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The Success of Plain People's Produce Auctions and Partnership with Missouri Extension

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Abstract: The number of produce auctions led by plain Anabaptist producers has surged since the mid-1990s. Typically grower-owned, these businesses are centralized facilities providing a wholesale market to area growers for a diverse group of buyers. For growers seeking an adequate living from growing produce, these facilities help reduce marketing time and product transportation, and provide frequent sales events that guarantee payment. As such, they have developed into a solid and long-standing market for local produce. However, plain growers have experienced challenges trying new crops or scaling up production. This article details how Missouri Extension assisted plain farmers with their challenges through modifications needed for effective engagement. Outreach efforts have been reminiscent of Extension in the earlier part of the twentieth-century, which employed farm visits and tours, direct mailings, and small group gatherings. Service delivery focus has included pest control, produce food safety, effective communication, and business innovation. Extension also worked with the Clark, Missouri, produce auction to adapt to challenges presented by the new federal food safety requirements. An analysis using the U.S. Census of Agriculture data documents that farms associated with produce auctions became critical to fresh vegetable production in Missouri. Market share doubled from 2007 to 2017 (from 13% to 26%). This demonstrates that the auction infrastructure has become a regionally important supply chain channel for fresh produce. [Abstract by authors.]

Keywords: Amish; Old Order Mennonite; vegetable sales; Missouri Extension; outreach

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INTRODUCTION

Led by the grassroots establishment efforts of plain Anabaptist producers, the number of produce auctions across the Eastern United States and Canada has surged since the mid-1990s, after declining from the 1940s. Beginning with plain people in Pennsylvania, produce auctions gradually spread to other states and now number over 70. The auction marketing model is an opportunity for growers wanting to make an adequate living from growing produce (Tubene and Hansen 2002). These marketing cooperatives provide growers with guaranteed sales to wholesale (i.e. large volume) produce buyers in a competitive bidding atmosphere at a spacious building that facilitates product delivery and distribution. Buyers are local or regional, acquiring produce for grocery stores, restaurants, roadside stands, or other food related uses; the produce is often destined for nearby cities or urban areas. As such, growers spend less time in direct selling (e.g. farmer's markets). While there is a commission charged by the auction, it is typically more than offset by the higher prices received at auction than through wholesale market alternatives, such as a supermarket contract (Trinklein 2015).

The first plain producer-led auction in Missouri began in 1994, and within 10 years, there were four auctions (Trinklein 2015). By 2008 there were over 200 growers in Missouri dedicated to produce growing (Lancaster 2009). Some of the distinctive aspects of plain Anabaptist culture make them well suited to vegetable, fruit, and flower production; for example, their large families and strong communities ensure ample supply of labor. The long historical tradition of producing fruits and vegetables in states such as Pennsylvania and New York has benefited Missouri; plain people migrated from those places, where land was expensive, to purchase farms in states where land was more affordable.

The produce auction model among plain people has developed into a solid and long-standing market as local fresh produce is in demand and an important source of a healthy diet for consumers. This can be documented using the U.S. Census of Agriculture and focusing on an agricultural commodity or group of commodities. The increase of fresh vegetable production from plain people's auctions best illustrates this, having nearly tripled

from 2007 to 2017 and growing from 13% to 26% of Missouri's market share (USDA-NASS 2009). While vegetable production is an important enterprise in Missouri, with over 65.6 million dollars in annual sales (USDA-NASS 2019; USDA-NASS 2020), it pales in comparison to dominant agricultural commodities such as grains, oilseeds, meat, poultry, dairy, and eggs. However, the market niche of fresh vegetables is a good match for the smaller farms typical of most plain people, with its high value and lower land needs. The relevance of this is understood by many of these communities, as their once prized dairy industry has been diminished or, in some places, totally lost. The produce auctions centered in plain people's settlements has led to growth and opportunity with new crops for their small farms.

Extension's assistance to produce auction growers in Missouri matured with time. Initially, as growers scaled up their production for recently established auctions, they often encountered new problems and would request a farm visit or similar one-to-one engagement. As auctions became more established, plain produce growers often conducted meetings and Extension's involvement became formal, such as through conducting pesticide applicator training. However, follow up outreach efforts by Extension could be challenging as typical communication methods were ineffective and sometimes culturally objectionable, such as, posting information on the internet, using computer-based technology, locating workshops in cities, and even making phone calls in some instances (Hoorman and Spencer 2001/2002). In Missouri, outreach efforts by the two land-grant universities—University of Missouri [1862] and Lincoln University [1890]—targeting plain produce growers were tailored to meet the producers' needs. Delivery reminiscent of Extension in the earlier part of the twentieth century was used, including farm visits and tours, direct mailings, and small group gatherings (Piñero, et al. 2015). Service delivery has focused on a variety of topics, including pest control, produce food safety, effective communication, and business innovation. A case study is presented here to demonstrate one produce auction's adaptations to market demands.

FIGURE 1: AMISH- AND MENNONITE-LED PRODUCE AUCTIONS IN MISSOURI



1. Barton County Produce Auction (Barton)
2. Central Missouri Produce Auction (Moniteau and Morgan)
3. Clark Produce Auction (Audrain)
4. Four County Produce Auction (Benton, Henry, Johnson, and Pettis)
5. Highway C Produce Auction and Webster County Produce Auction (Webster)
6. Leadmine Produce Auction (Dallas)
7. North Missouri Produce Auction (Daviess)
8. Rich Hill Businesses (Bates and Vernon)
 - a. Bates County Produce
 - b. Maple Grove Produce
 - c. Twin County Produce
 - d. Vernon County Produce

BRIEF HISTORY OF PRODUCE AUCTIONS LED BY PLAIN PEOPLE

Fruit and produce auctions in the United States go back almost 200 years, with 24 in existence in 1925 (Miller and Hauck 1925). Their impact peaked in the 1930s and slowly declined for several decades, due to more efficient methods of business communication and transportation (Box 1993). By the 1970s, few were left, and these were regarded as last resort outlets for excess and lower quality produce (M. Shirk, personal communication, 2006).

Auctions centered in Amish and Mennonite settlements originated in Pennsylvania in the early 1980s and served as a way to market vegetables, flowers, and fruit produced at local farms (Tubene and Hansen 2002). These community farmers knew there was a market, as many sold produce directly from their farms, a practice that still continues even with the success of produce auctions. Customers who stopped by the farm-based markets generally paid a good price, and, for the farmers, off-the-farm sales required little time and no transportation. However, the sales were small and inconsistent.

Spurring the shift to produce was the decline in demand for tobacco, a long-standing cash crop grown on Pennsylvania farms. As with tobacco, fresh produce requires high labor but low land input (M. Shirk, personal communication, 2006).

Most auctions are a marketing cooperative organized as a grower-owned limited liability cooperative or general partnership (Trinklein 2015), but variations of this model exist (Quinn and Miller 2013). Nonetheless, the common business model is a centralized facility providing a wholesale market to area growers for a diverse group of buyers.

The obvious benefits a produce auction provides to growers in the community are convenience in transportation, frequent sale events, solid demand, and guaranteed payment (Blaine, James, and James 1996). Auctions also provide an interesting mix of social, educational, and cultural benefits. Growers typically become motivated by their frequent engagement with each other. Discussions between growers and customers on various business, marketing, and production issues often serve as important learning opportunities (Jorgensen 2012). By selling their produce

away from their farm, visits from non-Amish/Mennonite individuals are reduced, which lessens the perceived corrupting influences of “the world” on families (Blaine, R. James, and B. James 1996). Lastly, auctions often supply boxes and related packaging, buying in bulk and storing until needed (Trinklein 2015).

The rapid increase of plain peoples’ produce auctions in Missouri was typical of other places in the Eastern United States. From the first, which was established in 1994, four were operating by 2004 and by 2013 there were eight (12 when including similar facilities) (see Figure 1) (Quinn and Miller 2013). Even at eight, Missouri has more produce auctions than any adjoining state and the most west of the Mississippi River. By 2019 there were more than 70 produce auctions in eastern North America (the majority in the United States) with Ohio (12) and Pennsylvania (16) having the most (Bergefurd 2019).

A produce auction typically becomes an important asset to the community as a business in itself. When beginning, the annual sales may be just several hundred thousand dollars (Jorgensen 2012) but larger auctions have grown to annual sales exceeding \$3 million (Tubene and Hansen, 2002). With sale commission rates of 8 to 12% (Trinklein 2015), the annual business income may only start at \$20,000 but typically grows to exceed \$100,000 and, for higher volume auctions, commission income might exceed \$250,000. A typical auction in Pennsylvania employs 7 to 10 individuals, has a 16,000 square foot building, and required an investment of \$1.5 million (Tubene and Hansen 2002). Extensive information is available on the business structure, technology usage, market operation, number of buyers, and growers supported, including crops sold (Tubene and Hansen 2002; Trinklein 2015). Produce auctions in Missouri do not provide any cooling and this has limited production and marketing of highly perishable items such as strawberries, lettuce and salad greens. Given the lack of refrigerated storage, growers have compensated by only selling crops that do not require cooling or by harvesting very early in the morning (Kruse and Zimmel 2021).

An auction often becomes the most known business of the community, placing that settlement on the map in the minds of outsiders (P. Byers, personal communication 2019). Local businesses, such as bakeries, bulk and discount grocery stores,

furniture shops, and farm stands, benefit from the increased traffic associated with market day (Jorgensen 2012). The facilities also offer additional benefits, such as hosting community events that may be impractical at any other structure or location (J. Harper, personal communication 2019). University Extension in states such as Indiana, Kentucky, Missouri, and Pennsylvania are helping buyers to connect or find produce auctions by hosting a webpage that lists the produce auctions. Additional information may also be provided, such as market price reports. Some produce auctions have their own website, Facebook presence, or other electronic outreach method.

EXTENSION ASSISTING WITH CHALLENGES TO PLAIN PRODUCERS

For more than a century, U.S. Extension has assisted farmers with their challenges, and this is no different with plain producers, but modifications were needed in outreach efforts for effective engagement. Plain growers experienced challenges as they tried new crops or scaled up production beyond the sizeable gardens characteristic of and visible on farms in their communities. However, plain producers pose a distinct challenge as their faith doctrines restrict the use of communication, transportation, and technology, which varies greatly among the many church groups. These restrictions have led to differences in production methods and in the perceptions of the sources of information considered valuable (Kline, et al. 2012). Plain producers are also considered limited resource farmers by the United States Department of Agriculture (USDA) (Ngathou, et al. 2006).

In Missouri, farm visits or similar one-on-one engagements became overly time-consuming for Extension workers as the number of growers swelled. Most of the growers were dedicating much more of their acreage or production to vegetables than to fruit or flowers. Several field specialists initiated a broader educational effort, which led to two projects supported with funding from the Environmental Protection Agency (EPA). The EPA provided fiscal support to take outreach activities directly into the communities. An annually produced Extension publication (*Midwest Vegetable Guide Production Guide for Commercial Growers*) was used extensively for

the EPA-funded outreach activities (Phillips, et al. 2021).

Pest Management

Dealing with agricultural pests (diseases, insects, and weeds) consistently ranks as a top challenge for farmers throughout the United States. Plain producers fare no differently (Piñero 2013; Cuperus, Berberet, and Kenkel 2013). For decades, Extension has advocated for growers' use of Integrated Pest Management (IPM) to achieve superior control while using less pesticide and having less harmful impact on the environment (Cuperus, et al. 2013). However, IPM requires additional education and management to be consistently successful (García-Pabón and Lutch 2009).

Outreach efforts addressing pests were taken into plain producer areas using farm tours, off-season workshops, in-season pest review sessions, and field visits. Over 1,500 participants attended outreach events through 2013. In formal settings, pre/post assessments confirmed increased knowledge. In early 2012, a comprehensive survey was mailed to 313 growers. A 20-question IPM survey was developed (score ranged from 0-14); the mean score was 10. Responders' scores increased relative to the number of Extension resources used to learn about IPM (positive correlation $r=0.38$). These resources included face-to-face conversations with agents, University of Missouri Extension (MU) publications, and MU Extension presentations. The survey report confirmed a number of desirable impacts: increased use of IPM, more growers and increased acreage, improved trust and engagement of Extension (Piñero, et al. 2015). Educational efforts with IPM waned as plain producers were required to shift their attention to produce food safety.

Produce Food Safety

Commercial fruit and vegetable growers across the country were required to adapt their operation to comply with a new federal law focused on food safety (e.g. reducing risks from microbial sources such as E. Coli). The U.S. Food and Drug Administration (FDA) Food Safety Modernization Act (FSMA) was signed into law in 2011, but it took until November 2015 for the Final Rule on Produce Safety to be completed. Getting trained

was the first step required of growers. A coalition of governmental, academic, and industry representatives was organized as the Produce Safety Alliance (PSA) to develop training materials that became available in late 2016. Most serious growers supplying to produce auctions chose to comply, but smaller volume growers could opt out if they met the exemption requirements by completing certain record-keeping documents annually.

Extension trained more than 300 plain growers, who were then certified by the American Food and Drug Organization in Missouri. This was accomplished by offering at least 10 FSMA PSA Grower Trainings directly in plain Anabaptist settlements from 2017 through 2019. Inspections of farm operations by the regulators at the Missouri Department of Agriculture (MDA) eventually needed to occur. To aide growers in this process, an educational farm visit process was developed, called the *On Farm Readiness Review* (OFRR). These were conducted (together) by Extension and MDA personnel (Quinn 2018). Between 2018 and 2019, at least 20 OFRRs were conducted at farms whose primary market was to a produce auction. Often nearby growers would attend and an estimated 100 growers received educational guidance.

Three partners—MU, MDA and Kansas State University's (KSU) Food Safety Lab in Olathe, KS—came together to solve one of the most difficult or complex produce safety issues with which growers had to deal; water testing to ensure adequately safe water was used in the growing, harvesting, and packing of fresh produce. Initially, there was a shortage of labs available to provide the testing; samples had to arrive at the lab within 24 hours of when it was collected. In 2019, samples were picked up by Extension or MDA personnel and driven to Olathe, and tested at no cost, made possible by a USDA grant. By November 2019, more than 350 samples were analyzed and a *Missouri Produce Growers (MPG) Bulletin* article summarized the results (Nwadike 2019). For 2020 and beyond, MU, KSU, and MDA worked with the Missouri Department of Health so its state water testing lab could analyze the samples at no cost. This allowed the samples to be submitted to the local county health department for transport to the state lab.

Service Provider Communication

A Missouri-wide Extension newsletter mailed through the postal service resolved a conundrum common to agricultural professionals or service providers: how to effectively communicate with plain producers without using the telephone or other electronic methods (Brock, Ulrich-Schad, and Prokopy 2018). The newsletter evolved over the years but was always oriented to growers whose primary outlet was produce auctions. Initially, it served as an in-person handout for face-to-face mini-clinics conducted at produce auctions during the 2010 growing season. Realizing the value of having a newsletter that could be mailed directly to growers, Extension made a piecemeal effort to gather names and addresses. In 2011, the quarterly newsletter '*Extension's IPM Bulletin*' was inaugurated. It continued under this name until December 2015 when it obtained a web presence under the name *Missouri Produce Growers* or *MPG Bulletin* (<https://ipm.missouri.edu/mpg/>). Web hosting permitted archiving of all past, current, and future articles. The newsletter continued to be mailed directly to anyone preferring this option. The distribution grew from just over 250 growers in 2011 to more than 500 by 2019. Throughout the years, a variety of funding sources have supported its publication so that it could be provided at no-cost to growers. The average cost including postage has been about \$1.50/newsletter.

The value of this newsletter to produce auction growers was underscored by a survey in 2012. The survey showed that, of all the Extension resources, it received the highest rating (Piñero, et al. 2015). From 2011 to 2019, about 150 articles were included in the newsletter, addressing a wide range of topics such as IPM, production methods, produce food safety, sustainable agriculture, and marketing or business developments. The newsletter (a team effort) was recognized with a 2013 communications award by the National Association of County Agricultural Agents (annual meeting in Pittsburgh, PA).

Innovation and Business Practices

Farmers need to innovate in order to prosper and Extension has a valuable role to play. Increased use of high tunnels and greenhouses is an innovation success example; they can be corre-

lated to sales growth at every produce auction. By having items such as tomatoes and flowers (bedding plants) earlier, more buyers were attracted. Also important is the role these structures provide in protecting crops from extreme and unpredictable weather associated with the Midwest, such as cold, heavy rain, hail, excessive heat, and high winds. Higher quality and more consistent production ensues throughout the growing season. The publication *High Tunnel Tomato Production (in Missouri)* was published in 2004 and became popular as an easy-to-use booklet covering all aspects of production and marketing (Jett 2004). In 2000, Extension began organizing yearly farm tours in Mennonite and Amish settlements around Missouri's first and largest produce auction, Central Missouri Produce Auction (Latham, MO). These tours continued through 2019 and consistently featured high tunnels and greenhouses at the farms of leading growers. Tours were often attended by plain growers, who were seeking ideas and wanted to view examples. Through the years, Extension reached at least 200 plain growers through these tours. Furthermore, almost every issue of the *MPG Bulletin* contained an article regarding high tunnels or greenhouses (most commonly in relation to growing tomatoes). Lastly, workshops or other educational events always addressed current issues related to high tunnels and greenhouses.

Extension is one of the most trusted sources for information that growers use to stay relevant or current with business (marketing and production) practices. Conveying knowledge gained through research to the general population is the most fundamental purpose of Extension and this includes relating advances in agriculture to plain people engaged in vegetable, fruit, and flower production. Extension typically provides annual updates on pesticides (new and old), including instructions on how to read labels and how to protect crops from unwanted drift from neighboring farm or roadside spraying (Harper and Quinn 2017).

Noteworthy market developments at auctions could be described in a newsletter article so the other auctions are informed. As an example, at one auction, changes were made following the drought year of 2012, to move produce under the cover of expanded floor space instead of sitting in the sun on wagons (Quinn 2013). Aspects related to protecting and improving natural resources, such

as soil, were consistently addressed at workshops and with publications.

DOCUMENTING SUCCESS

To receive public support and funding, Extension needs to demonstrate its effectiveness. Documenting mid- and long-term impacts is desired to demonstrate lasting change as opposed to short term impacts, such as level of knowledge gained (following a workshop). A case study is presented below to demonstrate mid-term impacts, and then United States Census of Agriculture data are presented to highlight the long term impacts of changes in crops produced for auctions over a decade.

Clark Produce Auction Business Adaptation: A Case Study

Plain families from Hazelton, IA, established the Clark, MO, Amish settlement in the 1950s. Dairy products represented the largest farm output but grain, livestock, and eggs were also produced. Several sawmills and furniture stores opened through the years.

The Clark Produce Auction started in late spring of 2003. By 2007, the primary county supplying it (Audrain) had 42 acres in production and five farms with high tunnels or greenhouses. By 2012, these had increased to 63 and 13, respectively (Garino and Quinn 2014). The auction facility was expanded twice and other improvements made, the most notable being the addition of sliding panel doors so the sales area could be enclosed during poor or cold weather. By 2017, acreage had increased to 103 between 28 farms, including a rise in high tunnel/greenhouse square footage from 35,281 to 80,999 (Tables 1 and 2). The growth of the produce auction was quite important as the community milk market declined dramatically and never recovered, as several farms sold off or reduced their herds.

For the growers of the Clark settlement and the produce auction, attaining some type of food safety certification in 2019 became a serious issue when a major buyer made it known he could no longer do business with them unless they gained food safety certification. At least one other buyer was saying something similar. The Clark Produce Auction and the growers supplying it rose to meet

TABLE 1: FIELD VEGETABLE (FRESH) IN MISSOURI FOR 2007, 2012, AND 2017 FOR SELECTED COUNTIES; NUMBER OF FARMS WITH ACRES AND SALES (\$1,000)

Counties	2007			2012			2017			% in-crease in '17 sales over '12	% in-crease in '17 sales over '07
	farms	acres	sales	farms	acres	sales	farms	acres	sales		
Audrain	29	42	138	23	63	222	28	103	572	158%	314%
Barton	7	87	301	25	151	606	20	89	304	-50%	1%
Dallas	29	68	314	40	121	398	27	98	447	12%	42%
Daviess	11	64	204	30	134	499	16	39	219	-56%	7%
Benton	7	57	197	8	30	120	3	11	63	-27%	-68%
Henry	11	42	215	9	47	171	2	10	58	-32%	-73%
Johnson	42	84	230	26	74	368	37	84	422	15%	83%
Pettis	14	76	187	4	6	30	7	15	83	-3%	-55%
4 County Auction	74	259	829	47	157	689	49	121	626	-9%	-24%
Moniteau	29	106	465	45	162	697	41	138	1,099	58%	136%
Morgan	45	121	419	34	83	333	30	97	539	62%	29%
Central Auction	74	227	884	79	245	1,030	71	235	1,638	59%	85%
Vernon	9	96	244	50	879	3,527	38	316	1,757	-50%	620%
Bates	14	88	308	12	84	337	9	61	499	48%	62%
Rich Hill Produce Businesses	23	184	552	62	963	3,864	47	377	2,256	-42%	309%
Webster	24	45	156	32	57	229	41	95	372	62%	138%
Total	271	976	3,378	338	1,891	7,537	299	1,157	6,434		
% increase from previous census				25%	94%	123%	-12%	-39%	-15%		

Light grey highlighted box for sales are adjusted as follows: acres were multiplied by average sales per acre for that year. Average sales per acre was calculated by summing sales from counties without a light grey highlight, of that given year, and then divided by the corresponding acres. Medium grey highlighted boxes were calculated using average farm size from the 2012 census. Dark grey boxes were calculated by dividing total sales by the average sales per acre.

a challenge, which (if unmet) could have threatened their successful business.

For farms with minimal post-harvest packing, the most common certification is termed *Good Agricultural Practices (GAP)*. For facilities such as an auction, additional requirements are needed, which are generally termed *Good Handling Practices (GHP)*. Key steps leading up to the

GAP audits were OFRRs conducted in late 2018 and early 2019, attended by about 25 growers. A large FSMA PSA grower training was held at a Clark growers' packing shed in January 2019, attended by about 30 growers. Lastly, mock GAP audits were conducted in mid-June 2019 at two farms with 12 growers attending.

TABLE 2: GREENHOUSE OR HIGH TUNNEL VEGETABLES AND HERBS IN MISSOURI FOR 2007, 2012, AND 2017 FOR SELECTED COUNTIES; NUMBER OF FARMS WITH SQUARE FOOTAGE AND SALES (\$1,000)

Counties	2007			2012			2017			% increase in '17 sales over '12 and '07	
	farms	sq ft	sales	farms	sq ft	sales	farms	sq ft	sales		
Audrain	5	14,552	109	13	35,281	179	15	80,999	546	206%	400%
Barton	3	7,488	56	10	36,980	173	11	83,672	605	249%	977%
Dallas	3	6,360	48	13	81,244	287	14	112,375	236	-18%	391%
Daviess	5	20,360	124	20	134,444	405	11	95,616	494	22%	297%
Benton	4	38,700	220	4	28,500	86	5	10,080	63	-27%	-71%
Johnson	4	3,850	28	12	46,200	161	7	37,836	184	14%	568%
4 County Auction	8	42,550	248	16	74,700	247	12	47,916	247	-0%	-0%
Moniteau	11	50,400	378	14	260,020	644	16	390,672	1,312	104%	247%
Morgan	15	89,740	675	17	97,553	444	20	262,517	1,701	283%	152%
Central Auction	26	140,140	1,053	31	357,573	1,088	36	653,189	3,013	177%	186%
Vernon	5	23,815	186	19	213,516	451	9	46,584	298	-34%	60%
Bates	3	6,000	43	4	28,500	86	1	5,176	25	-71%	-41%
Rich Hill Produce Businesses	8	29,815	229	23	242,016	537	10	51,760	323	-40%	41%
Total	58	261,265	1,867	126	962,238	2,916	109	1,125,527	5,463		
% increase from previous census				117%	268%	56%	-13%	17%	87%		

Grey highlighted box for sales are adjusted as follows: square footage was multiplied by average sales per sq. ft. for that year. Average sales per sq. ft. was calculated by summing sales from counties without a light grey highlight, of that given year, and then dividing by the corresponding square footage. The square foot for the operation in Bates County in 2017 is based on the average size an operation in Vernon County in 2017.

In July of 2019, the Clark Produce Auction became the first auction in Missouri to become GAP/GHP certified, followed shortly by at least 15 principal growers in the area becoming GAP certified. *Quality Fresh* of Magnolia, OH provided the certification audits (Quinn and Nwadike 2019).

The teamwork by the area growers with MDA and Extension served as an excellent example to the other Missouri produce auctions and their growers. The buyers who requested the certification appear to be satisfied and have continued their purchasing patterns. Several growers were asked to share some thoughts following their success at certification. The two most notable quotes were:

1. “My packing shed sure looks a lot different now than it did last year.”
2. “It was really a lot to deal with. We’re all taking a breather now, but we really can’t relax too much, because we have to keep these forms and records up.”

Increasing Importance to Missouri’s Fresh Vegetable Supply

An analysis was undertaken to document the general perception of benefits of produce auctions to area farms in Missouri. Prior studies from other states had reviewed the annual sales from certain auctions (Tubene and Hansen 2002;

TABLE 3: TOTAL SALES* OF FRESH VEGETABLES IN MISSOURI FOR 2007, 2012, & 2017 FOR SELECTED COUNTIES AND THE ENTIRE STATE (\$1,000)

Counties	2007			2012			2017			% increase in '17 sales over '12 and '07	
	Field	Cov-ered	Total	Field	Cov-ered	Total	Field	Cov-ered	Total		
Audrain	138	109	247	222	179	401	572	546	1,118	179%	352%
Barton	301	56	357	606	173	779	304	605	909	17%	155%
Dallas	314	48	362	398	287	685	447	236	683	-0%	89%
Daviess	204	124	328	499	405	904	219	494	713	-21%	117%
Four-County Auction: Benton/Johnson	427	248	675	689	247	936	626	247	873	-7%	29%
Central Auction	884	1,053	1,937	1,030	1,088	2,118	1,638	3,013	4,651	120%	140%
Rich Hill Produce Businesses	552	229	781	3,864	537	4,401	2,256	323	2,579	-41%	230%
Above	2,820	1,867	4,687	7,308	2,916	10,224	6,062	5,463	11,525	13%	146%
Statewide	32,832	3,706	36,538	43,215	5,719	48,934	32,083	11,517	43,600	-11%	19%

Several values are estimates, including field statewide value(s). A statewide average sales per acre had to be calculated for fresh vegetables (as the average with the census includes processing vegetables, which tend to be lower value). It was calculated by averaging all the counties for a given year where sales for a given county was available, and processing acreage was 0 to 10. For 2007 this was 26 counties, 29 in 2012, and 39 in 2017. This estimated that average sales per acre was \$2985 in 2007, \$4374 in 2012, and \$3811 in 2017.

Jorgensen 2012) and showed that associated farms increased vegetable production and hired workers (Blaine, R. James, and B. James 1996; Johnson 2014). However, these studies did not include Missouri and did not review acreage and sales increases for farms across many settlements. The Census of Agriculture provides an opportunity to capture acreage and sales from U.S. farms across the country down to the county level, for specific crops and commodities (e.g. tomatoes or apples, vegetables, or fruit). By comparing the results over time (every five years), changes in acreage and sales can be documented; in this case, vegetables as the predominantly grown crop. However, historical data for Missouri on protected culture vegetables (i.e., those in high tunnels and greenhouses) was not tracked in censuses prior to 2007, thus the information presented begins then. Additionally, complete information from a Census of Agriculture takes almost two years to be pub-

lished, so information surveyed in 2017 only became available in 2019.

Data from three censuses (2007, 2012 and 2017) were reviewed to reveal changes occurring at the county level in order to gauge how farms supplying those produce auctions might be benefiting. That was possible in Missouri, because produce auctions were consistently organized in counties where little to no commercial vegetable production was previously occurring. Three figures summarize results specific to the primary counties serving eight produce auctions and (collectively) similar facilities situated nearby the Hoover Mennonite settlement of Rich Hill, MO (Figure 1) (see Hoover 2018 pp. 88-89 for details about this group). The results exclude production of vegetables grown for processing (e.g. to facilities that can or freeze vegetables) because the focus of produce auctions is on fresh vegetable sales. In 2017, two-thirds of the vegetables sold in

Missouri were for the fresh market (USDA-NASS 2019; USDA-NASS 2020).

Open field production of vegetables (Table 1) shows that over the 10-year period, farms, acreage and sales increased but peaked in 2012. For the 10-year period, sales increased in nine of the 12 counties considered, sometimes greatly, but there was a decline for the last five years in sales, acreage and number of farms. This decline was not consistent across various counties, with a number posting sizeable gains (e.g., Audrain).

Use of high tunnels and greenhouses exploded between 2007 and 2017, nearly tripling in sales, quadrupling in production area (sq. ft.) and almost doubling in farm number (Table 2). For the last five years, sales and production area increased, but the farm number declined similarly to the open field vegetable production just reviewed. A decline in farms of 12 to 13% is one out of eight. Why might this have occurred? The best rationale offered (to the authors who made some inquiries on this) was that a number of Amish/Mennonite growers got into it after they lost construction employment or similar jobs following the great recession (2007 & 2008). After the recession subsided, a number returned to their prior line of work. There are almost certainly other contributing factors.

In Table 3, selected counties and the state total for Missouri fresh vegetable sales are presented (excluding the sales of vegetables for processing). The emphasis is on fresh vegetable sales because they are the focus of produce auctions and comparisons between growth in open field and covered sales are possible. A 146% increase in total fresh vegetable production occurred from 2007 through 2017 for these selected counties, as shown by combining sales from field with greenhouse and high tunnels (covered). This noteworthy increase is even more remarkable when considering that for the state, sales only increased 19%. While there was a 15% decline in field vegetable sales over the past five years (for these selected counties), the strong increase from high tunnels and greenhouses (Table 2) offset it and lifted total sales to an increase of 13%. Contrast this to the entire state, where a decline in fresh vegetable sales of 11% occurred over those five years.

The 2017 Census results document the rising importance of fresh vegetables coming from produce auctions and like facilities (as a percentage of what is produced in Missouri). Based on 2017

sales, these selected counties produced 26% of Missouri's supply, up from 21% in 2012, and 13% in 2007. Local fresh produce is in demand and an important source of a healthy diet. The growers for auction facilities and similar businesses have become critical to this supply.

CONCLUSION

The produce auctions located within Amish and Mennonite settlements have proven successful. The auction infrastructure has become a regionally important supply chain channel for fresh produce in a number of U.S. Eastern and Midwestern States, as detailed above and shown in other studies (Tourte and Gaskell 2004; Columbia, et al. 2020). University of Missouri Extension and Lincoln University Cooperative Extension have assisted these centralized distribution facility businesses in a number of ways for more than a decade. These efforts have certainly contributed to the success of the businesses and the growers supplying them. The extent of that benefit is undetermined and would be challenging to discover. This work highlights the importance of providing plain producers with timely, culturally sensitive Extension programming through traditional delivery systems such as newsletters, workshops, and other communication methods.

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