer that, on average, the subsample of Kentucky farms in the regression sample is similar to the population of farms located in these counties in terms of acres in vegetable production.

The subsample of Tennessee farms included in the regression sample is, on average, smaller in terms of acres in fruit and vegetable production (6.64 acres) compared to the Tennessee farms located in the 17 counties[8] under study according to the 2017 United States

[7] Thirteen of the 16 Kentucky counties included in the survey sample were included in the regression analysis.
[8] Seventeen of the 22 Tennessee counties included in the survey sample were included in the regression analysis.

Census of Agriculture (7.64 acres). This could be explained by the fact that a large percentage of the farms included in the contact list used for the survey are Pick Tennessee Products program participants. Smaller farms using direct-to-consumer market outlets might be more likely to participate in state-sponsored programs, such as the Pick Tennessee Products program, that help promote local farms directly to potential customers. The median fruit and vegetable acres under production by Tennessee farms included in the regression sample was 2.5 acres, compared to 3.47 acres for Tennessee farms located in the counties included in this study according to 2017 census data. Therefore, we acknowledge that the regression sample might be biased toward smaller farms.

### *Contingent Valuation Approach*

Given that one of the main goals of this study was to evaluate the factors influencing farmers' willingness to sell products through FSM, we used elements of the contingent valuation method to present survey respondents with two hypothetical market scenarios. The contingent valuation method has been used by several researchers to determine consumer and producer willingness to adopt various products and production practices (e.g., DeLong et al., 2020; Dobbs et al., 2016; McKay et al., 2019a; McKay et al., 2019b; Velandia et al., 2020a). Although FSM already exist, the producers targeted with the survey were farmers that have never sold produce through FSM and/or are located in counties where FSM do not exist. Respondents who indicated they had sold produce through FSM (n=9) were not asked questions about their willingness to sell produce through FSM.

Similar to the contingent valuation iterative bidding approach (FAO, 2000), one market scenario was presented to respondents to assess their willingness to sell produce through FSM at a specific price discount level. Depending on their answer to this first market scenario, they were

presented with either a lower price discount level or a higher price discount level in the second market scenario. In total, there were three price discount levels included in the market scenarios. Market scenario one asked for willingness to sell produce through FSM when prices paid are 25% below retail prices. If the respondent answered yes to market scenario one (i.e., 25% price discount level), then market scenario two asked the respondent if they would be willing to sell produce through FSM when prices paid are 30% below retail prices. On the other hand, if the respondent answered no to market scenario one, then market scenario two asked the respondent if they would be willing to sell produce through FSM when prices paid are 20% below retail prices. An illustration of the survey's setup of the market scenarios is shown in Figure 1. The price discount level (percentage) presented in each market scenario was with respect to prices obtained at their retail market (e.g., farmers markets). Farmers will most likely sell multiple produce products through FSM rather than a single product. Therefore, estimating a price level at which farmers are willing to sell products through FSM will entail a more complex analysis, where we will have to set prices for multiple products, and those products will have to be customized for each respondent depending on the products they currently grow.

Previous studies using the iterative bidding approach randomly assigned price variation in market scenarios across respondents, which in turn allowed for willingness to pay or willingness to accept estimates (Aydogdu, 2016). However, the focus of our study is to understand factors influencing farmers' willingness to sell produce through FSM and not the expected prices at what farmers are willing to sell products through FSM. With this in mind, we did not randomly assign price variation in market scenarios across survey respondents but instead presented all respondents with the same fixed price discount level in market scenario one (i.e., 25% below retail prices) and a second price discount level in the following market scenario

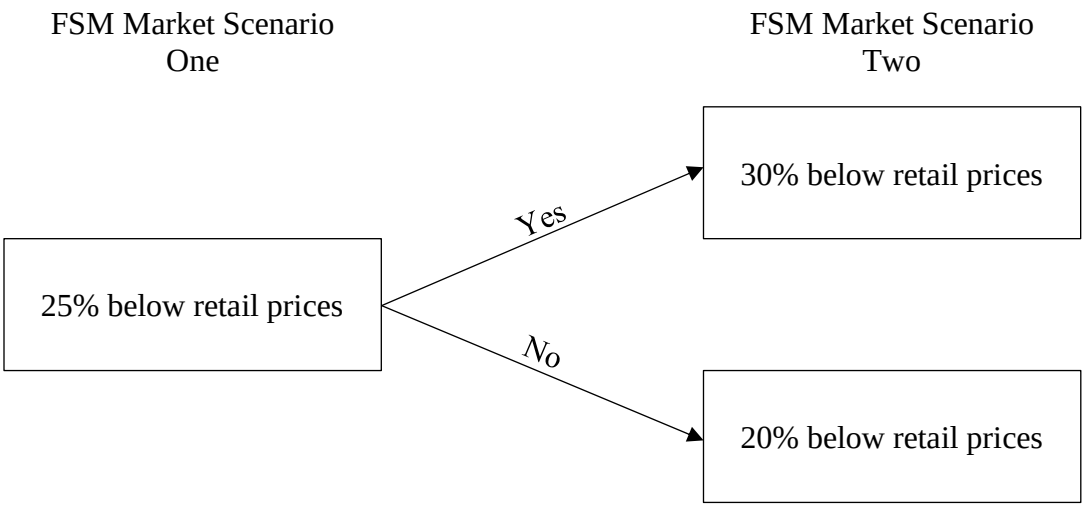


**Figure 1.** Illustration of hypothetical FSM market scenarios

two (i.e., 20% or 30% below retail prices). The price discount level presented in market scenario two was contingent on the respondent's response to market scenario one. The information used to create the market scenarios was based on interviews[9] with farmers who currently sell produce through FSM. Specifically, we estimated the difference between the value of an FSM share based on prices paid to farmers and the value of a CSA share for farmers selling produce through FSM that were also running their own farm CSA. We used this information to set up the three price discount levels presented in the market scenarios. The sales volume information presented in the market scenarios was also estimated based on sales volume information from farmers currently selling produce through FSM. Both market scenarios guarantee that farmers will be able to sell up to 30% of their produce through FSM.

The market scenarios discussed above can be directly connected to the profit a farmer receives when he or she sells produce through FSM, which is shown in equation (2). As discussed in the conceptual framework section, the profit a farmer receives when selling produce through FSM is equal to the revenue they receive from their retail market, FSM, and other markets minus the variable costs associated with each market outlet and fixed costs. The price received for produce sold through FSM is calculated by multiplying the price received at the retail market (i.e., $p$) by the price discount a farmer may receive when selling produce through FSM (i.e., $d$). For the market scenarios presented above, the price discount levels assigned in market scenarios one and two (i.e., 20%, 25%, and 30%) take the place of "$d$" in equation (2). The profit received when farmers sell produce through FSM could be directly impacted by the price discount assigned to the produce sold through FSM. Therefore, a farmer's expected utility

[9] We conducted interviews with farmers from Kentucky who have experience selling produce through FSM. Farmers that currently sell produce through FSM and run their own CSA were specifically asked about the prices they receive from FSM and the value of their CSA share.

from selling produce through FSM (i.e., equation (1)) can be directly impacted by the change in expected profits. For example, a farmers expected utility from selling produce through FSM could change when the price discount faced in market scenario one (i.e., 25%) increases to 30% in market scenario two. This change in expected utility resulting from the increased price discount for produce sold through FSM could cause the farmer's willingness to sell decision to change depending on if the expected utility from not selling produce through FSM is either lower or higher than the expected utility from selling produce through FSM.

# CHAPTER FIVE

# ESTIMATION METHODS

## *Bivariate Probit Regression*

As stated in equation (5) in the conceptual framework, we observed farmers' willingness to sell produce through FSM ($y_i$) instead of their differences in expected utilities $y_i^*$. Specifically, we observed farmers' willingness to sell produce through FSM at two market scenarios (i.e., $y_{im}$) where $m$ takes the value of one for market scenario one and two for market scenario two. A bivariate probit regression was used to jointly estimate $y_{i1}$ and $y_{i2}$ because there is no simultaneity in the market scenarios presented to respondents. In other words, market scenario two is presented to respondents after market scenario one is presented to them, but the error terms of the two outcomes (e.g., $y_{i1}$ and $y_{i2}$) might be correlated (Cameron and Trivedi, 2010). The likely correlation between the two binary outcomes via the error term might be due to unobserved explanatory variables (e.g., unobserved farmers' values and motivations) that could have similar effects on farmers' willingness to sell produce through FSM. It is assumed that the error terms ($\varepsilon_{i1}, \varepsilon_{i2}$) for $y_{i1}$ and $y_{i2}$ are normally distributed and correlated ($Cov(\varepsilon_{i1}, \varepsilon_{i2}) = \rho$). The two equations estimated using the bivariate probit regression are defined as:

(6) $$y_{i1} = x_i\beta_1 + \varepsilon_{i1}$$

(7) $$y_{i2} = x_i\beta_2 + \varepsilon_{i2},$$

where $x_i$ captures all variables potentially correlated with $y_{im}$ as stated in equation (1) ($x_i$= $nfi, \pi_{FSM}, z$). Equation (8) summarizes the assumptions related to $\varepsilon_{i1}$ and $\varepsilon_{i2}$ in terms of means, variance, and covariance (Greene, 2012).

(8) $$Cov\begin{pmatrix}\varepsilon_{i1}\\ \varepsilon_{i2}\end{pmatrix}|x_i, x_i\Big) \sim N\left[\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix}1 & \rho\\ \rho & 1\end{pmatrix}\right]$$

In order to simplify the log-likelihood function used to determine the values of $\beta_1$, $\beta_2$, and $\rho$, we assume that $q_{i1} = 2y_{i1} - 1$ and $q_{i2} = 2y_{i2} - 1$. For $q_{im}$ to be equal to one, $y_{im}$ must also be equal to one. On the other hand, for $q_{im}$ to be equal to negative one, $y_{im}$ must be equal to zero. Next, we used $q_{im}$ to calculate $v_{im}$ and $\rho_i^*$ which are defined in equations (9) and (10), respectively.

(9) $$v_{im} = q_{im}(x_i\beta_m) \quad m = 1,2$$

(10) $$\rho_i^* = q_{i1}q_{i2}\rho$$

The equation below defines the probabilities entering the log-likelihood function (Greene, 2012).

(11) $$\Phi_{Y_1=y_{i1};\, Y_2=y_{i2}} = \text{Prob}\,(Y_1 = y_{i1}, Y_2 = y_{i2}|x_i) = \Phi_2(v_{i1}, v_{i2}, \rho_i^*)$$

The log-likelihood function is defined below as:

(12) $$\ln L = \sum_{i=1}^{n} \ln\Phi_2(v_{i1}, v_{i2}, \rho_i^*).$$

The derivatives of the log-likelihood function with respect to $\beta_m$ and $\rho$ are defined in equations (13) and (14), respectively.

(13) $$\frac{\partial \ln L}{\partial \beta_m} = \sum_{i=1}^{n} \left(\frac{q_{im}\mathrm{g}_{im}}{\Phi_2}\right) x_i,\ m = 1,2$$

(14) $$\frac{\partial \ln L}{\partial \rho} = \sum_{i=1}^{n} \left(\frac{q_{i1}q_{i2}}{\Phi_2}\right)$$

The term $\mathrm{g}_{i1}$ in equation (13) is defined as:

(15) $$\mathrm{g}_{i1} = \phi(v_{i1})\Phi\left[\frac{v_{i2} - \rho_i^* v_{i1}}{\sqrt{1-\rho_i^{2*}}}\right],$$

where $\phi$ and $\Phi$ denote the univariate standard normal distribution density function and cumulative distribution function, respectively. To calculate $\mathrm{g}_{i2}$, $v_{i2}$ is replaced with $v_{i1}$, and $v_{i1}$ is replaced with $v_{i2}$ in equation (15). Values of $\beta_m$ and $\rho$ that maximize the log-likelihood

function are determined by simultaneously setting the derivatives shown in equations (13) and (14) equal to zero. In the case of zero correlation (i.e., $\rho_i^* = 0$), $g_{i1}$ equals $\phi(v_{i1})\Phi(v_{i2})$, $\Phi_2$ equals $\Phi(v_{i1})\Phi(v_{i2})$, and $\phi_2$ equals $\phi(v_{i1})\phi(v_{i2})$. Therefore, the derivative of the log-likelihood function with respect to $\beta_m$ (i.e., equation 13) simplifies to the first-order conditions of a univariate probit regression when $\rho_i^* = 0$.

***Wald Test***

We used the Wald test to determine if there was correlation between the error terms associated with equations (6) and (7). The Wald test (i.e., $\lambda_{WALD}$) is defined as (Greene, 2012):

$$\lambda_{WALD} = \left[\hat{\rho}_{MLE} / \sqrt{\text{Est. Asy. Var}[\hat{\rho}_{MLE}]}\right]^2, \tag{16}$$

where $\hat{\rho}_{MLE}$ represents the estimated $\rho$ value for the bivariate probit regression, and $\text{Est. Asy. Var}[\hat{\rho}_{MLE}]$ represents the estimated asymptotic variance of $\hat{\rho}_{MLE}$. Specifically, the Wald test checks for the absence of correlation between errors terms which is represented by the null hypothesis $H_0: \rho = 0$. To test the null hypothesis, we used a chi-squared distribution with one degree of freedom. If the Wald test statistic is greater than or equal to a critical value associated with a specific confidence level, then the null hypothesis is rejected. A rejection of the null hypothesis indicates that the errors terms in equations (6) and (7) are correlated, and therefore, using a bivariate probit regression is appropriate when estimating the parameters.

***Marginal Effects***

The joint probability that a farmer is willing to sell produce through FSM given the two market scenarios presented to them ($y_{i1} = 1, y_{i2} = 1$) is defined as (Greene, 2012; Edge et al., 2018):

$$\Phi_{y_{i1}=1;\, y_{i2}=1} = \text{Prob}\,[y_{i1} = 1, y_{i2} = 1 | x_i] = \Phi_2(x_i\beta_1, x_i\beta_2, \rho_i^*). \tag{17}$$

In the case that $\rho^* = 0$, continuous marginal effects are calculated separately according to their respective probit regressions. The univariate probability that a farmer participates in FSM at market scenario one or market scenario two ($y_{i1} = 1, y_{i2} = 1$) is defined as:

(18) $$\Phi_{y_{im}=1} = \text{Prob}(y_{im} = 1|x_i) = \Phi(x_i\beta_m) \text{ for } m = 1, 2.$$

If $\rho^* \neq 0$, then continuous marginal effects of the bivariate probit outcome are calculated by taking the derivative of equation (17) with respect to $x_{ik}$:

(19) $$\frac{\delta\Phi_{y_{i1}=1;\, y_{i2}=1}}{\delta x_{ik}} = \frac{\delta\Phi_2(x_i\beta_1, x_i\beta_2, \rho_i^*)}{\delta x_{ik}} = \Phi_{y_{i1}=1|\, y_{i2}=1}\phi_{y_{i2}=1}\beta_{2k} + \Phi_{y_{i2}=1|\, y_{i1}=1}\phi_{y_{i1}=1}\beta_{1k}.$$

This simply captured the change in the joint probabilities due to a one-unit change in $x_{ik}$. For the univariate regression in equation (18), the continuous marginal effects of participating in FSM at market scenarios one or two (i.e., $y_{i1} = 1,\ y_{i2} = 1$) is defined as:

(20) $$\frac{\delta\Phi_{y_{im}=1}}{\delta x_{ik}} = \phi(x_i\beta_m)\beta_{mk} \text{ for } m = 1, 2,$$

which captured the change in the univariate probabilities of a farmer participating in an FSM at market scenarios one and two due to a one-unit change in $x_{ik}$. The joint outcome where a farmer is willing to sell produce through FSM at both market scenarios one and two is equivalent to the farmer's maximum price discount over retail prices they are willing to accept (WTA) being above or equal to 30% (i.e., equation 21).

(21) $$\Phi_{y_{i1}=1;\, y_{i2}=1} = \text{Prob}\{25\% \leq \max \text{WTA} \;\&\; 30\% \leq \max \text{WTA}\}$$

Marginal effects will be also estimated for the following joint probabilities:

- Farmers are not willing to sell produce through FSM in market scenario one ($y_{i1} = 0$), and they are willing to sell produce through FSM in the second market scenario presented to them ($y_{i2} = 1$). This joint outcome is equivalent to a farmer's maximum price discount

over retail prices they are willing to accept being above or equal to 20% but below 25% (i.e., equation 22).

(22) $$\Phi_{y_{i1}=0;\, y_{i2}=1} = \text{Prob}\{25\% > \max \text{WTA} \geq\ 20\%\}$$

- Farmers are not willing to sell produce through FSM in market scenario one ($y_{i1} = 0$), and they are not willing to sell produce through FSM in the second market scenario presented to them ($y_{i2} = 0$). This joint outcome is equivalent to a farmer's maximum price discount over retail prices they are willing to accept being below 20% (i.e., equation 23).

(23) $$\Phi_{y_{i1}=0;\, y_{i2}=0} = \text{Prob}\{25\% > \max \text{WTA} \;\&\; 20\% > \max \text{WTA}\}$$

- Farmers are willing to sell produce through FSM in market scenario one ($y_{i1}$ =1), and they are not willing to sell produce through FSM in the second market scenario presented to them ($y_{i2} = 0$). This joint outcome is equivalent to a farmer's maximum price discount over retail prices they are willing to accept being above or equal to 25% but below 30% (i.e., equation 24).

(24) $$\Phi_{y_{i1}=1;\, y_{i2}=0} = \text{Prob}\{25\% \leq \max \text{WTA} < 30\%\}$$

***Multicollinearity***

The nonexperimental nature of the data collection process used in our study, might limit the use of the bivariate probit regression approach because of the lack of information provided by the survey sample. This shortage of information can occur from the lack of variable variation as well as the limited number of observations obtained in the data collection process (Judge et al., 1988). As a result, explanatory variables in the model could express an exact or near-exact linear combination of other explanatory variables (Judge et al., 1988). This is known as multicollinearity and could lead to inflated parameter variances, which could result in less

precise inferences related to estimated parameters (Greene, 2012). We used two methods to determine if multicollinearity existed among independent variables included in the regression, Condition Index (CI), and Variance Inflation Factor (VIF). Condition Index values greater than 20 indicate a moderate to serious multicollinearity problem (Belsley, Kuh, and Welsch, 1980; Greene, 2012). A VIF value of 10 or higher suggests a multicollinearity problem exists (STATA Corp LLC, 2021).

## CHAPTER SIX

## EMPIRICAL MODEL

In this section, we describe the explanatory variables to be included in the bivariate probit regression. Farmer and farm business characteristics we expect to be correlated with the dependent variable (i.e., farmers' willingness to sell produce through FSM) include farmer age ($age$), farm size ($farm\_size$), farm income dependence ($farm\_income\_dependence$), farmer education ($education$), farmer gender ($female$), and farmers market participation ($farmers\_market$). We also included explanatory variables that represented farmers' participation in different food justice activities. Explanatory variables associated with food justice activities that we expect to be correlated with willingness to sell produce through FSM include offering price discounts to low-income households ($low\_income\_household\_price$), donating produce to a food bank ($donate$), serving as a volunteer or leader in an organization with a food justice mission ($leader$), and offering on-farm, agricultural educational programs to communities ($edu\_programs$). Table 1 (see appendix) presents a description of explanatory variables included in the regression. The bivariate probit regression to be estimated is defined as:

$$\begin{aligned}(25)\quad Willingness\ to\ sell\ produce\ through\ FSM\ (y_{im}) = {} & \beta_{0m} + \beta_{1m} farm\_size_i + \\ & \beta_{2m} age_i + \beta_{3m} education_i + \beta_{4m} low\_income\_household\_price_i + \\ & \beta_{5m} donate_i + \beta_{6m} edu\_programs_i + \beta_{7m} leader_i + \beta_{8m} female_i + \\ & \beta_{9m} farm\_income\_dependence_i + \beta_{10m} farmers\_market_i + \varepsilon_{im}.\end{aligned}$$

Each explanatory variable included in the bivariate probit regression is associated with the expected utility function shown in equation (1). We use the explanatory variables to represent both non-farm income ($nfi$) and all other factors that could influence a farmer's willingness to sell produce through FSM ($z$). Explanatory variables that fall into the "all other factors" category

(i.e., $z$) include variables that measure farm business values (i.e., $donate$, $leader$, $low\_income\_household\_price$, and $edu\_programs$) and farmer and farm business characteristics (i.e., $age$, $farm\_size$, $education$, $female$, $and\ farmers'\_market$). On the other hand, the only explanatory variable associated with non-farm income ($nfi$) is farm income dependence. Although neither price nor volume variables are included in equation (25), both of those variables are taken into account by the respondents as they indicate their willingness to sell produce through FSM given specific market scenarios presented to them that include information about prices received and volume to be sold (see Chapter 4, data section).

We are interested in evaluating how farm size is related to farmers' willingness to sell produce through FSM because one of the main goals of food justice is connecting small- and medium-sized, limited-resource farmers to markets. With this in mind, we hypothesized that the size of the operation in terms of annual gross farm revenue ($farm\_size$)[10] could be correlated with farmers' willingness to sell produce through FSM. As suggested by Peterson et al. (2021), small farms are both more likely to (1) depend on value-based supply chains, such as FSM, as a source of revenue and (2) have value-based supply chains as one of their top three marketing channels. Therefore, we hypothesized that farmers with smaller operations are more likely to sell produce through FSM. However, farm size could limit the ability of a farmer to sell products through FSM. For example, small farms could be limited due to their inability to provide enough produce volume to satisfy FSM needs (Peterson et al., 2021). Therefore, there could also be a negative correlation between farm size and willingness to participate in FSM.

[10] We also measured farm size in terms of acres and obtained a similar interpretation to farm size in terms of annual gross farm revenue from the regression results. Nonetheless, the model with farm size measured in terms of annual gross farm revenue had a better fit to the data (i.e., lower Akaike Information Criterion).

Based on results presented by Montri, Chung, and Behe (2021), we inferred that farmers' dependence on farm income ($farm\_income\_dependence$) might also be correlated with their willingness to sell produce through FSM. For example, full-time farmers who rely heavily on farm income may be less likely to sell produce through FSM, given suggested price discounts that motivate them to sell produce through market outlets offering prices higher than what FSM could offer to maximize profits. Therefore, we specifically hypothesized that farmers' willingness to sell produce through FSM is negatively correlated with higher levels of farm income dependence.

In this study, we assume that farmers' values and motivations for farming will influence their willingness to sell produce through FSM. Results from Montri, Chung and Behe (2021), and Sitaker et al. (2020) suggest that farm business values and motivations are correlated with farmers' willingness to sell produce through market outlets with a food justice mission such as FSM. We assessed farmers' values and motivations by including variables that captured their engagement with food justice initiatives or activities, such as offering discounts to low-income households ($low\_income\_household\_price$), donating produce to food banks ($donate$), farmer involvement as a leader or a volunteer in an organization with a food justice mission ($leader$), and experience running educational programs to educate the community about sustainable agriculture and food systems ($edu\_programs$). We hypothesized that the values and motivations captured by the abovementioned explanatory variables are positively correlated with farmers' willingness to sell produce through FSM. We hypothesized that farmers who are already engaged in any of these food justice initiatives or activities are more likely to sell produce through FSM.

Farmer gender ($female$) could also be correlated with farmers' willingness to participate in FSM. As suggested by Newsome (2020) and Trauger et al. (2020), women farmers might use production and marketing strategies that differ from conventional strategies (e.g., conventional farming, wholesale) as ways to manage narrow profit margins and maintain the economic viability of their farms. Therefore, we hypothesized that women might be more likely to sell produce through non-conventional market outlets such as FSM. We captured respondent gender with a variable that takes the value of one if the survey respondent is a female and zero otherwise.

Farmers' willingness to sell produce through FSM could also be correlated with their use of farmers markets to sell their produce ($farmers\_market$). Based on results presented in previous studies by Kaiser et al. (2020), Pershing and Hendrickson (2017), and Pilgerman (2011), we inferred that farmers who sell produce through farmers markets might be less likely to sell produce through FSM due to the difference in prices received at farmers markets and FSM. Selling their produce at a lower price could result in decreased farm economic viability, which otherwise could be avoided by selling their produce for a premium price at a farmers market. On the other hand, some farmers who sell produce through farmers markets may be willing to sell through FSM due to the reduced labor and costs involved with marketing produce through FSM (Kaiser et al., 2020; Pilgerman, 2011). Therefore, we hypothesized that participating in farmers markets could have either a positive or negative correlation with farmers' willingness to sell produce through FSM.

Finally, we hypothesized that farmer characteristics such as age ($age$) and education ($education$) are correlated with farmers' willingness to sell produce through FSM. Previous studies suggested that older farmers are less likely to adopt new farming practices, technology, or

marketing strategies (Davis, 2012; Dong, Campbell, and Robinowitz, 2019; Edge et al., 2018; Walton et al., 2008; Zhong, Qing, and Hu, 2016). Therefore, we hypothesized that older farmers have shorter planning horizons and, thus, might be less likely to change or modify their marketing strategies. We specifically expect a negative correlation between farmers' age and willingness to sell produce through FSM. On the other hand, we hypothesized that education is correlated with farmers' willingness to sell produce through FSM because we expect knowledge and information to affect marketing or market outlet choice decisions (Pilgerman, 2011; Edge et al., 2018; Zhong, Qing, and Hu, 2016). Those decisions could be to sell but also to not sell produce through FSM. Thus, we are uncertain about the sign of the correlation between farmer education and willingness to sell produce through FSM.

# CHAPTER SEVEN

# RESULTS AND DISCUSSION

## *Sample Overview and Descriptive Statistics*

As mentioned in the data section, only 112 observations were available for analysis due to the elimination of respondents who did not produce fruits and vegetables in 2019 and have sold produce through FSM managed by New Roots Inc. Of the 112 observations, 42 were eliminated due to missing values, thus leaving 70 observations to be included in the regression sample. Figure 2 provides an illustration of respondents' willingness to sell produce through FSM at market scenario two according to their willingness to sell produce through FSM at market scenario one. Respondents who were willing to sell produce through FSM at market scenario one when prices paid were 25% below retail prices were directed to market scenario two when prices paid were 30% below retail prices. On the other hand, respondents who were unwilling to sell produce through FSM at market scenario one when prices paid were 25% below retail prices were directed to market scenario two when prices paid were 20% below retail prices. More than half of the respondents included in the regression analysis, approximately 61%, were willing to sell produce through FSM at market scenario one when prices paid were 25% below retail price. Of the 61% who were willing to sell produce through FSM at market scenario one, 60% were still willing to sell produce through FSM at market scenario two when prices paid were 30% below retail prices. On the other hand, nearly 19% of respondents who were not willing to sell produce through FSM at market scenario one changed their decision and were willing to sell produce through FSM at market scenario two when prices paid were 20% below retail prices.

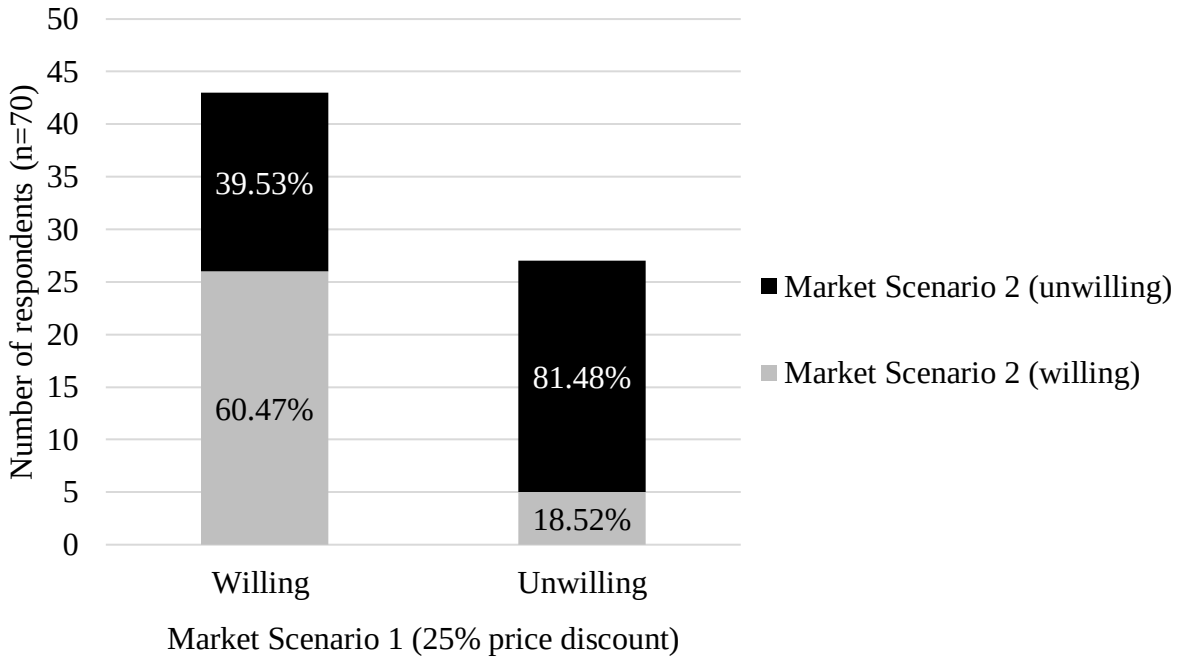


**Figure 2**. Respondents' willingness to sell produce through FSM at market scenario two given their willingness to sell produce through FSM at market scenario one (n=70).
Note. Respondents willing to sell produce through FSM at market scenario one were presented a 30% price discount in market scenario two, and respondents unwilling to sell produce through FSM at market scenario one were presented a 20% price discount in market scenario two.

Table 1 (see appendix) presents the explanatory variables' means and standard deviations. The average age of the respondents included in the regression sample was approximately 58 years. The average farm size in terms of annual gross farm revenue for 30% of respondents was greater than $25,000. Furthermore, 30% of respondents indicated that 25% or more of their taxable income came from farming. Seventy percent of respondents indicated that they attained a bachelor's degree or higher and 41% of the respondents in the regression sample were female. Nearly 73% of the respondents indicated that they sold produce through farmers markets in 2019. In terms of farmers' participation in food justice activities, donating produce to food banks ($donate$) was the activity most survey respondents engaged with. Approximately 63% of respondents included in the regression sample indicated that they donated produce to food banks. The second and third most prevalent food justice activities respondents engaged with were serving as a leader or volunteer in an organization with a food justice mission (31%) and running on-farm educational programs (29%). Lastly, offering price discounts to low-income households was the least prevalent food justice activity respondents engaged with (19%).

***Analysis of Bivariate Probit Parameter Estimates and Marginal Effects***

Parameter estimates from the bivariate probit and individual probit regressions for equations (6) and (7) are presented in Table 2 (see appendix). The results from the individual probit regression are presented for comparison purposes only. The robust or sandwich estimator of variance is used to estimate standard errors (Stata Corp LLC, 2021) that allow us to make statistically valid inferences in the presence of various misspecifications (e.g., heteroskedasticity). Results from the Wald test evaluating the correlation ($\rho$) between $\varepsilon_{i1}$and $\varepsilon_{i2}$ in equations (6) and (7), suggest $\rho$ is statistically significant at the one percent significance level. This result suggests that $\varepsilon_{i1}$and $\varepsilon_{i2}$ are correlated and that the bivariate probit regression is

appropriate for estimating the parameters in equations (6) and (7). The Wald test statistic evaluating the overall significance of the bivariate probit regression suggests at least one of the independent variables included in the regression is different than zero, and that removing all independent variables from the model will harm the fit of the regression.

Four of the ten variables included in the bivariate probit regression (see equation 25) had statistically significant parameters at various significance levels (i.e., 1%, 5%, and 10%) for market scenario one (i.e., 25% price discount over retail prices). The individual probit regression results suggested the same variables' parameters were statistically significant at the same significance levels, with the exception of $farm\_income\_dependence$, when compared to the bivariate probit regression estimates, but the magnitudes of the estimated parameters were different. Specifically, results suggest that farm size in terms of annual gross farm revenue ($farm\_size$), farm operator's gender ($female$), and experience as a leader or volunteer in an organization with a food justice mission ($leader$) are negatively correlated with survey respondents' willingness to sell produce through FSM at market scenario one. In contrast, running on-farm education programs about sustainable agriculture and/or food systems for the community ($edu\_programs$) was positively correlated with respondents' willingness to sell produce through FSM at market scenario one. We could infer from regression results that female farm operators reporting an annual gross farm revenue equal to or greater than $25,000 per year and who have been involved as leaders or volunteers in a food justice-related organization are less likely to be willing to sell produce through FSM when prices paid to farmers at this market outlet are 25% below the price they could receive at other retail outlets including farmers markets and CSAs. A possible explanation for female respondents being less likely to sell produce through FSM is the different roles male and female farm operators might take on in the

household. Female farm operators could be responsible for additional household tasks (e.g., childcare) on top of being responsible for the farm business, deterring them from adding a new market outlet to their marketing strategy (Inwood and Stengel, 2020). Additionally, survey respondents who have experience as leaders or volunteers in food justice-related organizations could have particular insights about the challenges related to running and sustaining organizations or market outlets with a food-justice related mission such as revenue volatility and human capital requirements that deter them from selling produce through FSM (Velandia et al., 2021). Parameter estimates for market scenario two (i.e., 20% or 30% below retail prices) suggested respondents' willingness to sell produce through FSM is positively correlated with the variable capturing information about whether farm operators are already offering produce at a discounted price to low-income households ($low\_income\_household\_price$). On the other hand, farm operator age ($age$) and dependence on farm income ($farm\_income\_dependence$) are negatively correlated with respondents' willingness to sell produce through FSM when prices paid are 20% or 30% below retail prices. We could infer from the regression results that younger farmers earning less than 25% of their taxable household income from farming and already offering produce at a discounted price to low-income households are more likely to be willing to sell produce through FSM when prices paid are 20% or 30% below retail prices.

The marginal effects of the bivariate probit regression for the various joint probability scenarios evaluated in this study are presented in Table 3 (see appendix). Three independent variables had statistically significant marginal effects on the survey respondents' willingness to sell produce through FSM at market scenarios one and two (i.e., $y_1 = 1, y_2 = 1$). These three variables were farm operator age ($age$), farm operator gender ($female$), and dependence on farm income ($farm\_income\_depedence$). The results suggested that a one-year increase in

farm operator age resulted in a one percent decrease in the likelihood of a respondent being willing to sell produce through FSM at a 25% and 30% price discount over retail prices. Additionally, female farm operators and respondents earning 25% or more of their taxable household income from farming were 25% and 26% less likely to sell produce through FSM at the 25% and 30% price discount levels, respectively.

Three variables had statistically significant marginal effects on the joint probability that a respondent would not be willing to sell produce through FSM at market scenario two and would be willing to sell produce at market scenario one (i.e., $y_1 = 1, y_2 = 0$). These variables are offering produce at a discounted price to low-income households ($low\_income\_household\_price$), dependence on farm income ($farm\_income\_dependence$), and having experience as a leader or volunteer in an organization with food justice-related mission ($leader$). Survey respondents already offering their produce at a discounted price to low-income households were 30% less likely to not be willing to sell produce through FSM at the 30% price discount level and be willing to sell their produce through FSM at a 25% price discount level. Additionally, survey respondents with experience as a leader or a volunteer in an organization with a food justice-related mission were 21% less likely to not be willing to sell produce through FSM at the 30% price discount level and be willing to sell produce through FSM at the 25% price discount level. In contrast, those respondents having 25% or more of their taxable household income from farming were 43% more likely to not be willing to sell produce through FSM at the 30% price discount level and be willing to sell produce through FSM at the 25% price discount level.

Marginal effects associated with the probability of not being willing to sell produce through FSM at market scenario one and being willing to sell produce through FSM at market

scenario two (i.e., $y_1 = 0, y_2 = 1$) were also evaluated. The marginal effects of three independent variables were statistically significant for this joint probability scenario. These variables included whether or not a respondent indicated offering on-farm education programs related to sustainable agriculture and/or food systems to the community ($edu\_programs$), farmer experience as a leader or volunteer in an organization with a food justice-related mission ($leader$), and dependence on farm income ($farm\_income\_dependence$). Respondents who indicated offering on-farm education programs related to sustainable agriculture and/or food systems to the community and having 25% or more of their taxable household income from farming were 7% and 9% less likely to be willing to sell produce through FSM at the 20% price discount level and not be willing to sell produce at the 25% discount level, respectively. In contrast, respondents who have experience as a leader or volunteer in an organization with a food justice-related mission were 9% more likely to be willing to sell produce through FSM at the 20% price level and not be willing to sell produce at the 25% discount level.

Finally, three variables had statistically significant marginal effects on the joint probability scenario where a respondent is unwilling to sell produce through FSM at market scenarios one and two (i.e., $y_1 = 0, y_2 = 0$). Those variables were farm size in terms of annual gross farm revenue ($farm\_size$), whether or not a respondent indicated offering on-farm education programs related to sustainable agriculture and/or food systems to the community ($edu\_programs$), and farm operator gender ($female$). Respondents who indicated they had an annual gross farm revenue equal to or greater than $25,000 and were female were 26% and 30% more likely to not be willing to sell produce through FSM regardless of the market scenario they are presented with, respectively. In contrast, respondents who indicated running educational programs related to sustainable agriculture and/or food systems for their communities were 38%

less likely to not be willing to sell produce through FSM regardless of the market scenario presented to them.

# CHAPTER EIGHT

# CONCLUSION

The mission of the food justice movement is to address societal inequality and disparity issues through food system restructuring. Some specific issues addressed by the food justice movement include unequal access to food among households, the wellness of farmworkers, and social, economic, and environmental sustainability of family farms, among other related elements. As suggested in the literature review section, the vast majority of the literature related to food justice in the context of local food systems has focused on strategies to increase consumer access to fresh fruits and vegetables through local and regional market outlets, but only a few studies have evaluated farmers' experiences with food justice activities. This study adds to the very scarce literature related to farmers' experience with food justice activities by exploring farmers' willingness to sell produce through markets with a food justice mission, specifically FSM.

Given the apparent success of the FSM model in addressing various food justice goals (FSM have been in business for 13 years), communities in other states might be interested in replicating the FSM model. One of the key components of the FSM model is the farmers selling fresh produce through FSM. Therefore, exploring the factors influencing farmers' willingness to sell produce through market outlets with a food justice mission like FSM is critical for the understanding of how a community could successfully replicate the FSM model. Therefore, the main objective of this study was to evaluate the factors correlated with farmers' willingness to sell produce through FSM. A survey of Kentucky and Tennessee fruit and vegetable farmers and a bivariate probit regression were used to accomplish this goal.

According to the bivariate probit regression results, specific farmer and farm business characteristics correlated with survey respondents' willingness to sell produce through FSM included farm operator age, farm operator gender, farm size in terms of annual gross farm revenue, dependence on farm income, and farmer engagement with certain food justice activities such as running on-farm education programs related to sustainable agriculture and/or food systems to the community, offering produce at a discounted price to low-income households, and experience as a leader or volunteer in organizations with a food justice-related mission. However, the correlation of these variables with respondents' willingness to sell produce through FSM varies depending on the market scenario respondents are presented with (i.e., 25%, 20% or 30% price discounts below retail prices). This is also the case for the factors correlated with the various joint probability scenarios when estimating the marginal effects. For example, at a 25% price discount scenario, operator gender, farm size in terms of gross revenue, and engagement with specific food justice activities (i.e., offering education programs and involvement in organizations with a food justice mission) are significantly correlated with respondents' willingness to sell produce through FSM. In contrast, age, income dependence, and offering price discounts to low-income families (a food justice-related activity) are correlated with respondents' willingness to sell produce through FSM at 30% and 20% price discount scenarios. For the various joint probability scenarios used in the marginal effects estimations, although there is variation in the variables correlated with the joint probability outcomes, farm income dependence seems to be a variable that is statistically significantly correlated with almost all joint probability outcomes. We could infer from these results that respondents' willingness to sell produce through FSM is highly sensitive to their household dependence on farm income, with respondents who are more dependent on farming income being less likely to take the risk of

participating in market outlets that could result in a decreased farm revenue due to lower prices when compared to other market outlets.

It is important to note that even though there is variation in the factors correlated with respondents' willingness to sell produce through FSM, many of the factors that are significantly correlated with this inclination are related to farming business values and motivations for farming that are indirectly captured in this study through variables indicating farmer engagement with various food justice activities (e.g., offering price discounts to low-income families, efforts to educate the community about sustainable agriculture and food systems) and farm income dependence. This information might help communities interested in replicating the FSM model assess the number of farmers with this profile likely to sell produce through FSM in their communities. Furthermore, this information could help organizations interested in replicating the FSM model to design strategies aiming to engage farmers with business values and farming motivations that align with the FSM food justice mission. Finally, this information could help managers of existent FSM identify areas of improvement in their FSM structure to better accommodate or support farmers willing to participate in FSM who are currently not selling produce through FSM. For example, there might be time constraints for farmers running educational programs on their farms or participating as leaders or volunteers in the food justice-related organizations that prevent them from selling produce through FSM. Facilitating the logistics associated with delivering produce to FSM could increase the participation of these types of farmers in FSM.

While this study identifies factors correlated with Tennessee and Kentucky farmers' willingness to sell produce through FSM, there are limitations of this study that can be improved upon in future research. For example, the sample size available for the bivariate probit regression

used in this study was relatively small and was limited to specific regions in Tennessee and Kentucky. Therefore, we cannot confidently generalize the results and conclusions for this study and apply them to farmers located outside the geographic regions included in the regression sample. As a result, future research should focus on expanding its population to account for more farmers located in a much larger geographic area. Furthermore, future research should also look to determine the specific price discounts farmers are willing to accept for their produce when selling produce through FSM. The survey design used for this study did not allow us to assess willingness to accept estimates. Future studies could improve the survey design to allow for these estimates. These estimates will provide organizations interested in replicating the FSM model with valuable information regarding the specific price discounts farmers are willing to accept when looking to attract suppliers for the market. This information will help prevent these organizations from setting price discounts that could negatively impact farm net profits, and therefore, farmer participation in FSM.

## LIST OF REFRENCES

Aydogdu, M. H., & Bilgic, A. (2016). An evaluation of farmers' willingness to pay for efficient irrigation for sustainable usage of resources: the GAP-Harran Plain case, Turkey. *Journal of Integrative Environmental Sciences*, *13*(2-4), 175-186. https://doi.org/10.1080/1943815X.2016.1241808

Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics : identifying influential data and sources of collinearity*, Wiley.

Bradford, V. A., Quinn, E. L., Walkinshaw, L. P., Rocha, A., Chan, N. L., Saelens, B. E., & Johnson, D. B. (2019). Fruit and vegetable access programs and consumption in low-income communities. *Journal of Hunger and Environmental Nutrition*, *14*(6), 780-795. https://doi.org/10.1080/19320248.2018.1498819

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrcis Using STATA*, (Revised e.d.). StataCorp LP.

Chase, C. (2020). *Evaluating marketing outlets.* Iowa State University Extension and Outreach. https://store.extension.iastate.edu/product/16010

Conner, D., & Rangarajan, A. (2009). Production costs of organic vegetable farms: Two case studies from Pennsylvania. *HortTechnology*, *19*(1), 193-199. https://doi.org/10.21273/HORTSCI.19.1.193

Cotter, E. W., Teixeira, C., Bontrager, A., Horton, K., & Soriano, D. (2017). Low-income adults' perceptions of farmers' markets and community-supported agriculture programmes. *Public Health Nutrition*, *20*(8), 1452-1460. https://doi.org/10.1017/S1368980017000088

Davis, A. D. (2012). *Locally grown produce as a marketing strategy: Producer perceptions of state sponsored marketing programs* [Master's thesis, University of Tennessee,

Knoxville]. Tennessee Research and Creative Exchange. https://trace.tennessee.edu/utk_gradthes/1147/

DeLong, K. L., Jensen, K. L., Upendram, S., & Eckelkamp, E. A. (2020). Consumer preferences for Tennessee milk. *Journal of Food Distribution Research*, *51*(2),111–130. https://doi.org/10.22004/ag.econ.305485

Dobbs, L. M., Jensen, K. L., Leffew, M. B., English, B. C., Lambert, D. M., & Clark, C. D. (2016). Consumer willingness to pay for Tennessee beef. *Journal of Food Distribution Research, 47*(2), 38-61. https://doi.org/10.22004/ag.econ.240768

Dong, H., Campbell. B., & Rabinowitz, A. N. (2019). Factors impacting producer marketing through Community Supported Agriculture. *PLOS ONE, 14*(7). https://doi.org/10.1371/journal.pone.0219498

Edge, B., Velandia, M., Boyer, C., Larson,. J., Lambert, D., Roberts, R., Wilson, B., Buschermohle, M., English, B., Rejesus, R., & Falconer, L. (2018). Automatic section control technologies and GPS auto-guidance systems adoption in cotton production. *Journal of Agricultural Science, 10*(7), 282-293. https://doi.org/10.5539/jas.v10n7p282

Food and Agricultural Organization of the United Nations. (2020). *Food: It's a human right.* Retrieved February 26, 2021, from http://www.fao.org/fao-stories/article/en/c/ 1333853/

Food and Agricultural Organization of the United Nations. (2000). *Applications of the Contingent Valuation Method in developing countries: A survey*. http://www.fao.org/3/X8955E/x8955e00.htm#TopOfPage

Gottlieb, R., & Joshi, A. (2010). *Food justice*. MIT Press.

Greene, W.H. (2012). *Econometric analysis*, (7th ed). Prentice Hall.

Hanson, K. L., Garner, J., Connor, L. M., Jilcott Pitts, S. B., McGuirt, J., Harris, R., Kolodinsky, J., Wang, W. W., Sitaker, M., Ammerman, A., & Seguin, R. A. (2019). Fruit and vegetable preferences and practices may hinder participation in Community-Supported Agriculture among low-income rural families. *Journal of Nutrition Education and Behavior*, *51*(1), 57-67. https://doi.org/10.1016/j.jneb.2018.08.006

Hardesty, S. D., & Leff, P. (2010). Determining marketing costs and returns in alternative marketing channels. *Renewable Agriculture and Food Systems*, *25*(1), 24-34. https://doi.org/10.1017/S1742170509990196

Hodgins, K. J., & Fraser, E. D. G. (2018). "We are a business, not a social service agency." Barriers to widening access for low-income shoppers in alternative food market spaces. *Agriculture and Human Values*, *35*(1), 149-162. https://doi.org/10.1007/s10460-017-9811-y

Hyden, H. (2017). *Cultivating a culture of food justice: Impacts of community-based economies on farmers and neighborhood leaders in the case of Fresh Stop Markets in Kentucky* [Master's thesis, University of Kentucky]. Theses and Dissertations—Community & Leadership Development. https://doi.org/10.13023/ETD.2017.018

Inwood, S., & Stengel, E. (2020). Working households: Challenges in balancing young children and the farm enterprise. *Community Development*, *51*(5), 499-517. https://doi.org/10.1080/15575330.2020.1800772

Judge, G., Carter, H., Griffiths, W., Lütkepohl, H., & Tsoung, C. L. (1988). *Introduction to the theory and practice of econometrics,* 2nd ed. Wiley.

Kaiser, M. L., Ryan-Simkins, K., Dionne, J., & Pence, E. K. (2020). Connecting small-scale producers and consumers: Exploring the feasibility of online food hubs in low-income

communities. *Journal of Agriculture Food Systems and Community Development*, *9*(3), 179-196. https://doi.org/10.5304/jafscd.2020.093.019

Kasprzak, C. M., Sauer, H. A., Schoonover, J. J., Lapp, M. M., & Leone, L. A. (2021). Barriers and facilitators to fruit and vegetable consumption among lower-income families: Matching preferences with stakeholder resources. *Journal of Hunger & Environmental Nutrition*, *16*(4), 490-508. https://doi.org/10.1080/19320248.2020.1802383

Kay, R. D., Edwards, W. M., & Duffy, P. A. (2008). *Farm management* (6th ed.). McGraw-Hill.

McKay, L., DeLong, K. L., Jensen, K. L., Griffith, A. P., Boyer, C. N., & Lambert, D. M. (2019a). Restaurant willingness to pay for local beef. A*gribusiness: An International Journal*, *35*(4), 610–624. https://doi.org/https://doi.org/10.1002/agr.21605

McKay, L., DeLong, K. L., Schexnayder, S., Griffith, A. P., Taylor, D. B., Olafson, P., & Trout Fryxell, R. T. (2019b). Cow-calf producers' willingness to pay for bulls resistant to horn flies (Diptera: Muscidae). *Journal of Economic Entomology*, *112*(3), 1476-1484. https://doi.org/10.1093/jee/toz013

McGuirt, J. T., Jilcott Pitts, S. B., Hanson, K. L., DeMarco, M., Seguin, R. A., Kolodinsky, J., Becot, F., & Ammerman, A. S. (2020). A modified choice experiment to examine willingness to participate in a Community Supported Agriculture (CSA) program among low-income parents. *Renewable Agriculture and Food Systems*, *35*(2), 140-157. https://doi.org/10.1017/s1742170518000364

Montri, D., Chung, K., & Behe, B. (2021). Farmer perspectives on farmers markets in low-income urban areas: A case study in three Michigan cities. *Agriculture and Human Values*, *38*(1), 1-14. https://doi.org/10.1007/s10460-020-10144-3

New Roots. (2022). *About*. Retrieved February 26, 2021, from https://newroots.org/about/

Newsome, L. (2020). Beyond ‘get big or get out’: Female farmers’ responses to the cost-price squeeze of Australian agriculture. *Journal of Rural Studies, 79*, 57-64. https://doi.org/10.1016/j.jrurstud.2020.08.040

Pershing, M., & Hendrickson, M. (2017). The impact on farmers selling into low-income communities: A literature review. https://www.feedingflorida.org/cms/resources/fab_resources/rafiliteraturereviewimpactoffarmerssellingintolowincomecommunitiesjuly-2017.pdf

Peterson, H. H., Feenstra, G., Ostrom, M., Tanaka, K., Brekken, C. A., & Engelskirchen, G. The value of values-based supply chains: farmer perspective. (2021) *Agriculture and Human Values*. *39*, 385-403. https://doi.org/10.1007/s10460-021-10255-5

Pilgeram, R. (2011). The only thing that isn’t sustainable is the farmer: Social sustainability and the politics of class among Pacific Northwest farmers engaged in sustainable farming. *Rural Sociology, 76*(3), 375-393. https://doi.org/10.1111/j.1549-0831.2011.00051.x

Quandt, S. A., Dupuis, J., Fish, C., & D’Agostino, R. B., Jr. (2013). Feasibility of using a Community-Supported Agriculture program to improve fruit and vegetable inventories and consumption in an underresourced urban community. *Preventing Chronic Disease, 10*,(E136). Article 130053. https://doi.org/10.5888/pcd10.130053

Sitaker, M., McCall, M., Belarmino, E. H., Wang, W. W., Kolodinsky, J., Becot, F., McGuirt, J. T., Ammerman, A. S., Jilcott Pitts, S. B., & Seguin-Fowler, R. A. (2020). Balancing social values with economic realities: Farmer experience with cost-offset Community Supported Agriculture. *Journal of Agriculture Food Systems and Community Development*, *9*(4), 29-43. https://doi.org/10.5304/jafscd.2020.094.004

Stata Corp LLC. (2021). *Stata base reference manual release 17.* https://www.stata.com/bookstore/base-reference-manual/#contents

The Kentucky Department of Agriculture. (2022). *Kentucky Proud.* Retrieved May 21, 2022, from http://www.kyproud.com/

Trauger, A., Sachs, C., Barbercheck, M., Brasier, K., & Kiernan, N. E. (2010). "Our market is our community": Women farmers and civic agriculture in Pennsylvania, USA. *Agriculture and Human Values, 27*(1), 43-55. https://doi.org/10.1007/s10460-008-9190-5

United States Department of Agriculture Economic Research Service. (2008). Can low-income Americans afford a healthy diet? *Amber Waves*. https://www.ers.usda.gov/amber-waves/2008/november/can-low-income-americans-afford-a-healthy-diet/

United States Department of Agriculture Economic Research Service. (2021). *Definition of food security*. Retrieved March 28, 2022, from https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/definitions-of-food-security/#:~:text=Food%20insecurity%E2%80%94the%20condition%20assessed,may%20result%20from%20food%20insecurity.

United States Department of Agriculture Economic Research Service. (2021). *Documentation*. Retrieved March 28, 2022, from https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation/

United States Department of Agriculture (2021). *2017 Census of Agriculture.* Census Data Query Tool (CDQT). Washington, DC: U.S. Department of Agriculture, National Agricultural Statistics Service. Retrieved December 16, 2021, from https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1

Velandia, M., DeLong, K. L., Wszelaki, A., Schexnayder, S., Clark, C., & Jensen, K. (2020a). Use of polyethylene and plastic biodegradable mulches among Tennessee fruit and vegetable growers. *HortTechnology, 30*(2), 212-218. https://doi.org/10.21273/HORTTECH04559-19

Velandia, M., Rejesus, R., Clark, C., DeLong, K. L., Wszelaki, A., Schexnayder, S., & Jensen, K. (2020b). Evaluating the relationship between fruit and vegetable growers use of plastic biodegradable mulches, and environmental stewardship and labor savings: The case of Tennessee fruit and vegetable farmers. *Sustainability, 12*(5), 2075. https://doi.org/10.3390/su12052075

Velandia, M., Trejo-Pech, C., Moskowitz, K., Tanaka, K., Hyden, H., Rignall, K., & Del Brocco, A. (2021). Financial sustainability of nonprofit organizations covering multiple goals of the food justice mission: The case of New Roots, inc. *Journal of Food Distribution Research*, *52*(3), 63-87. https://www.fdrsinc.org/wp-content/uploads/2022/01/JFDR52.3_4_Velandia-1.pdf

Walton, J. C., Lambert, D. M., Roberts, R. K., Larson, J. A., English, B., Larkin, S. L., Martin, S. W., Marra, M. C., Paxton, K. W. & Reeves, J. M. (2008). Adoption and abandonment of precision soil sampling in cotton production. *Journal of Agricultural and Resource Economics*, *33*(3), 428-448. http://dx.doi.org/10.22004/ag.econ.46556

Wolf, C. A., & Widmar, N. J. O. (2014). Adoption of milk and feed forward pricing methods by dairy farmers. *Journal of Agricultural and Applied Economics, 46*(3), 527-541. http://dx.doi.org/10.22004/ag.econ.189100

Zhong, H., Qing, P., & Hu, W. (2016). Farmers' willingness to participate in best management practices in Kentucky. *Journal of Environmental Planning and Management, 59*(6), 1015-1039. https://doi.org/10.1080/09640568.2015.1052379

# APPENDIX

**Table 1.** Regression sample explanatory variable description and summary statistics (n=70).

| Variable | Description | Hypothesis Sign | Mean | Standard Deviation |
|---|---|---|---|---|
| *Age* | Quantitative variable that represents the respondent's age in years. | - | 57.943 | 13.616 |
| *Farm Size* | Qualitative variable that represents farm size in terms of annual gross farm revenue. (= 1 if revenue ≥ $25,000; 0 if revenue < $25,000). | - | 0.300 | 0.462 |
| *Farm Income Dependence* | Qualitative variable that represents the respondents' percentage of taxable income coming from farming in 2019 (=1 if % of taxable income ≥ 25%; 0 if % of taxable income < 25%). | - | 0.300 | 0.462 |
| *Farmers market* | Qualitative variable that represents respondents' participation in farmers markets (=1 if yes, 0 otherwise). | +/- | 0.729 | 0.448 |
| *Education* | Qualitative variable that represents education level (= 1 education ≥ bachelor/graduate degree; 0 otherwise). | +/- | 0.700 | 0.462 |
| *Low-Income Household Price* | Qualitative variable that indicates if a farmer offers a price discount to low-income households (= 1 if yes; 0 otherwise). | + | 0.186 | 0.392 |
| *Donate* | Qualitative variable that indicates if a farmer donates produce (= 1 if yes; 0 otherwise). | + | 0.629 | 0.487 |
| *Edu. Programs* | Qualitative variable that indicates if a farmer runs educational programs to educate the community about sustainable agriculture and food systems (= 1 if yes; 0 otherwise). | + | 0.286 | 0.455 |
| *Leader* | Qualitative variable that indicates if a farmer has been involved as a leader or volunteer in an organization with a food justice mission (= 1 if yes; 0 otherwise). | + | 0.314 | 0.468 |
| *Female* | Qualitative variable that indicates if a farmer is a female (=1 if female; 0 if male). | + | 0.414 | 0.496 |

**Table 2.** Parameter estimates for the FSM market scenario one and market scenario two participation equations from the bivariate probit and individual probit regressions with robust standard errors.

| Independent Variables | Parameter Estimates for the Bivariate Probit Regression | | Parameter Estimates for the Individual Probit Regression | |
|---|---|---|---|---|
| | Market Scenario 1 | Market Scenario 2 | Market Scenario 1 | Market Scenario 2 |
| *Constant* | 1.003 | 1.616* | 0.771 | 1.572 |
| | (1.072) | (0.976) | (1.036) | (1.037) |
| *Age* | -0.013 | -0.029** | -0.011 | -0.028** |
| | (0.014) | (0.014) | (0.014) | (0.014) |
| *Farm Size* | -0.702* | -0.615 | -0.748* | -0.621 |
| | (0.420) | (0.565) | (0.411) | (0.611) |
| *Education* | 0.152 | 0.037 | 0.187 | -0.004 |
| | (0.373) | (0.357) | (0.368) | (0.365) |
| *Low-Income Household Price* | -0.027 | 0.101** | -0.020 | 0.108** |
| | (0.049) | (0.047) | (0.048) | (0.048) |
| *Donate* | 0.063 | 0.310 | 0.118 | 0.236 |
| | (0.401) | (0.360) | (0.378) | (0.371) |
| *Edu. Programs* | 0.154*** | 0.044 | 0.139*** | 0.057 |
| | (0.053) | (0.042) | (0.049) | (0.042) |
| *Leader* | -0.841** | -0.042 | -0.811** | 0.104 |
| | (0.404) | (0.377) | (0.393) | (0.378) |
| *Farm Income Dependence* | 0.478 | -0.981 ** | 0.538 | -0.998* |
| | (0.349) | (0.501) | (0.417) | (0.551) |
| *Farmers market* | 0.461 | 0.099 | 0.488 | 0.096 |
| | (0.403) | (0.391) | (0.396) | (0.366) |
| *Female* | -0.878** | -0.582 | -0.803** | -0.619 |
| | (0.381) | (0.375) | (0.376) | (0.405) |
| *n* | 70 | | 71 | 70 |
| *Log pseudo-likelihood value* | -68.674 | | -37.055 | -37.696 |
| Wald $\chi 2$ | 39.27*** | | 17.65* | 12.66 |
| *Rho* | 0.740 | | | |
| *Wald Test Statistic* | 10.125*** | | | |

Note. Values in parenthesis are robust standard errors. Statistical significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively.

**Table 3.** Marginal effects on FSM participation joint probabilities from bivariate probit regression.

| | $y_1 = 1$ $y_2 = 1$ | $y_1 = 1$ $y_2 = 0$ | $y_1 = 0$ $y_2 = 1$ | $y_1 = 0$ $y_2 = 0$ |
|---|---|---|---|---|
| *Age* | -0.010** | 0.005 | -0.001 | 0.006 |
| | (0.005) | (0.004) | (0.001) | (0.005) |
| *Farm Size* | -0.237 | -0.029 | 0.007 | 0.259* |
| | (0.158) | (0.160) | (0.053) | (0.147) |
| *Education* | 0.025 | 0.031 | -0.010 | -0.046 |
| | (0.121) | (0.126) | (0.042) | (0.119) |
| *Low-Income Household Price* | 0.194 | -0.295*** | 0.190 | -0.090 |
| | (0.174) | (0.087) | (0.123) | (0.130) |
| *Donate* | 0.101 | -0.078 | 0.019 | -0.043 |
| | (0.125) | (0.126) | (0.033) | (0.132) |
| *Edu. Programs* | 0.241 | 0.209 | -0.067** | -0.382*** |
| | (0.159) | (0.143) | (0.032) | (0.106) |
| *Leader* | -0.106 | -0.211*** | 0.090* | 0.227 |
| | (0.139) | (0.081) | (0.047) | (0.145) |
| *Farm Income Dependence* | -0.264** | 0.432*** | -0.087* | -0.081 |
| | (0.132) | (0.150) | (0.051) | (0.107) |
| *Farmers market* | 0.075 | 0.100 | -0.036 | -0.138 |
| | (0.136) | (0.104) | (0.046) | (0.141) |
| *Female* | -0.249** | -0.074 | 0.026 | 0.297** |
| | (0.121) | (0.100) | (0.037) | (0.125) |

Note. Statistical significance at the 10%, 5%, and 1% levels are indicated by *, **, and *** respectively

**Table 4.** Regression sample representativeness in terms of acres in fruit and vegetable production.

| | | Fruit and Vegetable Acres | | |
|---|---|---|---|---|
| | | *Mean* | *Median* | *Standard Deviation* |
| *Kentucky* | **Regression Sample** | 6.60 | 2.00 | 10.44 |
| | **Population*** | 4.43 | 2.60 | 5.24 |
| *Tennessee* | **Regression Sample** | 6.64 | 2.50 | 8.13 |
| | **Population*** | 7.64 | 3.47 | 7.67 |

* Population statistics were calculated based on values recorded in the 2017 United States Census of Agriculture from counties represented in the survey

**SURVEY INSTRUMENT**

# USE OF MARKET OUTLETS WITH A FOOD JUSTICE MISSION

You have been selected to participate in this study because you were identified as a fruit and vegetable grower. Your unique perspective and opinions are valuable to this study. We at the University of Tennessee and the University of Kentucky will use information from this survey to assess your willingness to sell products through market outlets that have a food justice mission. The elements that best describe a market with a food justice mission include:

They connect small and medium-sized with low-farm sales and low-farm income to markets; They reduce food insecurity by giving the opportunity to low-income food insecure households to purchase farm fresh products; and they increase community engagement in promoting and supporting sustainable agriculture, sustainable food systems, and healthy eating.

## We ask you to take about 15 to 20 minutes to complete this survey.

I cannot promise that your participation will result in any personal or immediate benefits to you or your community. There are no foreseeable risks other than those encountered in everyday life. If confidentiality was breached and your responses were disclosed outside the research, there no additional risks for you as most of the questions asked in this survey do not compromise your security, and are related to your willingness to participate in a market outlet that currently does not exist in your region or that you may not have heard about before.

Participation in the study is completely voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty. Your responses will remain strictly confidential. Data obtained from this survey will be stored securely and will be made available only to researchers conducting the study unless participants specifically give permission in writing to do otherwise. No reference will be made in oral or written reports which could link participants to the study.

You can enter into a random drawing for a $100 gift card. Participation in the survey is not required to participate in the drawing. Please click on the following link and provide your name and contact information so that you can be included in the drawing: https://utk.co1.qualtrics.com/jfe/form/SV_6kTwY7FDQckKv2d. The winner will be randomly selected from the list of those who provided their names and contact information by May 1, 2020.

If you have questions at any time about the study or the procedures (or you experience adverse effects as a result of participating in this study), you may contact the researcher, Margarita Velandia, at mvelandi@utk.edu or at (865)974-7409. If you have questions about your rights as a participant, you may contact the University of Tennessee IRB Compliance Officer at utkirb@utk.edu or (865) 974-7697. Thank you for taking the time to assist the University of Tennessee and the University of Kentucky with this survey.

**CONSENT**

I have read the above information. I have received a copy of this form. Return of the completed survey (questionnaire) constitutes my consent to participate.

_____

**Q1.** Are you eighteen years of age or older?

- ○ Yes → Please go to **Q2**
- ○ No → Please go to **Q33**

**Q2.** In the 2019 farm year, did you produce fruits or vegetables for sale?

- ○ Yes → Please go to **Q3**
- ○ No → Please go to **Q33**

## *FARM ACTIVITIES RELATED TO FOOD JUSTICE*

The elements that best describe the food justice mission include:

1. Connecting small and medium-sized limited resource farmers (i.e., low-farm sales and low-farm income) to markets and guarantee farmers "fair" prices for their products;
2. Reducing food insecurity (i.e., reduced quality, variety, or desirability of food, disrupted eating patterns, and reduced food intake), by giving the opportunity to low-income food-insecure households to purchase farm fresh products and to learn skills and acquire knowledge that empower them to reduce their food insecurity; and
3. Increasing community engagement in promoting and supporting sustainable agriculture, sustainable food systems, and healthy eating.

**Q3.** What farm business and related activities are you involved with that are related to the food justice mission? (*Select all that apply)*

- ○ I accept SNAP or WIC.
- ○ I sell my products in farmers markets that are located in low-income neighborhoods.
- ○ I offer discounted prices to low-income families.
- ○ I donate products to food banks and other charities.
- ○ I run programs on my farm to educate the community about sustainable agriculture and food systems.
- ○ I am involved or I have been involved as a leader/volunteer in an organization with a food justice mission.
- ○ Other (explain)_____

## *PARTICIPATION IN MARKET OUTLETS WITH A FOOD JUSTICE MISSION*

**What is a Fresh Stop Market?** Fresh Stop Markets are farm-fresh food markets that occur bi-weekly during the primary growing season. Fresh Stop Markets are managed by a non-profit organization (New Roots) that handles marketing and sales.

**Who buys at Fresh Stop Markets and how much do they pay for the produce?** Shareholders commit to pay ahead of time, on an income-based sliding scale, for a "share" of produce. A share is a selection of eight to ten varieties of seasonal, local produce. The shareholder picks up the share at the market. The sliding scale means food is affordable and everyone is included. Low-income, food-insecure shareholders pay the lowest amount for their shares; other shareholders pay a higher amount based on their income. No matter how much an individual family pays, everyone gets the same amount and varieties of food.

**Q4.** Have you sold produce through the **Fresh Stop Markets** managed by New Roots?

- ○ Yes → Please go to **Q5**
- ○ No → Please go to **Q9**

**Q5.** What are the advantages of selling produce through **Fresh Stop Markets**? (*Select all that apply).*

- ○ It reduces sales risk, in terms of guaranteed sales volume
- ○ It is less labor intensive than other market outlets
- ○ It provides competitive prices
- ○ It is a high volume market
- ○ It allows me to plan before production season
- ○ Other (explain) _____

**Q6.** What are the disadvantages of selling produce through **Fresh Stop Markets**? (*Select all that apply).*

- ○ It is not profitable
- ○ It is labor intensive, when to compare to other market outlets
- ○ Coordination between Fresh Stop Market staff and farmers is complicated and labor intensive
- ○ Other (explain) _____

**Q7.** Are you currently selling produce through **Fresh Stop Markets**?

- ○ Yes → Please go to **Q14**
- ○ No → Please go to **Q8**

**Q8.** Why did you discontinue selling produce through **Fresh Stop Markets**? *(Select all that apply).*

- ○ It was not profitable for my farm business
- ○ Requirements were too much for my farm business (explain) _____

  _____
- ○ It was too labor intensive
- ○ Fresh Stop Markets stopped buying from my farm, although I wanted to continue selling to them
- ○ Other (describe) _____

  _____

→ Please go to **Q14**

## *WILLINGNESS TO SELL PRODUCE THROUGH FRESH STOP MARKETS*

**Q9.** Imagine that you had the choice to sell produce through Fresh Stop Markets. This market outlet has the following characteristics:

1. Fresh Stop Markets representatives communicate with the farmers about items needed for the market. They are responsible for aggregating the food and delivering it to the markets to decrease the logistics burden for farmers.
2. A non-profit organization is responsible for all marketing efforts. Therefore, farmers have no costs associated with recruiting and maintaining shareholders.
3. The mission of this market is to give low-income, food-insecure families access to fresh, healthy foods.
4. There is **no** binding contract between the farmer and the non-profit organization coordinating this market opportunity, but this organization provides information about the potential volume and kinds of produce a farmer could sell through the Fresh Stop Markets.

**Q9.1**. Would you be willing to sell produce through Fresh Stop Markets if:
Prices paid are **25% below retail prices** (e.g., Farmers' markets). You can sell up to **30% of your produce** through this market outlet.

- ○ Yes → Please go to **Q9.2.**
- ○ No → Please go to **Q9.3.**

**Q9.2**. Would you be willing to sell produce through Fresh Stop Markets if:
Prices paid are **30% below retail prices** (e.g., Farmers' markets). You can sell up to **30% of your produce** through this market outlet.

- ○ Yes → Please go to **Q10**
- ○ No → Please go to **Q13**

**Q9.3**. Would you be willing to sell produce through Fresh Stop Markets if:
Prices paid are **20% below retail prices** (e.g., Farmers' markets). You can sell up to **30% of your produce** through this market outlet.

- ○ Yes → Please go to **Q10**
- ○ No → Please go to **Q13**

**Q10.** In order to sell a percentage of my produce through the Fresh Stop Markets, I would have to … (*Select all that apply)*

- ○ Expand my production (e.g., buy or rent more land)
- ○ Reduce the percentage of sales I made through other market outlets
- ○ Not have to change anything. I grow enough excess produce that could be sold to new markets
- ○ Other _____

**Q11.** What advantages do you see in selling your farm produce through the Fresh Stop Markets For each potential advantage, please assess how advantageous it would be to your farm business. *(Rate each on a scale from 1 to 5, where 1 is "not advantageous" and 5 is "very advantageous"; circle your rating*).

| Possible advantages | not advantageous (1) | | | | very advantageous (5) |
|---|---|---|---|---|---|
| It provides me the opportunity to move a larger produce volume than I can move through other market outlets | 1 | 2 | 3 | 4 | 5 |
| It is less labor intensive than other market outlets | 1 | 2 | 3 | 4 | 5 |
| It reduces my marketing efforts | 1 | 2 | 3 | 4 | 5 |
| It allows me to plan before production season | 1 | 2 | 3 | 4 | 5 |
| It allows me to sell my produce to low-income families | 1 | 2 | 3 | 4 | 5 |
| Other (describe) _____ | 1 | 2 | 3 | 4 | 5 |

**Q12.** What disadvantages do you see in selling your farm produce through the Fresh Stop Markets? (*Select all that apply)*

- ○ Prices paid are not competitive
- ○ There is not binding contract that guarantees my sales though this market outlet
- ○ Potential sales volume does not justify the price cut I would have to take
- ○ Other (explain) _____

→ Please go to **Q14**

**Q13.** Which of the following best describes why you chose not to sell produce through the Fresh Stop Markets (FSMs)? (*Select all that apply)*

- ○ Prices paid are not competitive
- ○ There is no binding contract that guarantees my sales though this market outlet
- ○ The size of my business prevents me from considering other market outlets for my produce
- ○ Other (explain) _____

→ Please go to **Q14**

## *INFORMATION ABOUT THE MARKET OUTLETS YOU USE*

**Q14.** Mark with an "X" each marketing method you used in **2019** to sell farm products and estimate the percentage of your sales made through that method.

| | **Marketing methods used in 2019** | **Percentage of sales made through this method (this column should total 100%)** |
|---|---|---|
| ***Direct Sales to Consumers***: | | |
| On farm sales | ◯ | _____ % |
| Farmers' market | ◯ | _____ % |
| Community Supported Agriculture (CSA) | ◯ | _____ % |
| Roadside stand | ◯ | _____ % |
| Pick-your-own | ◯ | _____ % |
| Other direct sales(describe) _____ | ◯ | _____ % |
| ***Sales to Intermediaries:*** | | |
| Grower cooperative | ◯ | _____ % |
| Wholesale buyer/broker/packer | ◯ | _____ % |
| Other farmer | ◯ | _____ % |
| Food hub | ◯ | _____ % |
| Other intermediary (describe) _____ | ◯ | _____ % |
| ***Sales to Retail Outlets:*** | | |
| Grocery store | ◯ | _____ % |
| Food cooperative | ◯ | _____ % |
| Restaurant | ◯ | _____ % |
| Institution (such as a school or hospital) | ◯ | _____ % |
| Other retail outlet (describe) _____ | ◯ | _____ % |
| TOTAL | | 100% |

**Q15.** In the first column, *mark an X* if you have ever used the marketing method at any year of your farm's operation. Then, for each marketing method you have used, rate its effectiveness at **maintaining or improving farm profits**, where 1 is "ineffective" and 5 is "very effective." (circle your rating).

| Select if used **in any year** | **Marketing method** | Ineffective (1) | | | | Very Effective (5) |
|---|---|---|---|---|---|---|
| ◯ | On-farm Sales | 1 | 2 | 3 | 4 | 5 |
| ◯ | Farmers Market | 1 | 2 | 3 | 4 | 5 |
| ◯ | Consumer Supported Agriculture (CSA) | 1 | 2 | 3 | 4 | 5 |
| ◯ | Road side stand | 1 | 2 | 3 | 4 | 5 |
| ◯ | Pick-your-own | 1 | 2 | 3 | 4 | 5 |
| ◯ | Fresh Stop Market | 1 | 2 | 3 | 4 | 5 |
| ◯ | Food hub | 1 | 2 | 3 | 4 | 5 |
| ◯ | Wholesale buyer/broker/packer | 1 | 2 | 3 | 4 | 5 |
| ◯ | Other farm | 1 | 2 | 3 | 4 | 5 |
| ◯ | Grocery store | 1 | 2 | 3 | 4 | 5 |
| ◯ | Restaurant | 1 | 2 | 3 | 4 | 5 |
| ◯ | Institution (school or hospital) | 1 | 2 | 3 | 4 | 5 |

## *INFORMATION ABOUT YOUR ENGAGEMENT WITH YOUR COMMUNITY*

**Q18**. Do you belong to any farming-related organization?

◯ Yes (*list all organizations you are involved with*) _____

_____

◯ No → Please go to **Q20**

**Q19.** Are you involved in a leadership role in any of the farming-related organizations you belong to?

- ○ Yes
- ○ No

**Q20.** Are you involved as a volunteer in any organization in your community?

- ○ Yes
- ○ No

## *INFORMATION ABOUT YOUR FARM*

**Q21.** Which production system do you use? (*Select only one option*).

- ○ Conventional (this includes "Certified Naturally Grown")
- ○ USDA Certified Organic
- ○ Other (describe) _____

**Q22.** How many acres did you grow in 2019?

| | **Rent** | **Own** |
|---|---|---|
| **Fruit and vegetable** | | |
| **Row Crops** | | |
| **Other Crops** | | |

**Q23.** What percentage of your production was given to charity in 2019 (e.g., food pantries, food banks, and other organizations feeding low-income or food-insecure individuals)?

- ○ Less than 10%
- ○ Between 10% and 20%
- ○ Between 21% and 30%
- ○ More than 30%

**Q24.** In 2019, what was the gross revenue generated from all farm business?

- ○ Less than $25,000
- ○ $25,000 - $49,999
- ○ $50,000 - $74,999
- ○ $75,000 - $99,999
- ○ $100,000 - $249,999
- ○ $250,000 - $499,999
- ○ $500,000 - $999,999
- ○ $1,000,000 - $2,499,999
- ○ More than $2,500,000
- ○ Prefer not to disclose

**Q25**. Select the range that best represents the percentage of your taxable household income from farming in 2019.

- ○ Less than 25%
- ○ 25% - 49%
- ○ 50% - 74%
- ○ More than 75%
- ○ Prefer not to disclose

## *INFORMATION ABOUT YOU*

**Q26.** Are you …

- ○ Male
- ○ Female
- ○ Prefer not to disclose

**Q27.** In what year were you born?

_____

**Q28**. How many years have you been involved in production as a farm owner, manager, or primary decision maker? (years)

_____ (years)

**Q29.** In 2019, in what zip code(s) were your farm(s) located?

_____ (zip codes)

**Q30.** Which category best describes your ethnic and racial background? (*Mark one option*).

- ○ White/Caucasian, European American, Non-Hispnaic
- ○ Hispanic/Latino/Spanish American
- ○ American Indian
- ○ Asian, Asian American
- ○ Black, African American, Non-Hispanic
- ○ Middle eastern, Middle Eastern American
- ○ Pacific Islander
- ○ Other (specify) _____
- ○ Prefer not to disclose

**Q31.** What is the highest level of formal education that you have completed? (*Mark one option*).

- ○ Some high school or less
- ○ High school diploma or equivalent
- ○ Some college, but no degree
- ○ Two-year college degree
- ○ Four-year college degree
- ○ Some graduate school
- ○ Graduate degree
- ○ Other (specify) _____

**Q32**. In 2019, what was your household income?

- ○ Less than $25,000
- ○ $25,000 - $49,999
- ○ $50,000 - $74,999
- ○ $75,000 - $99,999
- ○ $100,000 - $249,999
- ○ $250,000 - $499,999
- ○ $500,000 - $999,999
- ○ More than $1,000,000
- ○ Prefer not to disclose

**Q33.** Thank you for completing the survey. If you have any other comments you would like to share, please note them here.

_____

_____

_____

_____

***Thank you for your participation in this survey!***

*Please send your completed survey in the enclosed postage-paid business reply envelope. If that is misplaced, please send to:*

*Margarita Velandia*
*UT Agricultural & Resource Economics*
*2621 Morgan Cir. 314 C Morgan Hall*
*Knoxville, Tennessee 37996*

# VITA

Riley Denton is the son of Jeff and Jill Denton and was born on September 3rd, 1997, in Knoxville, Tennessee. He graduated from Jefferson County High School, located in Dandridge, Tennessee, in 2016. After high school, he graduated from Walters State Community College with an Associate of Science Degree in Agriculture Business in 2018 and went on to graduate from the University of Tennessee-Knoxville with a Bachelor of Science Degree in Agricultural and Resource Economics in May of 2020. Riley Denton also attended the University of Tennessee-Knoxville from August 2020 to May 2022, where he earned a Master of Science Degree in Agricultural and Resource Economics.