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On-Farm Hog Processing Demonstration for Teenage Exhibitors: Blending Academic, Laboratory, and Farm-Based Learning

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Abstract. COVID-19 challenges induced a U.S. meatpacking industry bottleneck. Ohio Extension identified the need and responded by creating a three-step hands-on training for teenage junior fair exhibitors. Ohio Extension Meat Scientist and graduate students assisted in demonstrating an on-farm hog harvest and processing event in collaboration with a local Extension office for 4-H and FFA teenagers. To add a practical perspective, a local hog-producing and harvesting family was asked to assist with the event. An online post-survey reflected 90-100% gains in five educational areas and 100% said they would a similar event in the future and recommend it to a friend.

INTRODUCTION

With the emergence of COVID-19, the U.S. meatpacking industry faced major challenges that created a bottleneck in the industry. Many local, small-scale meat processors were sought to help alleviate the backlog of market-ready animals. However, they could not satisfy the demand, and many animals remained unprocessed. Some farmers even sold live hogs directly to customers for home harvest. At the same time, with less than 2% of Americans involved in production agriculture (American Farm Bureau Federation, 2019), the knowledge needed to process animals at home was lacking.

These factors, coupled with the desire to educate teenagers taking market livestock projects, created the ideal opportunity to provide hands-on training for 4-H and Future Farmers of America (FFA) youth. Throughout Extension's history, demonstrations have been an effective means to teach when "knowing how" to do something and adopting new practices are the goals (Franz et al., 2010; Pigg, 1983). This program delivery method brought together a diverse set of knowledge and perspectives while empowering a rich dialogue about animal welfare, food safety, animal harvesting, meat processing, and career opportunities for youth. The objective of this program includes outlining, explaining, and demonstrating proper on-farm meat-processing and food-safety practices.

The Ohio State University Extension, Ross County, capitalized on a chance to bring "cutting-edge" knowledge to the local community by inviting leading Ohio State University Extension meat specialist Lyda Garcia and her graduate students to assist in an on-farm hog-slaughter and -processing event for county 4-H and FFA youth. To add a practical perspective, a local hog-producing family, who harvests several hogs annually on their farm, was asked to actively assist with the event.

PROGRAM DESCRIPTION

ROLES

This event was a collaboration across Extension program areas, Ohio State University faculty, and local farms. The 4-H youth development educator designed publicity, recruited participants, identified a local farmer and a location, secured food-packaging supplies, and developed the evaluation. The agriculture and natural resources educator contributed guidance from previous on-farm hog processing and supplied documentation for the COVID-19 exemption required by The Ohio State University College of Food, Agricultural, and Environmental Sciences.

Garcia supplied most of the processing equipment and cleaning supplies and involved knowledgeable graduate students studying meat science. During the event, Garcia, graduate students, local farmers, and Extension educators provided instruction, ensuring that all aspects of proper processing procedures were followed. This format

created a learning experience where teen participants could see multiple perspectives and observe flexibility in efforts and communication between adults from different backgrounds.

Throughout the demonstration period, Extension educators monitored the teenagers' reactions and asked clarifying questions on terminology and details that might have initially been beyond their audience's knowledge base. With Extension professionals managing the learning experience, Garcia, her students, and local farmers could focus on doing and explaining their work effectively. The combination provided a rich learning experience.

CONTENT AND DELIVERY METHODS

The program was delivered over 3 days. On Day 1, a preliminary virtual meeting allowed youth and instructors to discuss "what to expect" from the program. During this time, Garcia focused on four main concepts while explaining proper slaughtering practices: (a) animal welfare, (b) good manufacturing practices (GMP), (c) safety sanitation operating procedures (SSOP), and (d) food safety.

Day 2 consisted of the hands-on aspect at a local livestock farm. The lesson began with a recap of the process. The teaching format included application with explanation and dialogue. The process began by discussing animal welfare and its impact on the end products (meat quality). A brief explanation of specific knives (boning vs. skinning vs. breaking) was given, including how steels are used to realign a knife's edge to maintain sharpness.

Garcia led a discussion on proper personal protective equipment (PPE), explaining the benefits of reducing cross-contamination during the process, as well as approved stunning methods. Then, Bruynis led the teenagers out of view while the animal was rendered unconscious. The team used a mechanical method (.22 rifle) after highlighting the significance of shot placement, followed by sticking and exsanguination (blood was captured in a tub to avoid creating a messy environment). Instructors discussed the anatomical location of the sticking and the importance of a strong bloodstream during the bleeding phase. Next, the hog was hoisted and placed on a cradle (on its back), where the front and back feet were removed (showing proper joints), followed by the skinning process that started at the opening at the feet (front and back), eventually led to the midline (belly), and extended as far back around to the backbone, toward the cradle. Instructors noted that hogs are not commercially skinned; however, small meat processors and on-farm processors usually skin due to their lack of equipment. Subsequently, the removal of the head occurred, with a discussion of the proper removal location (between the occipital condyle and atlas vertebrae). Lastly, while on the cradle, splitting of the sternum with a handsaw occurred. The hog was hoisted by its back feet on a gambrel (through the Achilles tendon), where bunting (loosening of anus muscle) took place. Soon after evisceration, there was a discussion of why a 24-hour fasting period is critical in reducing cross-contamination (higher risk of puncturing the stomach when full that can, and will, lead to a food-safety issue). Graduate students captured all internal contents in a tub, where Garcia identified organs and discussed their function along with what inspectors look for when checking the offal. An explanation and discussion of the types of meat inspection offered in Ohio followed. At this point, the team removed all the skin in a downward direction. While the hog was hoisted, the team split the carcass down the backbone with a handsaw. As a final intervention step, the carcass was washed with water and then sprayed with a 1:1 mix of tap water and acetic acid (white vinegar) before chilling. The carcass was refrigerated at an estimated 37°F temperature for 48 hours. The graduate students helped ensure the rinsing of knives, handsaws, and rubber aprons between the slaughter-process steps. Garcia emphasized the importance of keeping the work environment clean as well as the people, equipment, and tools. The team implemented a three- bucket system to wash, rinse, and sanitize equipment and tools. Graduate students captured the blood, head, feet, skin, and viscera in two 70-quart buckets.

On Day 3, following a 48-hour chill, Garcia described the PPE (white coat, rubber gloves, hairnet, and a cutting glove) used for the fabrication process. The team placed the pork carcass on a stainless-steel table and discussed the location of basic cutting guidelines, along with dollar-value differences in purchasing a live hog versus buying a carcass versus selling retail meat cuts.

Fabrication began by separating the primal parts, followed by subprimals and then retail cuts. Retail cuts included boneless chops, roasts, and trim. Garcia reviewed the concept of muscle myology and how the industry relies on muscle size, shape, workmanship, and consistency based on the U.S. Department of Agriculture specifications. The generated trim was then ground on-site with an electric home grinder. Garcia also explained the mechanics of the grinder and the differing grinding plates available for achieving different types of ground products. A portion of the ground pork was placed in 1-pound chub bags, while another portion was set aside for the next product-development lesson. Chops and roasts were vacuum packaged on-site with a FoodSaver and then refrigerated.

On-Farm Hog Processing Demonstration

Participants moved into a product-development lesson, where they were placed into groups and each given roughly a quarter-pound of ground pork to make pork patties ($n = 6$ per group). Graduate students then led the participants through a process intended to explore desired flavor profiles by mixing various seasonings into the ground product. The participants learned about muscle protein extraction (salt-soluble and heat-coagulable proteins) and protein's role as a binder in a ground product. Garcia demonstrated how to form a patty by hand. Groups formed their patties and then cooked them to an internal temperature of 160°F on a gas grill. Participants used meat thermometers to monitor internal temperature and learned the importance of wearing rubber gloves during preparation. Graduate students discussed and demonstrated the proper placement of thermometers (geometric center) into the pork patties. When the patties reached the internal target temperature, the team cut two per group into eight sections for sensory evaluation. As each group's pork patties were discussed, participants also ate the other cooked patties for lunch.

During lunchtime, a discussion was had regarding the impacts of management techniques and practices on overall meat quality and safety. The role and importance of PPE, animal welfare, GMP, SSOP, and food safety on the end product were also discussed. Participants had the opportunity to reflect on the knowledge gained. The teenagers interacted with The Ohio State University graduate students, who shared information about related academic programs, careers, and their personal experiences. The graduate students emphasized the relevance to the livestock and meat industries while serving on a collegiate meat-judging team or livestock-judging team and other university agriculture-related student organizations. 4-H and FFA teenagers, having spent time closely interacting with The Ohio State University graduate students, felt comfortable freely asking broader and more specific questions than they might have otherwise.

One of the more interesting aspects of this experience was the combined knowledge sharing from the academic and lab perspectives, contrasted with generational wisdom from decades of field-based practices. This knowledge exchange was beneficial throughout the planning and delivery of the event, with a mutually respectful banter of insights, ideas, and problem-solving.

OUTCOMES

The team conducted an online survey with teen participants and their parents 1 week post-event. Table 1 reflects results from participants regarding their knowledge gain in various topic areas as well as what parents perceived their child's knowledge gain to be on the same topics. Response options were Definitely Enhanced, Somewhat Enhanced, Neutral, Somewhat Not Enhanced, and Definitely Not Enhanced. Additionally, Table 2 depicts responses on their (youth and parents) willingness to attend and encourage others to attend future Extension programs. Response options were No, Neutral, and Yes.

Noteworthy reflections from participants included the following:

- “It was exciting to get to have a professor on-site teaching me and I had the option to ask her questions if I had any. I also enjoyed learning about career opportunities in the agricultural field because I never knew there were so many options.”
- “My favorite part was the casual atmosphere. I had the opportunity to ask Garcia and her team specific questions about processing and the relationship between environmental conditions, handling, and nutritional practices to the overall quality of the meat.”

Table 1. Percentage of Knowledge Enhanced from On-Farm Hog-Processing Participation

Knowledge Topics	Participants		Parents	
	<i>Somewhat enhanced</i>	<i>Definitely enhanced</i>	<i>Somewhat enhanced</i>	<i>Definitely enhanced</i>
Food safety	54.55	45.45	0	100
Swine-harvesting process	27.27	63.64	20	80
Ground-pork eating characteristics	36.36	54.55	0	100
Industry jobs	54.55	45.45	0	100
Education options	36.36	63.64	0	100

Table 2. Percentage of Likely Participation in Future The Ohio State University Extension Programs

	Participants		Parents	
	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Attend future The Ohio State University Extension programs	0	100	0	100
Encourage others to attend future The Ohio State University Extension Programs	0	100	0	100

CONCLUSIONS

The unique target audience of teenagers taking market projects through 4-H and FFA allowed us to tie the curriculum directly to their own experiences and knowledge as producers and consumers of market livestock. Participants had an opportunity to observe firsthand, ask questions, and hear detailed explanations about animal welfare, GMP, SSOP, food safety, proper practices, anatomy, muscle myology, product development, and sensory evaluation.

The experience afforded The Ohio State University meat-science students a chance to participate in an out-of-lab hog slaughter. The local farmers and Garcia exchanged best practices from the classroom and the farm setting.

The exposure to real issues in the agriculture world that directly relate to animal-raising market projects was eye-opening for the teenagers' own production choices as well as for career opportunities and education pathways. This program focused on farm processing to aid with some of the challenges faced by families interested in consuming their own products and willing to process them independently. This experience allowed The Ohio State University Extension to help identify and connect needs to hands-on experiences.

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