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Describing North Dakota Small Farmers and Their Connection with Extension

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Abstract

Small farms and small farmers are a growing sector of the agricultural economy nationwide. Notably, small farms are influenced by similar antagonists to the success of their business as large, concentrated operations, but they experience it differently. The purpose of this study was to describe small farms and farmers in North Dakota to assist North Dakota State University Extension in defining their needs for programming development. We found that nearly 45% of small farmer respondents are women. Small farmers prefer to access information for their operations in a variety of ways but like to engage with Extension through more direct and personal means. Recommendations include developing programming targeted at female farmers and organizing Extension information resources targeted at small farm needs, specifically.

Keywords: small farms; small farmers; Extension

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Introduction

The diverse small farm sector may not produce the same volume of agricultural products as large-scale concentrated farms, however they play an integral role in the United States' total agricultural output (Marshall, 2012). The need to continually adjust to the economic and technological changes in agriculture puts additional challenges on small farmers which in turn adds pressure to diversify and explore alternative enterprises as they are competing among other small and large-scale farms (Muhammad, Isikheumhen, & Basarir, 2009). Unlike many large-scale farmers, small farmers have the capability of owning their own land and the independence to be more diverse and agile in their operation, leading to innovation and important relationships with rural communities. Because this sector of production agriculture is continually evolving in North Dakota and around the country, Extension needs to establish a better understanding of their needs as producers and business managers. Creating resources and providing outreach for small farmers in North Dakota would create an area of opportunity for North Dakota State University (NDSU)

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Extension to aid in further fulfilling its mission.

Definition of Small Farms

In 1998, The National Commission on Small Farms defined a small farm as an operation that grosses under $250,000 annually. Since then, the United States Department of Agriculture (USDA) has consistently used this number as the cut-off between small and large farms nationwide. Mayerfeld (2004) contemplated, "should this farm really be considered a large farm, because it takes in more than $250,000 (p. 9)?", or should these farms just be considered extremely successful small farms (Mayerfeld, 2004)? The first argument against the small farm definition is income fluctuation. The second argument is location; a small farm that markets high-value fruits and vegetables in an urban setting could generate a higher income compared to being located in a more remote area (Braun & Mirzabaev, 2015). Fluctuation and location can cause a small farm to gross $170,000 one year and potentially $260,000 three years later, pushing it into the large farm category. Mayerfield argues for characteristics such as land, income, labor, and management should cumulatively be factored into determining the farm size instead of income alone. The economic sales class by average size farms (acres), has stayed relatively consistent from 2013-2017 in North Dakota. The average size farm for $1,000-$9,999 sales class is 154 acres, $10,000-$99,999 is 451 acres, $100,000-$249,999 is 1,194 acres, $250,000-$499,999 is 1,742 acres, and $500,000-$999,999 is 2,476 acres according to the USDA-NASS (2018).

In *America's Diverse Family Farms* (2017), the USDA Economic Research Service (ERS) recognized the broad descriptions of farms and how the definition can greatly mask the different sizes and types of farms in actuality. The ERS decided to create a report that would categorize farms into defined groups, a typology, to show the individual conditions of the nation's diverse farm sector. The ERS defined a small farm as a farm with gross cash farm income (GCFI) of less than $350,000. The farm typology categorizes small farms by their activity level into three definitions: 1. Retirement farms (small farms with reported retired operators, but, continue to farm on a small scale); 2. Off-farm occupation farms (small farms with operators who have a major occupation outside of farming); and 3. Farming-occupation farms (small farms with reported operators who farm as their major occupation). Category three farms are further sub-grouped into low sales (GCFI of less than $150,000), and moderate sales (GCFI between $150,000 and $349,999). Using the USDA's existing definition, the National Agriculture Statistics Service (NASS) last conducted the Census of Agriculture in 2017 (performed every 5 years). It is hopeful that in 2022 NASS might adopt the ERS's new farm typology to better help define the wide range of farm sizes to gather accurate small farm and farmer demographics throughout the United States.

Small Farm Niche Markets

Small farms are unique when compared to large farms due to the ability to be more diversified and agile businesses. With generally less, yet, more manageable acres, small farmers tend to be more innovative when it comes to implementing sustainable agriculture practices (Mayerfeld, 2004). A majority of small farmers are moving towards on-farm niche markets to supplement income (Kline, Cardenas, Leung, & Sanders, 2007), such as adding a quarter acre of cut flowers alongside their vegetable production. Agritourism is another type of market that is being embraced to allow the public to connect with the rural lifestyle and their food sources. These niche markets are also a way for rural families to keep successors on the farm and become ambassadors for the production agriculture community (Kline et.al., 2007).

In order to adopt profitable niche markets, small farmers must skillfully recognize high-value products, which on one hand can provide great benefits, but on the other hand, the producer

must meet the local buyer's demands and the specifications of a commercial buyer (Vaughan & Robinson, 2017). The risks involved with selling commercially to leading manufacturers may include meeting the quantity needs and seasonal scheduling demands. For both the grower and the buyer, they appreciate long-term stability and it can be difficult maintaining a long-term business relationship with factors fluctuating the markets every season, i.e., production cost, weather, inputs, and transportation costs (Vaughan & Robinson, 2017).

A popular outlet for small farm products is often local or regional farmer's markets where product is sold directly to the consumer, in most cases. As a result, farmer's markets come with the challenge of acquiring buyer trust. In Oregon, Extension Economists, Gwin and Lev (2011) surveyed the influences and buying habits of local farmer's market shoppers. Inconvenience was ranked as the number one limitation with food safety concerns not far behind. Although the vendors must abide by the Oregon food safety regulations, buyers indicated they did not fully trust the farmers and were not convinced that the regulations were being followed (Gwin & Lev, 2011). University of Florida professors, Rumble and Lundy (2017) conducted a study on the local food movement and revealed that trust is a key reason for purchasing from local markets. Trust includes knowing the farmer and their knowledge of food processing (quality, safety, freshness). Alternatively, Florida market shoppers said that buying local increased their trust in the farmer and the whole process of food production (Rumble & Lundy, 2017). Whether it is developing a market or consumer trust, small farm operators are met with numerous risks not dissimilar from large farm operations.

Mitigating Risk in Small Farms

For many small farmers, the seasonality of marketing products and lack of ability to meet the needs of larger purveyors creates a level of risk in their entire income stream. The USDA reports that small farms are more likely to go out of business compared to larger farms in times of financial stress partly due to the lack of absorption ability (Athearn, 2016). The USDA ERS (2017) reported on the *Farm Financial Performance* of small farms, that "small farms are more likely to have an operating profit margin (OPM) in the red zone-indicating a higher risk of financial problems" (America's Diverse Family Farms, 2017, p.7). In Tennessee, researchers utilized data from the Agricultural Resource Management Survey to focus on the tools that small farmers took advantage of that contributed to a successful operation (Muhammad, Tegegne, & Ekanem, 2004). The main goal was to increase farmer's income by raising the overall profitability of their business. Nationally, the top three management practices in successful farms were using proper production strategies that kept costs low, having good marketing practices, and financial planning. Factors that led to success in Tennessee were good management, business knowledge, use of technology, having a strong work ethic, making use of government programs, and local support. A second study in Tennessee characterized successful farms by those that continued the use of old equipment instead of purchasing new equipment, raised specialty products, and had diverse marketing practices (Muhammad et al., 2004).

University of Florida research indicates that financial success in small farms was from years of farming experience, local educational workshops and programs, utilizing proper financial planning tools, and incorporating agritourism events. Marketing is a struggle among many small farmers with the need to make decisions about promoting products, where and when to sell, and setting product prices. Gaining proper financial management tools and practices through local organizations like Extension, can reduce financial risks that involve long-term purchases, return on investments, and cash-flow impacts (Athearn, 2016).

Small Farm Extension Support

According to the USDA, there is a significant portion of food production (40% of the US value of farm products) which depends on small farms (Farmland Information Center, 2014). As farm sizes increase in large scale production and the total number of farms decrease, small farms are looking to other farmers, neighbors, and Extension for local support (Muhammad et al., 2004). New York Extension specialist, Ochterski and beginning farmer project coordinator, Frenay (2010) realized the importance of the relationship between educators and farmers. They found that the support time through Extension is valuable and should be used effectively and efficiently. A group of specialized beginning farm Extension educators in New York have successful working relationships with farmers one-on-one or in workshop settings. This guidance gives the educator the ability to help the farmer determine their goals and develop a business plan (Ochterski & Frenay, 2010). Michigan State University Extension followed the same relationship pursuit when the New FARM (Farmer Assistance and Resource Management) program was created. New FARM was not only designed to help small farmers but to create a foundation for long-lasting relationships between beginning/small farmers and MSU Extension (Sirrine, Eschbach, Lizotte, & Rothwell, 2016). The Pennsylvania Women's Agriculture Network sought to understand the educational needs of female farmers and provide recommendations to Extension on how to engage with the growing clientele of farm women. Out of 151 women surveyed, 32% were sole operators of the operation, producing either fruit, vegetables, livestock, dairy products, row crops, or non-traditional specialty products. One recommendation to Extension resulting from the needs assessment was to make personal contact with the women and create opportunities for them to network with other farm women and other agricultural service providers (Barbercheck et.al., 2009). Working with farmers in a workshop setting allows successful more experienced farmers to share their story and encourage other beginning or struggling farmers. It also allows the educator to reach more farmers at one time, giving local farmers a chance to collaborate with each other (Ochterski & Frenay, 2010).

Times are changing drastically and farmers are needing more up-to-date technology (Marshall, 2012). Because of this change, Extension, agriculture teachers, and agribusiness persons need to collaborate in order to deliver programs effectively. In order to be proactive, small farmers should be evaluated to determine their individual needs as producers. Also, "Extension could benefit from being assessed as to whether our delivery system is actually being tapped into, utilized, and ultimately, effective. By doing this, we could be of a better service to the clientele we serve" (Marshall, 2012, p.4). Although Extension activities are being outsourced by other agriculture organizations and professions, this leaves Extension as one of the last long-standing sources of unbiased research-based information (Sirrine et al., 2016). Extension can have a greater impact by helping recruit and retain small farmers, meet one-on-one, assist with loan applications, and by providing and educating with available resources (Marshall, 2012).

Conceptual Framework

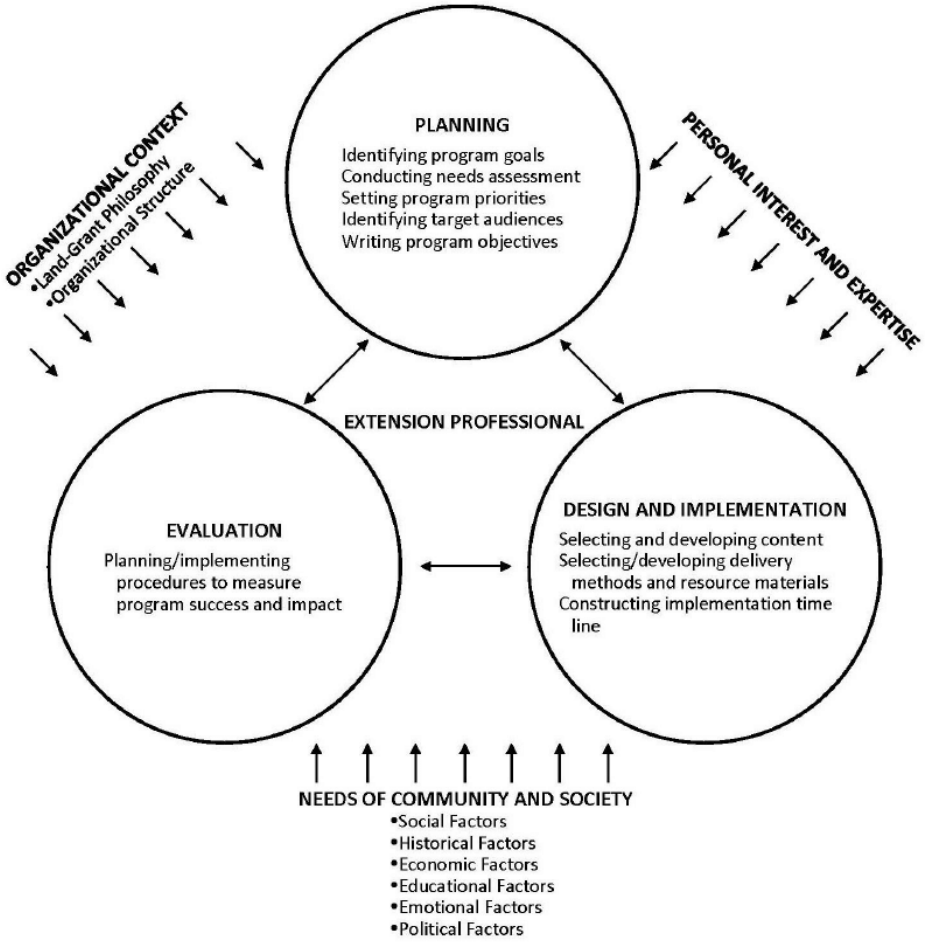
Program development begins with the identification of a problem and the needs of a specific community. Defining those needs through direct and substantive input helps to provide the rationale for programmatic design and the foundation of subsequent organizational structures for educational design (Franz, 2015; Garst & McCawley, 2015). Further, incorporating the needs of the population(s) in question into each aspect of a program helps build public buy-in and clearer connections for evaluation and impact (Franz, 2015). "Needs assessment has provided a means for

Extension professionals to transform their own role into that of convener and partner in situations that require a more in-depth approach to problem solving" (Garst & McCawley, 2015, pg. 41).

The program development model (see Figure 1) originated by Coklin (1997) as used by Seevers and Graham (2012) in their text is utilized in this study to offer practical and organizational guidance to this present work. In working with small farmers throughout the state we need to be reminded of the lack of present structure to overarching organizations and will therefore need to use diverse approaches to contacting small farmers. Moreover, because we presently have no Extension programming focused on small farming we need to confirm these individuals have educational needs, discover who they are, and learn their present sources of information. In turn, this will inform our planning and design to ultimately best address their requirements for success further providing an understanding of small farmers and their operations in our geographical region. "Needs assessment enhances the Extension Program Development Model by improving accessibility and services to a variety of people" (Garst & McCawley, 2015, pg. 28)

Figure 1

A Basic Program Development Model (Conklin, 1997; as cited in Seevers & Graham, 2012)



In terms of scale, the importance of small farms tends to be overlooked, ignoring their operational needs and challenges. Small farm producers face some of the same challenges as larger farms, yet, they have the extra tasks of handling food safety requirements and finding grants and

loans to meet their operational needs. Small farms may be a minority, but they play an important part in feeding our ever-growing population and educating our communities about where our food comes from. Extension has the privilege of being able to support the unique and innovative operations that come from the producers of North Dakota. Therefore, we seek to describe, who are small farmers in North Dakota, what resources do they need for successful operations, and how do they presently use Extension resources?

Purpose and Research Questions

The purpose of this study was to describe small farms and farmers in North Dakota to assist NDSU Extension in defining their needs for programming development. The objectives of this study were to:

1. Describe the personal and farm operation characteristics of North Dakota small farmers.
2. Describe the information resources being utilized for beginning and maintaining a small farm operation.
3. Describe small farmer's perceptions of University Extension.
4. Describe small farmer's perceptions of their operations' current challenges and limitations.

Methodology

This study was exploratory in nature and employed a survey design. Small farmers were recruited to complete a digital questionnaire designed in Qualtrics® which was distributed via email. Through the questionnaire we acquired small farmer's demographic information, small farm characteristics, sources of information, and their perceptions of the Extension system.

The target population for this research project was all small farmers throughout North Dakota. To incorporate a more structured small farm definition, this study utilized the USDA ERS typology defining a small farm as a farm that had an annual gross income of less than $350,000 (America's Diverse Family Farms, 2018). The accessible population came from six individual small farm organizations willing to directly distribute the survey through their email listserv:

1. Young Farmers Coalition Chapter: Northern Small Farm Alliance: 20 members
2. Farmer's Market and Grower's Association: 655 members
3. Northern Plains Sustainable Agriculture (NPSA): 450 members
4. Local Foods: 200 members
5. Grape and Wine Growers Association: 200 members
6. Foundation for Agriculture and Rural Resource Management and Sustainability (FAARMS): 450 members

The six organizations selected to distribute the survey contained a membership that fit the goals for this study. The survey was distributed to potentially 1,975 small farmers although, those were not necessarily unique members in each organization as many people may engage in multiple organizations. Data in this study was represented by 76 (N) usable respondents consisting of small farmers from 36 out of the 57 counties throughout the state. Because of the exploratory nature of this study and the complexity involved in calculating an accurate and representative response rate, no attempt was made to report. Therefore, the results of this study are not generalizable beyond the sample discussed herein.

To mitigate the likelihood of duplicated survey submissions for each farm, it was requested that one farmer per household complete the Qualtrics survey, further, instructions were given to only complete the form once. After contact was made with all six organizations, an introductory email, and link to the survey was sent to the chairperson responsible for each organization. The chairperson of each organization directly forwarded the survey by email to their listserv, which was followed by a confirmation to the sender that the survey was delivered. Each organization's distribution date was documented and all follow-up emails were delivered based on that date. The first reminder email was sent seven days after the initial distribution, followed by a second and final reminder ten days later. All reminder emails were delivered to the organization's membership in the same manner and the survey was active for 34 days.

Participants received a questionnaire created in Qualtrics® and with items modified from Muhammad, Isikhuemhen, & Basarir (2009) requesting information on: demographics, small farm income, commodities produced, business challenges, connection with Extension, importance of educational topics to their small farm operation, perceived quality of information and outreach with University Extension, and importance of educational outreach to access news and educational information. Minor modifications incorporated from the previous study included the demographics, Extension (education and outreach needs, and sources of information sections. A panel of four experts evaluated the instrument for face and content validity through three intervals of review and editting. The panel consisted of extension specialists, agents, and education faculty and made recommendations for item wording, scale definitions, clarity, and demographic items. The final instrument included 25 item stems, including demographics. A sample of items included in the instrument is found in Table 1.

Descriptive statistics were calculated and reported for each research objective. The intent of this study was to help establish an understanding of who small farmers are in North Dakota and describe their needs related to information sources and Extension usage. Therefore, presenting means, standard deviations, and quantities satisfied the data needs for this stage of the research with the described population.

Table 1

Questionnaire Sample Item Stems

Item Stem	Table Location
Describe the frequency which you gain information for your farm operation from the following resources.	See Table 4
How familiar are you with the Extension Service?	See Table 6
How often do you use Extension Service Information?	See Table 6
Identify how you have used Extension Service resources for your farm operation.	See Table 7
Based upon your experiences, describe your satisfaction with the following Extension Services.	See Table 8
What limits you from using the Extension Service more?	See Table 9
	See Table 10

Based on your experience, rate the current challenges you face in your small farm operation.

See Table 11

How important is information on each of the following topics for the success of your small farm operation?

Findings

Objective One: Describe the personal and farm operation characteristics of North Dakota small farmers.

Nearly 45% of small farmer respondents were women (see Table 2). Farms in this study represented a wide range of years of active operation with nearly half of the farmers (47.3%) considered beginning farmers (< 10 years). This is compared to the other 52.7% that have had 11-30 years of farming, some of whom are generational farmers. Farm-related income of $10,000 or less annually was reflected by 41% of respondents. Following the USDA ERS typology, over half (52.6%) of the respondents farm part-time.

Table 2

Demographics of North Dakota Small Farmers (N = 76)

Characteristic	*n*	%
Gender		
Male	42	55.3
Female	34	44.7
Age (years)		
18-25	1	1.3
26-35	12	15.8
36-50	25	32.9
51-65	27	35.5
Over 65	11	14.5
Length of Active Operation (Years)		
1-5	22	28.9
6-10	14	18.4
11-20	22	28.9
21-30	7	9.2
Over 30[a]	11	11.0
Farm Size (Acres)		
0-10	28	36.8
11-40	10	13.1
Over 40[b]	38	50.0
Annual Gross Income		
Less than $10,000	31	40.8
$10,000-$49,999	21	27.6
$50,000-$149,999	12	15.8
$150,000-$249,999	6	7.9
$250,000-$349,999	5	6.6
Type of Small Farm Occupation		
Retirement farm	7	9.2
Part-time farm	40	52.6

Farm is main occupation	24	31.6

Note. [a]Greater than 30 years ranged from 31-106 years of active operation. [b]Greater than 40 acres ranged from 70-3500 acres.

Each small farmer is unique in how they decide to market their products (see Table 3). Although farmers markets (43.4%) and on-farm sales (43.4%) are the two most common forms of marketing in North Dakota, small farmers showed that they have also dedicated time to other marketing practices unique to small farmers such as providing CSA baskets or being involved in agritourism activities.

Table 3

Marketing and/or Production Practices of North Dakota Small Farmers (n = 76)

Marketing/Production Practice	***Rank***	**%**
Farmers market	1	43.4
On-farm sales	1	43.4
Organic, not certified	3	28.9
Livestock market	4	23.7
Other[b]	5	19.7
Elevator/Co-op	6	18.4
CSA	7	14.5
Institutions[a]	7	14.5
Organic, certified	9	13.2
Agritourism	10	11.8
Winery	10	11.8
GAP certified	11	3.9
Roadside stand	11	3.9
Pumpkin patch	11	3.9

Note.[a]Institution examples include schools, nursing homes. [b]Other practices not listed include direct marketing events, food hub, grocery store.

Small farmers were further asked about the commodities and products that they produce and raise. The list of crops, animals/animal products, and horticulture shows diversity and how specialized many small farmers need to be when comparing their operation with the traditional large farm operation. Those products included: Crops: wheat, soybeans, corn, canola, flax, barley, dry peas, lentils, dry beans, sunflowers, potatoes, hay, rye, sorghum, silage, triticale, hairy vetch, millet, buckwheat, and oats. Animals/Animal Products include: poultry, beef cattle, dairy cattle, swine, sheep, equine, goats, elk, eggs, honey, alpacas, and rodeo stock. Further, Horticulture products included a variety of: vegetables, fruit, herbs, floriculture, and hops.

Objective Two: Describe the information resources being utilized for beginning and maintaining a small farm operation.

The information resources small farmers reported using were assessed through using a four-point Likert-type scale with choices: 4 (frequently), 3 (sometimes), 2 (rarely), and 1 (don't use at all) and ranked by item mean (see Table 4). Small farm producers would prefer to learn from someone they trust and/or spend time to research on their own using the internet. Generally, small farmers reported utilizing local organizations for resources to assist with their operations.

Table 4

Resources Used by Small Farmers (n=76)

Resource	Rank	Mean	SD
Family/friends/other farmers	1	3.37	0.72
Web	2	3.27	0.86
University Extension	3	2.87	0.91
Magazines	4	2.79	0.82
University/research stations	5	2.75	0.95
NRCS	6	2.54	0.93
Social media	7	2.43	0.96
USDA	8	2.43	0.91
State Farmers Market & Growers Assoc.	9	2.26	1.08
Newspaper	10	2.11	0.89

Additionally, small farmers were asked to report how they prefer to receive educational information (see Table 5) with the identical scale. Correspondingly to Table 4 responses, more direct contact and individualized modes were identified as more frequently utilized.

Table 5

Small Farmer's Preferred Modes to Receive Information (n=76)

Information Delivery Services	Rank	Mean	SD
One-on-one support	1	3.67	0.98
Instructor-led, hands-on workshops	2	3.66	1.02
E-mail	3	3.60	0.98
On farm demonstrations	4	3.58	1.09
Web/internet	4	3.58	0.98
Small farm services/organizations website	6	3.43	1.19
Current publications	7	3.25	0.98
Online courses	8	3.15	1.23
Mail	9	2.82	1.05
Social Media	10	2.70	1.28

Objective Three: Describe small farmer's perceptions of NDSU Extension.

To adequately address this objective, we sought to describe how small farmers use Extension and Extension-developed resources and identify any limitations using those resources. Further, small farmers were asked to identify their preferred methods of receiving information from Extension. Farmers were asked how often they visit University Extension for resources either online or locally (see Table 7). It was common for small farmers to have visited an Extension location one to three times per year (36.4%); however, 22.1% said they visited seven or more times per year, while 10.4% said they did not use Extension at all. Respondents answered how familiar they were with Extension services (see Table 6), revealing that the overwhelming majority were at least moderately familiar and a small number (3.9%) were not at all familiar with Extension.

Table 6

Frequency of University Extension Resource Usage and Familiarity with Extension (N=76)

Frequency (year)	***n***	**%**
0 times	8	10.4
1-3 times	28	36.4
4-6 times	19	24.7
More than 7 times	17	22.1
Familiarity with Extension		
Extremely	26	33.8
Very	19	24.7
Moderately	16	20.8
Slightly	8	10.4
Not at all	3	3.9

Based on the list of services (see Table 7), farmers expressed that although they would prefer face-to-face, they at least frequent workshops or trainings hosted by University Extension whether online (32.5%) or face-to-face (46.8%). These perspectives were given prior to the ongoing pandemic which subsequently necessitated more virtual engagement by Extension within the present state and around the country. Respondents also indicated they are utilizing Extension research, publications, and knowledge of local staff to assist with operational support.

Table 7

Reported Ways That Small Farmers Use University Extension (N=76)

Use of Extension Locally (year)	***n***	**%**
Workshops/trainings/classes/demonstrations	36	46.8
Pick up publications	23	29.9
Find studies/researched results	21	27.3
Requested help solving a problem	22	28.6
Pick up soil sample bags	10	13.0
Borrow equipment	4	5.2
Use of Extension Online (year)		
Workshops/trainings/classes/demonstrations	25	32.5
Find studies/researched results	25	32.5
University Extension YouTube videos	16	20.8
Follow University Extension groups on social media	15	19.5
Search publications	20	26.0

Participants were also asked to report their satisfaction if utilized, with University Extension services (see Table 8). Responses were measured using a five-point Likert-type satisfaction scale with choices: 5 (extremely), 4 (very), 3 (moderately), 2 (slightly), and 1 (not at all). Overall, small farmers were at least moderately satisfied with each of the ten services provided through Extension.

Table 8

Small Farmer's Satisfaction with Extension Services (n=76)

Information Delivery Services	Rank	Mean	SD
Web/internet	1	3.49	0.92
E-mail	2	3.47	1.08
One-on-one support	2	3.47	1.25
Instructor-led, hands-on workshops	4	3.41	1.28
Mail	5	3.26	1.08
Current publications	6	3.24	1.01
On-farm demonstrations	7	3.07	1.18
Online courses	7	3.07	1.14
Social Media	9	3.06	0.95
Small Farm services/organization website	10	2.87	1.07

Small farmers were asked what might prevent them from utilizing Extension services. The most common reason reported was not enough available information specific to small farms (18.2%) (see Table 9). Small farmers had the opportunity to openly explain their choice of 'Other' in the questionnaire. A few selected limitations for small farmer's use of Extension included: female discrimination, field tours are held Monday through Friday and during working hours, hard to find information, unaware of all the different Extension services, and no hands-on workshops.

Table 9

Reported Limitations Keeping Small Farmers from Using University Extension (N=76)

Limitations	*n*	%
No available information for the operation	14	18.2
Producer does not feel the need to use University Extension	13	16.9
No support for the goals of the operation	10	13.0
Extension workshop information does not apply to the operation	10	13.0
Extension does not put the operation as a priority	8	10.4
Producer does not feel the information is trustworthy	3	3.9
Other	20	26.0

Objective 4: Describe small farmer's perceptions of their operations' current challenges and limitations.

Small farmers were asked about their challenges and the topics they consider the most important within their operation. Responses were measured by using a five-point Likert-type scale with choices: 5 (extremely), 4 (very), 3 (moderately), 2 (slightly), and 1 (not at all). The scale was utilized to address topics which are challenging to small farmer operations (see Table 10) and topics which are important to maintain knowledge (see Table 11). Nineteen items/challenges were measured and ranked by using the total item mean *(M).* Interestingly, the top challenges reported included grants and grant writing, weed management, and business

management focused topics. Other items involving food safety and animal bio-security were considered less challenging for this mix of small farmers.

Table 10

Challenges Reported by Small Farmers (n=76)

Challenge	Rank	Mean	SD
Currently available grants	1	3.82	1.27
Grant writing	2	3.73	1.35
Weed management	3	3.15	1.89
Identifying and minimizing risk	3	3.15	1.11
Finding help/labor	5	3.09	1.43
Marketing skills	6	3.04	1.13
Keeping up to date with regs. & requirements	7	2.88	1.19
High tunnel set up	8	2.82	1.49
Identifying value-added opportunities & products	9	2.81	1.10
Soil amendments	10	2.69	1.26
Applying organic practices	11	2.68	1.10
Production/management skills	12	2.67	1.05
Education on how to utilize a high tunnel	13	2.63	1.52
Pest management	14	2.61	1.05
Record keeping & financial management	14	2.61	1.18
How to stay innovative/creative/unique	16	2.43	1.13
Current food safety practices	17	2.40	1.10
Animal bio-security	18	2.21	1.02
Public perception	19	2.20	1.10

With the list of topics as displayed in Table 10, small farmers were asked to describe the educational importance of those topics for their operations (see Table 11). The top ten items were reported as moderately important to important. The marginal numerical separation holds them close with regard to interpretation and prioritization.

Table 11

Most Important Educational Topics for State Small Farmers (n=76)

Topic	Rank	Mean	SD
Marketing skills	1	3.85	1.20
Weed management	2	3.83	1.15
Keeping up to date with regs. & requirements	3	3.74	1.01
Production/management skills	4	3.72	1.03
Identifying value-added opportunities & products	5	3.71	1.13
Identifying & minimizing risks	6	3.70	1.09
Current available grants	7	3.66	1.26
Grant writing	7	3.66	1.16
Pest management	9	3.61	1.03
Public perception	9	3.61	1.23

Conclusions and Recommendations

Although the participating sample is small compared to the approximate population of farmers in the state, the findings of this study can give us insight into the educational needs of this group and encourage University Extension to look more intently at this growing sector of the farming population through continued research. That said, our conclusions are limited to the described sample, though we hope our findings can find logical interpretation and usefulness beyond these specific respondents.

Given the open and general nature of the program development model (Conklin, 1997; as cited in Seevers & Graham, 2012) we utilized to frame this work, we feel work related to the development of small farm programming in North Dakota has foundational direction. In highlighting sources of knowledge, sample characteristics, and basic operational needs for small farmers, further efforts can be initiated toward the purposeful engagement of this population through Extension. As suggested herein, we can develop new and repurpose existing farm management tools, align personnel resources across the system, and create an array of educational resources which help to engage this sector of the farming economy.

We highlighted the substantive proportion of female respondents to this study however, it was not intended that this study was to compare the perceptions based on gender. The findings do provide insight into women providing operator roles on farms which encourages further study. Nationwide, 51% of all farm operations are lead by women; of that 51%, 14% are the primary operators (America's Diverse Family Farms, 2020, pg.12). Additional research has shown that oftentimes, women operate smaller farms and specialize in niche markets, while also engaging in a large variety of tasks/decision making for the operation (Barbercheck et.al., 2009). Aside from previously stated recommendations in this report, to improve the relationships with women farmers, it is recommended to express that their operation is taken seriously, invite women farmers to speak at events, and serve on advisory committees (Barbercheck et.al., 2009). The marketing of and expansion of programs such as Annie's Project to this population of operators is warranted. Additionally, due to these findings the needs of women should be front and center in designing the format for meetings, educational content, and business development opportunities.

The range of crops, products, and marketing avenues that small farmers benefit from displays the diverse amount of dedication, knowledge, and skills that must be attained to stay relevant and lucrative. Grants and marketing were ranked as a high challenge and important topic to small farmers. Related to this, it is appropriate to question grant related understandings being a top need and may not be reflective of a real need, but simply a lack of experience and knowledge altogether. This area can be addressed with supplemental resources but is likely not as essential as other items in Table 10 to the operational and fiscal success of small farms. Marketing is a struggle among many small farmers with the need to make decisions about promoting products, where and when to sell, and setting product prices. Gaining proper financial management tools and practices through local organizations like Extension, can reduce financial risks that involve long-term purchases, return on investments, and cash-flow impacts (Athearn, 2016). In assessing the findings represented in Table 11 in particular, it is clear that small farmers need practical and substantive educational resources, given the present dearth in our area. Reasonably, these resources could serve multiple purposes across related programmatic areas in the state.

This study gives insights into the current connection between small farmers and Extension. Small farmers generally visit Extension a minimum of one to three times a year and

utilize workshops, publications, and research. However, almost 10.5% said they do not use Extension, and 3.9% said they were not familiar at all with Extension. This, we believe presents some opportunity for engagement because in addition, nearly 31% of farmers reported having moderate or less familiarity with Extension. Developing relevant resources and performing direct marketing strategies could help improve both familiarity and overall use of Extension as a resource.

Local support and face-to-face workshops were ranked as the top important service to small farmers. For those who are familiar with and use Extension, these items were also ranked high for satisfied services by University Extension, showing that Extension is potentially meeting a need. The important limitations for not using Extension more are narrowed down to limited resources and the lack of operational support. The reports of how small farmers use Extension services, important delivery resources, and the limitations for using Extension, it is necessary to reiterate that face-to-face events, and trusted personal relationships are important, while web-based courses and social media are among the least preferred educational services. Although, it is reasonable that these findings may have shifted somewhat following the pandemic. That said, our findings support the use of a variety of methods to deliver targeted information that is of high quality, accessible, and trustworthy.

There are two findings in this study that encourages somewhat effortless modifications to University Extension programming. One, regardless of the workshop emphasis, a great number of farm operation Extension programs are currently hosted during the Monday through Friday work hours. In the future, there should be consideration for those that have occupations outside of the farm, providing workshops during the off-season months in the evenings and weekends, with an available option of daycare, if possible. Doing so would support the needs of women in agriculture with younger families as well. Data from the Pennsylvania Women's Agriculture Network needs assessment showed that 58% respondents said that child care was a problem the women face when trying to have a successful operation (Barbercheck et.al., 2009). During the growing season, it is recommended for more one-on-one farm visits as a way to build relationships, administer demonstrations, and provide hands-on support. Further, the continued development of virtual meetings and recordings is warranted.

Next, small farmers are presently taking advantage of Extension programs and resources; however, they are requesting that the services provide more information related to small farms. Currently, the University Extension provides resources that pertain to all types of farms on a broad scale, making it difficult for small farmers to access and find the necessary information needed for their operation. Small farmer's interest in expanding and maintaining a successful operation creates the foundation to consider investing in research designed for a small acreage farm. Similarities were presented by the Kentucky State University Extension's assessment that many of their small farmers commented that Kentucky Extension programs did not address their needs and they had a hard time attending programs because of other commitments (Andries, Simon, & Rivers, 2016). This assessment indicated the need for a change in how Extension programs in Kentucky are being offered. Support for small farm research came from rural Northeast Ohio, where 15 Extension agents met to discuss the problems and needs of the people in their counties (Polson & Gastier, 2001). Though there are numerous small farm resources in the form of magazines and newsletters, the clientele wanted research supported information.

The NDSU Extension re-organization of its website is encouraged so the information can be easily classified for small farm application. The Ohio State Extension small/new farm web site was used to help agents quickly and easily find research information to answer questions and was well received by Extension personnel (Polson & Gastier, 2001). The lack of web organization in NDSU Extension is a potential leading cause in the gap between communication and the support

between county agents and local small farmers. It is recommended that county agents receive training in available small farm resources to help equip their local small farmers to begin building a foundation of local Extension support. Finally, it is imperative that we continue assessing small farmer's needs regularly to develop understanding around market trends and help project future managerial needs. Along those lines, within our state we need to establish regional advisory boards comprised of diverse operators to enhance the direct connections and build upon the feedback loop for this important and growing sector of our agricultural economy.

References

America's Diverse Family Farms. (2017). USDA Economic Research Service. *America's Diverse Family Farms.* https://www.ers.usda.gov/webdocs/publications/86198/eib-185.pdf?v=43083

America's Diverse Family Farms. (2020). USDA Economic Research Service. *America's Diverse Family Farms.* https://www.ers.usda.gov/webdocs/publications/100012/eib-220.pdf?v=1495.9

Athearn, K. (2016). Financial fortitude key for small farm success. *Growing Produce*. http://www.growingproduce.com/vegetables/financial-fortitude-key-for-small-farm-success/

Barbercheck, M., Brasier, J.K., Kiernan, E.N., Sachs, C., Trauger, A., & Findeis, J. (2009). Meeting the extension needs of women farmers: A perspective from Pennsylvania. *Journal of Extension,* 47(3). https://www.joe.org/joe/2009june/a8.php

Braun, J.V., & Mirzabaev, A. (2015) Small farms: Changing structures and roles in economic development. *ZEF Center for Development Research*. https://doi.org/10.2139/ssrn.2672900

Farmland Information Center. (2014). 2012 Census of agriculture. *Farmland Information Center*. http://www.farmlandinfo.org/2012-census-agriculture#BeginningFarmers

Kline, C., Cardenas, D., Leung, Y., & Sanders, S. (2007). Sustainable farm tourism: Understanding and managing environmental impacts of visitor activities. *Journal of Extension,* 45(2). https://www.joe.org/joe/2007april/rb2.php

Garst, B. A. & McCawley, P. F. (2015). Solving problems, ensure relevance, and facilitating change: The evolution of needs assessment within cooperative extension. *Journal of Human Sciences and Extension, 3*(2), 26-47.

Gwin, L., & Lev, L. (2011). Meat and poultry buying at farmers markets: A survey of shoppers at three markets in Oregon. *Journal of Extension,* 49(1). https://www.joe.org/joe/2011february/rb4.php

Marshall, R. (2012). The impact of the extension service on minority-owned small farm operations. *Journal of Extension,* 50(1). www.joe.org/joe/2012february/comm1p.shtml

Mayerfeld, D. (2004) A matter of scale: Small farms in the north central region. North Central *Region Sustainable Agriculture Research and Education Program and the Illinois Department of Agriculture.* http://ssfin.missouri.edu/report.thm

Muhammad, S., Isikhuemhen, O., & Basarir, A. (2009). Promoting alternative enterprises: Assessing farmers' needs in research, education, and extension. *Journal of Extension*, 47(6). https://www.joe.org/joe/2009december/rb5.php

Muhammad, S., Tegegne, F., & Ekanem, E. (2004). Factors contributing to success of small farm operations in tennessee. *Journal of Extension,* 42(4). https://joe.org/joe/2004august/rb7.php

Ochterski, J., & Frenay, E. (2010). Best management practices for beginning farmer support. *Journal of Extension*, 48(3). https://www.joe.org/joe/2010june/tt9.php

Polson, J., & Gastier, T. (2001). Small farm/new farm: One agent meeting other agents' needs for research-based information through the www. *Journal of Extension,* 39(4). https://www.joe.org/joe/2001august/tt1.php

Rumble, J., & Lundy, L. (2017). Examining consumer attitudes and cultural indicators surrounding local food. *Journal of Extension,* 55(6). https://www.joe.org/joe/2017december/a7.php

Seevers, B. & Graham, D. (2012). *Education through cooperative extension.* University of Arkansas.

Sirrine, J.R., Eschbach, C.L., Lizotte, E., & Rothwell, N.L. (2016). The new farm program: A model for supporting diverse emerging farmers and early-career extension professionals. *Journal of Extension,* 54(4). Retrieved from https://www.joe.org/joe/2016august/a1.php

United States Department of Agriculture Economic Research Service (USDA ERS) (2017). Illuminating the issues: How ERS research informs decisions. Annual Report FY 2017. https://www.ers.usda.gov/about-ers/plans-and-accomplishments/ers-annual-report-fy-2017/

United States Department of Agriculture, National Agricultural Statistics Service, North Dakota Field Office. (2018). North Dakota agricultural statistics (No.87). Grafton F. K., Boerboom, C., Goehring, D., Perdue S., & Hamer H. https://www.nass.usda.gov/Statistics_by_State/NorthDakota/Publications/Annual_Statistical_Bulletin/2018/NorthDakota-Annual-Bulletin18.pdf

Vaughan, B., & Robinson, M. (2017). Small-scale farmers supplying produce commercially: Five issues and associated buyer questions and implications for extension. *Journal of Extension,* 55(3). Retrieved from https://www.joe.org/joe/2017june/iw7.php