

Agriculture and Agriculture-based Employment for Individuals with Autism Spectrum Disorder:
Exploring Benefits and Barriers through Community-based Participatory Research

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Abstract

Adults with Autism Spectrum Disorder (ASD) have greater difficulty finding employment than other peer groups with and without disabilities, experiencing rates of unemployment as high as 42% following the end of schooling. In an effort to investigate industries that may offer unique benefits to this population, as well as this population to the industry, this research, focused on the state of Virginia, utilizes the principles of Community-based Participatory Research to investigate agriculture and agriculture-based employment as an option for adults with ASD. Participants (n=12) included adults with ASD who work in agriculture or agriculture-related employment, and individuals with or without ASD who employ or work closely with individuals with ASD in agriculture-based employment or education. Benefits of and challenges to agriculture-based employment are discussed, as are learnings from the field about what may work best for this population of employees and employers.

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Introduction

By the numbers, adults with Autism Spectrum Disorder (ASD) face challenges in finding employment. In a 2019 report by the U.S. Department of Labor, 65.9 percent of U.S. adults without a disability had been employed in the past year. The same was true of just 19.1 percent of individuals labeled with a disability (BLS, 2019). According to Roux and colleagues (2015), when we look to break those employment numbers down even further, in their early twenties, 95% of individuals with a learning disability will find employment, as will 91% of those with emotional disturbances and 74% of individuals with intellectual disabilities. However, that numbers drops to just 58% for young adults with ASD. Research shows this statistic is a problematic sign for employment later in life as well. Of their research looking into transitions to employment for young adult social security recipients, Hart and Grigal (2018) reported that gainful employment today is correlated to gainful employment tomorrow. As they succinctly stated, "Paid work predicts paid work."

The latest estimates of the Center for Disease Control, collected in 2014, reported that 1 in 59 eight-year-old children in the U.S. had been diagnosed with ASD (Baio et al., 2018), a number down from 1 in 88 children in 2008 and 1 in 150 in 2000. That difference is indicative of a trend that has been occurring in ASD diagnoses, with higher and higher rates of prevalence estimates each year (CDC, 2019). Note that these numbers are estimates of children at age 8, and that as these numbers increase, so do the numbers of soon-to-be or current adults who will be or are looking to join the ranks of the employed. For those represented by the statistic that 42% of adults with ASD cannot find adequate employment, the numbers are growing. Research into ways to increase employment across job sectors becomes vitally important as a way to expand the opportunities for this community. To further drive home this point, across the lifespan, one in four individuals with ASD are reported to have the goal of finding community-based employment, and only 14% of these individuals are able to find that work (Roux et al., 2017).

Autism is a developmental disorder that is characterized by difficulty in social communication and interaction, and in repetitive and restrictive interests and behaviors (American Psychiatric Association, 2013). ASD is deemed a spectrum because there is a wide range of how symptoms are expressed and to what severity from individual to individual (National Institute of Mental Health, 2019). In a study on hurdles to employment for individuals with ASD, Lorenz and colleagues (2016) studied two types of barriers for this population: those that were expected by the job seekers prior to employment and those challenges that actually occurred on the job or during the job-seeking process. For expected barriers, job seekers had the following concerns, in the order of the magnitude of their worry: 1) having the qualifications to win the position, 2) what potential issues of communication may occur, and 3) concern about the job's equipment and environment. Regarding the barriers that occurred, the primary issues were related to the job's equipment and environment, followed by issues with the application process and the work routine.

The problem of unemployment for individuals with ASD is particularly evident in rural communities, where work can be hard to find for everyone, and services fewer and farther between for individuals with ASD (Antezana, Scarpa, Valdespino, Albright, & Richey, 2017). When thinking about the types of jobs that are available in rural communities, some look outward to the acres of farmland around them, and think: opportunity. At least that's what growing numbers of farms specializing in providing therapy and work opportunity to those with ASD in the U.S. and abroad have thought. Intuiting benefits that may be available to individuals with ASD through farmwork specifically, these communities have begun small operations that offer employment to this population, and this research begins to look at these groups—employers, employees, and individuals who work closely with them—in the field of agriculture and agriculture-based employment.

Agriculture and agriculture-related industry (including forestry and goods sales) contributed to over \$1 trillion of the U.S. gross domestic product, with \$132 billion of this number coming directly from the production of farms. During that same period, it's estimated that 11 percent of jobs in the U.S. were in the agriculture or agriculture-related fields, with 2.6 million jobs on the land itself (USDA, 2019). Those numbers include all kinds of farms, from what the U.S. Department of Agriculture calls "very small farms" of 20 acres or less, to "very large" farms of over 2,000 acres. Small farms, the type on which the present research's participants work, are estimated to make under \$350,000 in annual gross cash farm income and make up 25% of farms in the U.S. (MacDonald and Hoppe, 2017; Dunkel, 2013).

In Virginia, in which we situate the present research, agriculture is the largest non-public industry in the state, with a \$70 billion contribution to the economy. It provides 334,000 jobs. In 2017, an estimated 54,000 farmers were working the land with 44,800 farms beneath them, covering an estimated 8.1 million acres, with the average farm totaling 181 acres. In Virginia, 90% of farms are owned by individuals or families, and the average age of farmers is closing in on 60 years old, with more than a third over the age of 65 (Virginia Department of Agriculture and Consumer Goods, 2019). It's an industry that's looking for employees all the time, and increasingly so in 2019 due to changes in immigration, the labor market, and other considerations (Porter, 2019).

It's also a profession that is no stranger to disability. Estimates of farmers working with some type of disability are between 1.04 million to 2.23 million depending on the survey used (Deboy, Jones, Field, Metcalf, & Tormoehlen, 2008). A more recent study found that nearly 1 in 5 farmers (19.2%), and nearly one of ten farm employees (9%) had a reported disability (Miller & Aherin, 2018). Disabilities may come from advancing age, injuries sustained on or off the job, at birth, or by other means. In order to assist this population, United States Department of Agriculture-funded AgrAbility grants have been awarded to land-grant state universities, with the purpose of providing support and technological innovation to keep farmers with disabilities farming. As just a handful of examples, this may mean adding handrails to a tractor, building a lift to get the farmer unto equipment, providing on-the-job review of physical accommodations or changes to practices as needed, or anything the farmer may need within physical, financial and technological possibility to keep working the job. AgrAbility works primarily with farmers who have become disabled, but they also have branched out in some locations to work with new farmers who come to the work already having disabilities, such as veterans returning from war with sustained injuries.

While there is not much by way of research on the *vocation* of farming for individuals with ASD, there is a somewhat robust literature on the benefits of farming and related practices as therapy for this population. Although it is practiced in only a handful of locations in the U.S., the practice of “care farming,” also known as “green care” or “therapeutic farming,” in which agriculture is used as therapy for individuals with neurological and other differences, is established and gaining in popularity in Europe, particularly in the Netherlands. Research has shown a number of benefits to this practice, including increases in social interaction, confidence, physical fitness, motivation, and self-efficacy, among others (Artz and Davis, 2017; Gorman and Cacciatore, 2016; Leck, Upton, & Evans, 2015; Hassink, Elings, Zweekhorst, Nieuwenhuizen, & Smit, 2010). Additionally, horticulture therapy is a practice in which gardening is used as a therapeutic modality with trained therapists. Research has shown horticulture therapy to provide positive results, particularly for those with dementia and other forms of cognitive decline (Mizuno-Matsumoto, Kobashi, Hata, Ishikawa, & Asano, 2008; D'Andrea, Batavia, & Sasson, 2007). Related to what individuals might encounter in agriculture, depending on the type of farm, is animal-based therapy. This type of therapy, particularly utilizing horses, is becoming increasingly established for its therapeutic outcomes for individuals with ASD. Equine-assisted therapy has been shown to improve motivation, and social and physical functioning in children and adolescents with ASD (Taylor et al., 2009; Anderson and Meints, 2016), and farm animals used in the therapeutic spaces of care farms have been shown to increase social engagement, increase relaxation, decrease stress and anxiety, and provide opportunities for learning about reciprocity and other areas of engagement (Hassink, De Bruin, Berget, & Elings, 2017; Gorman, 2017).

While the therapeutic interventions described are not vocation, these positive outcomes suggest that components of agriculture and agriculture-related employment can have similar effects. At the same time, agriculture-based employment offers the opportunity for concrete, often repetitive and goal-oriented work, which is a type of work that may be well suited to the interests of some adults with ASD. In addition, agriculture is an industry that needs employees, and job seekers with ASD are a population looking to work. In Virginia, although there is no precise count of how many individuals that may be, the Virginia Department of Education reported in 2016 that 19,556 students received services for ASD, a number up from 6,448 just a decade earlier. Coupled with the statistics already noted, that 42% of these individuals when adults may be facing unemployment, it is vital to look to industry such as agriculture to see how the needs of these two populations, farmers who need employees and adults with ASD who want to work, can impact each other in potentially very positive ways. Therefore, this research looks to the community already engaged in this type of work, individuals with ASD who work in agriculture and agriculture-related employment, and individuals who work in agricultural with this population but may not necessarily have ASD, to gain insight into the benefits and barriers of this type of employment for this population, and to seek valuable insight into how to increase employment for individuals with ASD.

Methods

Research Design

Community-based Participatory Research (CBPR) is a research methodology in which the community about whom the research is focused is part of conducting that research. That is to say, research is not conducted *on* a population, but is instead conducted *with* a population. This was vitally important to this research as the real experts of Autism Spectrum Disorder and agriculture—as individual communities and as they merge—are those who have ASD, those who work with individuals with ASD in the field, and the farmers (both with and without ASD) themselves. As outlined in Israel, Schulz, Parker, & Becker, 1998, the key principles of CBPR include:

1. Recognizing the community as a unit of identity
2. Building on strengths and resources within the community
3. Facilitating collaborative partnerships in all phases of the research
4. Integrating knowledge and action for mutual benefit of all partners
5. Promoting a co-learning and empowering process that attends to social inequalities
6. Involving a cyclical and iterative process
7. Addressing health from both positive and ecological perspectives
8. Disseminating findings and knowledge gained to all partners

In all aspects of the present research, the researcher attempted to adhere as best as possible to these guidelines. The community was involved through outreach, presentations, recruitment efforts, expert content interviews, and the shaping of the structured interview. The iterative process of the change in interview approach that occurred during the recruitment and interview phase of the research (discussed below) was tied to a cyclical and iterative process, collaboration, and building on strengths and resources within the community. Co-learning took place during meetings between the researchers and participants in the community through the mutual flow and dissemination of information between them, and health (physical, emotional, and vocational) was of central importance in the approach and the research as a whole. In terms of a positive and ecological perspective, this research couldn't help but focus on the person as situated within their environment, both in a social context and in a literal one. Agriculture is one profession that arguably works most closely with the earth, and the earth with the farmer, and this interaction with the environment is exactly where we see some of the benefits of this work for individuals with ASD.

Participants

The following analyses include responses from 12 individuals (n=12), including four with Autism Spectrum Disorder, six who work directly with individuals with ASD in agriculture but do not identify as having ASD, and two mothers of children with ASD engaged in agriculture-based employment or education. Additionally, two of the six individuals working in farming with individuals with ASD are also the parent of a child with ASD engaged in farming. Of the individuals with ASD, two were female and two male. Of the individuals who worked with individuals with ASD and/or were a parent of someone engaged in agriculture, all were female. Participants were not asked to disclose ethnic or race information. The age of the participants with ASD ranged from 19 to 40 years of age, and from 19 to 63 for all participants.

One participant with ASD was a beneficiary of Social Security disability benefits. All but two participants resided in area codes affiliated with Northern Virginia counties. One additional participant with ASD was consented (outside of the 12 participants counted above), but excluded from analyses as they worked outside of agriculture-based employment.

Procedure

The community was engaged in a number of ways from the conception of this research through the final analyses. At the beginning of this research, 30 content experts—including farmers, professionals who work with farmers (such as State Agricultural Extension Officers), rehabilitation counselors working in various states, educators, those who work in AgrAbility, assistive technology experts, and other experts in ASD, were consulted, and provided guidance and information through semi-structured interviews. The input from these “content expert interviews” is included in more detail in the “Discussion/Implications” section below, for those who gave their verbal consent to participate in such a manner. Recruitment was also performed through the community (e.g., via vocational offices, farm extension offices, farmers’ markets, and word of mouth), and focused on the state of Virginia. In the analyses phase of the research, participants who opted into further contact via an option on the Informed Consent Document were contacted via email with initial results and asked to provide further feedback at this stage as well.

Regarding the iterative process and building on the strengths and resources of the community, a change was made to the initial research plans. In the initial iteration, it was the goal of this research to form focus groups including individuals with ASD who did and did not work in agriculture (as separate groups; each of 8-12 individuals) and farmers who did and did not work with individuals with disabilities (also as separate groups; each including 8-12 individuals). Once recruitment began, numbers were lower than expected, and information was gained from speaking with potential participants and those familiar with these groups, specifically, that: 1) individuals with ASD often do not like to engage in group settings, and 2) farmers reported being uncomfortable with discussing their employee-base when they did not report to work with individuals with disabilities, in particular as the research was identified as having a focus on working with individuals with a disability. With this feedback, the research pivoted to an interview-only approach, focusing on the group of most pertinent interest to the present research question: individuals with ASD who work in agriculture and agriculture-based employment and the individuals who work with them in that field.

Due to the limited numbers of potential participants, targeted sampling was used (Watters and Biernacki, 1989). All target group participants were consented via a process approved by the Institutional Review Board of The George Washington University, which also reviewed and approved all other research plans and procedures.

Data collection and analyses followed the principles of Community-Based Participatory Research (Bergold and Thomas, 2012; Holkup, Tripp-Reimer, Salois, & Weinert, 2004; Israel, Schulz, Parker, & Becker, 1998). Structured interviews from the participants, semi-structured interviews from the content experts, and research notes were all coded for content, and themes were determined from that content as is reflected below. Quoted answers to questions when applicable are included only for participants who did not opt out of using quotation. Participants who opted into further contact by the researcher (10 of 12 participants) were contacted via email to review themes from the initial analyses and asked for feedback on the benefits and barriers to employment in agriculture-based employment as presented, as well as to offer any additional

thoughts since their initial interview. This is a crucial part of CBPR, as the community who participates in the research and is the basis of the research should have input throughout the research process. Feedback was incorporated into the final analyses.

Results

Participants were asked questions in a structured interview format that fell into four categories: 1) related to the specifics of their employment, including past work experience, the hiring process, travel to work, and a typical day and mentorship on the job; 2) questions relating to communication and perception of self in regards to their job; 3) questions related to their definition of “disability” and of being (or having) a “good employee”; and 4) their perception of agriculture-based employment, including challenges and benefits of the job.

The sizes of the farms on which the participants worked were in the “small” to “very small” USDA categories. All were under 30 acres, with most working on growing fields of less than 5 acres. Job duties of the participants ranged from working with crops (planting, weeding and harvesting), working with farm animals, landscaping duties, working with produce at the market, working with customers selling farm-product such as flowers, and other duties on and off the farm (such as transit of product and participation in farmers markets, etc.). Work times ranged from part-time to full-time. Three individuals with ASD reported to have mentors at their place of employment.

In the analyses of participant responses, the following themes arose. Below they are ranked in order by the amount of interviews in which the theme was identified with the number of interviews that included the theme labeled to the side. The first list and accompanying information are in regards to the *benefits of agriculture-based employment* that were identified through analyses of interviews. The second list and accompanying information are of *challenges with agriculture-based employment*, followed by indicative sample answers to specific questions not captured in the other themes.

Benefits of agriculture-based employment

1. Community involvement (11 interviews)
2. Opportunity to learn with short- and long-term visible goals (10 interviews)
3. Learning adaptability (9 interviews)
 - a. also termed “perseverance” and “grit” by participants
4. Self-esteem / self-advocacy (8 interviews [tied with #5 and #6])
5. Social aspects (i.e., interactions with employers, employees, consumers (8 interviews [tied with #4 and #6])
6. Opportunities to learn in a hands-on manner (8 interviews [tied with #4 and #5])
7. The work’s environment (7 interviews)
8. Reduction of stress (6 interviews [tied with #9])
9. Concrete tasks (6 interviews [tied with #8])
10. Entrepreneurial lessons (5 interviews [tied with #11])
11. Opportunities to learn other job skills (5 interviews [tied with #10])
 - a. Other included: “virtues like patience”, time-management skills, handling money and products, showing up on time, and greeting and saying goodbye to managers and other employees at the job
12. Earning an income (4 interviews [tied with #13-#15])

13. The emotional benefits of working for employees and families (4 interviews [tied with #12, #14 and #15])
14. Jobs in rural communities (4 interviews [tied with #12, #13 and #15])
15. Neurological benefits (4 interviews [tied with #12-14])
16. Interactions with other living things, i.e., animals (3 interviews)

Barriers to agriculture-based employment

1. Transportation / Access to farmland (5 interviews)
2. Challenges with sensations/ conditions, i.e., heat, dirt (4 interviews [tied with #3 and #4])
3. Difficulty in finding employment that is sustainable/not seasonal (4 interviews [tied with #2 and #4])
4. Communication issues (4 interviews [tied with #2 and #3])
5. Time commitments in teaching employees, or employers about how to work best with employees (3 interviews [tied with #6 and #7])
6. Stigma, including about farmers and/or individuals with ASD (3 interviews [tied with #5 and #7])
7. Ability to provide/access specialized training, including availability of/agriculture knowledge of job coaches (3 interviews [tied with #5 and #6])
8. Difficulty in making a profit in general in agriculture (2 interviews)

In Their Own Words

Samples of direct answers from participants offer additional insight into this population in terms of agriculture and other employment more broadly in rural and semi-rural areas of Virginia. Here are participant answers in their own words.

“What are the biggest benefits to your job?” elicited answers that included:

- *“Agriculture is such a great open opportunity [with] a lot of room for growth and so many possibilities.”*
- *“It’s rewarding to know that you get to help even if it’s in a small way.”*
- *“Bosses and managers that understand the effects of my disability, but treat me like an adult and encourage me to improve my skills. My favorite part is the overall sense of community.”*
- *“In agriculture, I could make my own day, morph around my day based on what I was feeling. I don’t think the stress level was ever as high [as in other types of jobs].”*
- *“I have always enjoyed being outdoors, and farm work offered opportunities for me to be social and productive while doing so.”*

“What are the biggest challenges to your job?” included predominantly answers related to travel/accessibility of farmland, and the following:

- *“Direct communication, be it in person or over the phone.”*
- *“A lot of time you just power through, adapt.”*
- *“Interacting with different co-workers.”*
- *“Communication is a huge issue in any work environment.”*
- *“Sunlight was the biggest challenge – I like sunlight but I have a really bad light sensitivity, and migraines with extreme temperature.”*

In response to the question, “What does the word ‘disability’ mean to you?” almost all participants included the word “accommodations” in their answer, such as “a person who needs accommodations.” Other answers included:

- *“I know it’s something I have, but I don’t let it hinder me.”*
- *“Not disabled, but unique learners.”*
- *“It’s doesn’t mean a whole lot to me. Disability is something you’re slapped with, like who you are kind of takes a back seat. That doesn’t define who I am and that’s part of my work ethic. I feel like I have something to prove.”*

In response to the question, “What abilities does one need to be a ‘good employee’?” participants answered predominantly about working hard, being adaptable, and being able to learn. Answers included:

- *“Dedication and a willingness to learn.”*
- *“A strong work ethic, a reason to be there—you’ve got to want to do what you are doing.”*
- *“I think the most important thing—disability or not—is to be teachable and moldable.”*
- *“There’s no way you can ever start a job and know everything—and you might realize there may be other ways to do things.”*

Participants were also asked if there was anything else they wanted employers or the public to know about them. These answers included the following:

- *“What I want society at large to understand is that autistic people are people. We have a voice, we have skills to offer, and above all, we’re just as human as anyone else.”*
- *“I’m not going to say I wish they knew I had a disability, because I honestly don’t.”*
- *“Just being more aware of each other.”*
- *“Everyone at work knows me well. I wish the public knew more about my hard work and kind heart.”*

Discussion

In the *Background* section above, we began a conversation about potential benefits from agriculture-based employment for individuals with ASD that can be extrapolated from therapeutic techniques that involve the actions, environment, and animals of agricultural life. Additional benefits from work in agriculture-based employment were also introduced through interviews with participants, such as concrete, hands-on learning with clear short-term outcomes (e.g., the animal eats the food that is put in its pen) and long-term outcomes (e.g., harvesting many weeks after planting), positive environmental influences, an income, emotional, cognitive and physiological benefits, and a greater sense of community-involvement.

In addition to these benefits, those who work with animals in their farmwork may experience improvement in social development (as is true for neuro-typical and neuro-atypical children), increases of social interactions (frequency and duration) in the presence of animals, increases in vocalizations, decreases in aggressive-type behaviors, and decreases in stress, heart rate and blood pressure (O’Haire, 2013). Additionally, work with farm animals can be unpredictable as often the animal does as it pleases, and this can lead to teachable moments about theory of mind, flexibility, and approaches to interacting with living things in a controlled

and non-confrontational environment. Conversations about safety and danger can be had around animal handling and care, in addition to those around tools and equipment. Animals and crop-work also give the opportunity to work on motor skills including both fine motor skills, as would be needed to deposit a seed in the soil, and gross motor skills, like crossing the midline of one's body to lift a bale of hay.

Another potential benefit may be that the changes in routine and expectation that are unavoidable in farmwork (e.g., it's raining outside, pests have invaded, crops have died, or the tomatoes aren't ready for harvest on the day expected) can provide opportunity for individuals with ASD to process the unexpected and practice working with through change. This may lead to better coping skills and physiological benefits as well. According to studies by Corbett and colleagues (2009, 2008), changes in routine or schedule have been shown to increase levels of the stress-related hormone cortisol in individuals with ASD. Notably, their research showed that the bigger spike in cortisol came with anticipatory stress rather than stress once the change had actually occurred. This suggests to the present researcher that learning to cope with change in routine and schedule through activities such as those frequently related to farmwork can have a backward directional effect too, hypothetically decreasing those spikes in anticipatory stress over time as the individual sees and experiences evidence that coping is possible. This is, however, theoretical and a place for potential further research.

In addition to benefits from agriculture, professionals and employers noted what individuals with ASD could bring *to* agriculture, including conscientious work, dedication to the job and an enthusiasm about the employment. As one participant stated of individuals with whom she worked, they "rarely miss work, as they take great pride in their jobs." Another participant spoke about how learning to be a good boss to individuals with ASD meant being a good boss any type of employee, as "accommodations" such as giving clear directions, setting clear expectations, and showing consistency are good ways to approach anyone being asked to complete a task, she said. Several vocational rehabilitation experts and individuals who worked with employees with ASD spoke about agriculture-related fields in which they believed individuals with ASD would excel, such as in breweries and in vineyards. These jobs would take a careful focus, a wide knowledge of a specific area, and attention to detail, which can all accompany the restricted-type interests of certain individuals with ASD.

As this research focuses on employment outcomes, it is important to discuss the financial benefits and considerations, and work-skills acquisition of agriculture-based employment. In semi-structured interviews with content experts, frequent mention was made of the low wages associated with farmwork, and the difficulty with finding sustained (i.e., yearlong, non-seasonal) employment in agriculture. Two participants with ASD were working part-time schedules in agriculture-based employment. One participant with ASD was working full-time, and one participant, who received Social Security benefits, was offered full-time work, but kept his hours to 30 per week in order not to lose his benefits, he stated. Participants who were parents of children with ASD were more likely to speak about the job skills that could be learned in agriculture than the money earned from such employment. In terms of earnings, farm employees and employers spoke about the impact of the paycheck, either in the autonomy the money afforded them or the actual receipt of the check itself that meant employees were participating in true employment. "They know the difference between a contrived job and a real job, and they know when they're in the [field], they're doing real work," one participant said. Another participant who employed individuals with ASD talked about an employee not knowing what to do with his paycheck when it was given to him and that engaging in a banking system became

part of their work skills conversation along with skills to be learned in the field. Parents and employers alike spoke about transferable skills related to communication that were being learned on the job, such as two employers noting the strides they had seen their employees make in saying hello and goodbye at the start and the end of each workday.

In addition to finances, employment can largely be about purpose, and this was something that came up frequently in interviews: the impact of having a purpose for the employee. Participants' purposes were often stated to include wanting to help the community. One participant spoke about her child with ASD being motivated by the idea that people are counting on the food he harvested, and how that motivated him to get to work each day even on mornings other activities initially seemed more tempting to him. Along with building internal motivation, decision-making skills and dedication are learned from those types of decisions and the conversation she has with her son around them, the parent said, and the research is behind her. A study by Watanabe and Sturmey (2003) shows that the ability to engage in one's own decision-making contributes to positive outcomes in overall development, and increased self-efficacy and engagement in tasks.

Another participant spoke about how she highlighted to employees and volunteers where the food they were producing would end up. In addition to local restaurants, their produce went to a food bank in the community, along with a few extras they included:

We also donate flowers and herbs to the foodbank, and you know, just because you can't afford healthy foods for your family doesn't mean you still wouldn't be happy from a nice vase of flowers, a nice bundle of lavender. I think one of the biggest satisfactions for me is some of these [employees and volunteers with ASD with whom she works] are people that have always had others do for them their entire life, and this gives them the opportunity to give back. It makes them feel good. They get it.

She noted that when the foodbank came back a time later for the next pick-up, the driver expressed the joy and gratitude from the foodbank patrons, saying how those floral-filled jars and bundles had meant a lot to them.

And my participants, they get that. They were happy, and the next time we were harvesting for the foodbank, we were making a list on the whiteboard about what we were going to harvest for the day, and one of the participants said, "And we're going to do—don't forget!—we're going to do the flowers, and we're going to do the herbs, because they like those!"

"That was huge," she said, reflecting on areas of motivation, agency, and connection to the community and the contribution of the flower, herb and produce growers with ASD to it. She also noted, along with those areas, were the tangible skills learned of growing, cutting, measuring the length of the stems, and others related to the floriculture of those mason jars of flowers. As the statistics introduced at the start of this paper may suggest, in several cases individuals with ASD who participated in this research noted not being able to find other types of employment prior to their work in agriculture. Repeatedly reflected in participant interviews were similar examples: individuals with ASD seeing benefits not only financially and physiologically from their agriculture-based employment, but additionally from the benefits of

the engagement in the community it afforded them. Here is just one example of many that reflected how the community around these employees benefitted as well.

There can be a misconception that because individuals with ASD are considered to have "deficits" in social interaction that they want or need less social connectedness. While everything is different on an individual case-by-case basis, the results of these interviews and a literature review tell us this isn't necessarily, or perhaps even typically, the case. Several research studies have indicated that individuals with ASD report feeling lonely at higher rates than age-matched peers (White and Roberson-Nay, 2009; Bauminger, Shulman, & Agam, 2003; Bauminger and Kasari, 2000). Staving off loneliness can lead to better emotional, mental and physical health, and increase longevity (Cacioppo and Hawkley, 2009). With that being said, along with the community-connectedness explored in these interviews in regards to agriculture-based employment, the agrarian environment has also been shown in the literature to improve social integration, even in smaller settings like urban gardens (Kweon, Sullivan, & Wiley, 1998).

A wheat farmer who participated in a content expert interview and gave verbal consent to be quoted spoke to this point and more broadly about the potential benefits of a vocation in agriculture for individuals with ASD.

"The old timers told me, 'Take care of the land and it will take care of you,'" the farmer reflected, who pursued farming after retiring from another career. What's been most rewarding for him has been doing just that, he said: cultivating the land and watching his wheat start to come up consistently at a quality he's proud to sell to market, where it eventually makes its way into consumer goods. Although he's been farming the property for the last 20 years, in these last two and a half years, he said, "I can really see the effect that [cultivation's] had on the land," but "it's hard work. It doesn't farm itself."

"I get what you're trying to do," he said of the research project. He began a story about going up to the top floor of his farmhouse to look out from the highest window at his fields. He called his sons up to join him, to see what he saw "when that wheat is flowing."

"The wind blowing over the top of those wheat fields, it's magical. You can see it. You can feel it. The wind going in two different directions like two hands going down the field and spreading them. And if you can show that to an autistic individual? That's calming. That's some kind of satisfaction. It is for me."

From an employment standpoint, he added, "from a farmer's perspective, the only thing you need to be a good employee" is: 1) physical capability, which meant lifting 50 pounds and stamina to him, and 2) the ability to be trained.

"I'd consider any individual" who met those two requirements, he said.

Addressing Barriers

A topic that was not raised in participant interviews, but came up in several "content expert interviews" was related to the dangers of the work: unpredictable animals, sharp, heavy and powerful machinery, pesticide inhalation, and accidents from any numbers of activities related to farmwork. This topic is addressed in the literature as well (Deboy et al., 2008, Runyan, 1993). Farmers, in particular, who gave semi-structured interviews, highlighted that concern. Farmwork is noted to have higher rates of injury than other types of employment, and several vocational rehabilitation and related professionals working in rural communities cited that when they work with farmers, they're typically those who have become disabled during the course of their career on the farm, as opposed to people with disabilities looking to start in farmwork. During the feedback portion of this community-based participatory research, one participant

noted of addressing dangerous work: “Careful screening of strengths/weaknesses/skill sets of all employees is key.”

Transportation was an issue that came up in most participant interviews. Without a car and relative proximity to farmland, it is usually not possible for employees or would-be employees to get to agriculture-based employment if they do not live on the farm in which they are employed. Two participants were driven work by their parents, and one expressed concern about how she would get to work when her parents’ schedules changed. Employers noted that some prospective employees were simply not able to get to the farms at all or with any consistency due to transportation concerns, and therefore, were not able to procure or sustain employment. Farms are often located outside the bounds of accessible public transportation, and this remains a barrier for many would-be employees and complication for current employees who do not have access to a vehicle, and if they don’t drive, someone to drive them.

As reported in the literature (Cascio et al., 2008), issues regarding sensitivities to sensations were reported across structured and semi-structured interviews. Individuals with ASD noted needing to take breaks, concerns about the heat and the light, and other issues. Employers, educators and counselors working with individuals with ASD spoke about accommodations that most noted were good for any employee working in outdoor conditions, such as taking breaks in shaded or cooled areas, wearing hats and gloves, and putting a damp towel on the back of the neck in high temperatures. Many noted that some individuals had tried farmwork but determined the sensations were not for them: such as the touching of dirt. Participants who were also employers noted that they try to fit employees with jobs that are suited to their skillsets and sensitivities. For example, an individual with ASD who wanted to be involved in one of the farms, but did not find farmwork to her liking, was asked about her interests. When the employer found out she had an interest in making movies, the employer elicited this individual’s help in filming projects for the farm.

Communication issues were addressed by farm employees and employers alike. Employers and educators spoke about utilizing visual techniques, such as the use of white boards that reflected the day’s chores to be reviewed at the start of shifts and to remain visible throughout the day. They stressed using both words and images to illustrate activities, as ways to make clear work schedules, duties and expectations. Issues that seem to be with communication, one participant stated, may be related to “people with ASD having a hard time with the transition.” Individuals with ASD are often drawn to structure and routine, and moving away from these conditions can cause distress (D’Cruz, Ragozzino, Mosconi, Shrestha, Cook, & Sweeney, 2013). This participant found that not only assigning employees to certain jobs, but also to specific crews each day, helped alleviate some of these stressors. She noted that this way, even as the tasks changed, the crew stayed the same, and the employee knew to expect this. For employees who were “having a hard time with the transitions,” they then “always knew ahead of time who they were going to be with and what they were going to be doing.”

In order to address issues around the seasonality of farmwork, which would make it difficult for individuals with ASD to find year-round employment in the field, employer participants and a number of content experts suggested looking into the practices of farms that participate in Controlled Environment Agriculture (CEA). CEA involves agriculture that takes place in an environment shielded from the direct effects of nature (as much as is possible). This includes high tunnel greenhouse growing, hydroponics, and other indoor methods of growing such as with artificial light. Along with extending the length of the growing “season” with these methods (as with some types the traditional idea of “season” no longer exists), other issues with

sensation sensitivity or environmental factors that might preclude some individuals with ASD from engaging in agriculture-based employment (such as those of dirt and intense heat from the sun, as discussed earlier) may no longer be a factor as they are, in some forms of CEA, removed from the experience.

Limitations

Limitations to the present study include a small sample size and a restriction of geographical range with this sample in relation to the entirety of the Commonwealth of Virginia. Most participants reported to live in area codes that are in Northern Virginia, and may not represent the agriculture experiences of the rest of the state. Additionally, it was the researcher's plan to collect more data from participants who were recipients of Social Security disability benefits, but only one participant with ASD reported to receive benefits, and as such, inferences as relate to other individuals employed in agriculture who are recipients of Social Security benefits could not be made. However, the implications of studying employment specific to individuals with ASD is an important line of research for increasing opportunities for employment for this population. Along with estimates of the numbers of children diagnosed with ASD increasing over the last decade as stated earlier, we know that the numbers of individuals under the age of 65 who are recipients of Social Security disability benefits in the "Autistic disorders" diagnostic group are also increasing at a similar rate. In 2009, that number represented 130,772 individuals, and has been increasing yearly by an average of 24,584 people. In 2017, the number of individuals receiving Social Security benefits within the "Autistic disorders" diagnostic group had risen to 327,442, two and a half times more than the number of individuals with ASD reflected just eight years before (Social Security Administration, 2017). Looking back to that previously reported estimate that 42% of this population is unable to find sustained, meaningful employment, research into how to increase employment opportunities for this population becomes vital on an ever-increasing scale.

Suggestions for Future Research

As noted above, the effects of experiencing changes in schedule and routine due to agriculture-based work on the reduction of physiological signs of anticipatory stress for individuals with ASD is one identified area for future research. The same can be said of the physiological markers of any of the benefits suggested herein in relation to the vocation of agriculture for individuals with ASD as these research studies do not currently exist beyond those related to farming as therapy. Additionally, while the present research offers a start at investigating the benefits of, barriers to, and potential viability for increased attention to agriculture and agriculture-based employment for adults with ASD, more research is needed with greater numbers of participants who are farmers with and without ASD to be able to make more generalizable recommendations in the future.

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