College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Food Safety and Technology
June 2011
FST-44

A Review of Mobile/Modular Slaughter and Processing Technology

Matthew Stevenson and Glen Fukumoto
Department of Human Nutrition, Food and Animal Sciences

Background

During the era of low fuel and feed costs and high demand for beef, shipping calves to the mainland for finishing was a viable, relatively low-risk option for most Hawai'i ranchers who marketed wean-offs or maintained ownership through feedlot finishing. Over the last ten years, the makeup of all livestock industries in Hawai'i has been changing rapidly, owing to the dramatic increase and greater volatility in the costs of imported feeds and shipping. This economic shift has resulted in a sharp decline of the feeding industries in Hawai'i (Table 1). Pasture-based operations such as beef cattle ranching have maintained inventory in response to strong demand, but with the fluctuating national cattle prices and long-term outlook for rising fuel costs, there is interest in supplying beef to a growing local market. Years of exporting calves and the decline of the dairy industry have forced the local slaughter and processing segment of the industry and its infrastructure to downsize in order to remain viable.

Table 1. Number of confined feeding operations 1999 – 2008 and beef cattle inventory for the state of Hawai'i according to USDA National Agricultural Statistics Service.

Operation Type	1999	2008
Broiler	5	0
Dairy	10	2
Layer	11	5
Swine (selected)	30	21 ('04)
Slaughterhouses	12	10
Beef Cows	82,000 ('04)	82,700

Figure 1. One example of a mobile slaughter and processing unit owned and operated by Taos County Economic Development Corporation (TCEDC), New Mexico.
Except where otherwise noted, all photos by M. Stevenson and used with permission of TCEDC.

Concurrent with the decline of these industries and downsizing of infrastructure in the state is a growing and steady demand for locally produced food from individual consumers, the food service industry, and government. For example, the Hawaii Department of Agriculture's "Buy Local, It Matters" program actively promotes local products, and the 2009 Governor's State of the State address called for "action now to increase Hawai'i's food self-sufficiency and strengthen and preserve agriculture for future generations as required by our State Constitution." The Governor said she had "directed State agencies such as schools, prisons, and hospitals to purchase local products" and that "Hawai'i farmers will receive a 15-percent price preference when placing their bids for State purchases." Furthermore, the majority of Hawai'i-produced beef falls within natural, grass-finished, or other higher value programs.

Published by the College of Tropical Agriculture and Human Resources (CTAHR) and issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, under the Director/Dean, Cooperative Extension Service/CTAHR, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822.

Figure 2. Many ranchers have looked to mobile and modular slaughter and processing facilities to gain access to USDA inspection in isolated areas and capture the value of retail beef.

The net results of these economic trends are insufficient chill space, insufficient skilled labor for processing, and inadequate or aging slaughter facilities to meet growing demand. The high cost of retrofitting facilities to maintain USDA standards and urban encroachment into rural areas where slaughterhouses are located further threaten the long-term viability of existing operations. The critical situation facing ranchers hoping to capture the value of marketing beef came to a head at the Slaughter and Processing Summit organized by the Hawaii Cattlemen's Council in December 2009. Common themes among the individual island association reports were needs for island independence and cooperation in slaughter and processing, waste-disposal options and costs, a reliable skilled labor pool, and consistent beef quality in the supply chain.

In addition to the livestock industry, other sectors such as various government bodies, non-profit organizations, and renewable energy concerns recognize the need to overcome slaughter and processing bottlenecks. The high cost of refurbishing or building new plants is the primary hurdle in addressing these needs. For example, a recently completed slaughterhouse on Moloka'i cost over $1,700,000, with monthly energy costs for the chill unit often approaching $2,000. Consequently, a diverse group of organizations and individuals have been investigating mobile and modular technology currently in use on the mainland as a potentially cost-effective alternative to brick-and-mortar facilities.

To aid discussions of mobile and modular slaughter and processing, we have compiled this review of our firsthand experience touring units used in New Mexico, Washington, and Nebraska (Figure 1). We also draw from our attendance at a mobile slaughter conference sponsored in part by the USDA Food Safety Inspection Service, as well as a growing wealth of Internet resources listed in this publication.

Why Mobile/Modular Slaughter and Processing?

The first red meat MSU began operating in 2002 and is owned by Island Grown Farmers Cooperative in Washington. Starting in 1996, ranchers of the San Juan Islands began meeting to strategize how to overcome their lack of access to USDA inspection, logistical complications arising from being located on islands, and distance to processors. The MSU concept, borrowed from the poultry industry, arose as the least cost and most flexible option to overcome these issues. With the system now in its ninth year of operation, a detailed case study, including equipment and operating costs, is available online through the Niche Meat Processor Assistance Network (see the "Resources for More Information" section at the end of this publication).

Four reasons for developing small-scale mobile or modular slaughter and processing systems are 1) geographic isolation and related food security concerns, 2) potential for livestock producers to capture the value of retail and wholesale meats, 3) providing services to

several small-scale farms and ranches, and 4) improving health and sanitation of slaughter and processing in rural areas (Figure 2). In addition, some regions are transitioning into livestock agriculture in response to a decline in another economic sector and have traditionally lacked extensive slaughter and processing infrastructure. For example, the MSU system in Taos County, New Mexico, modeled after the Island Grown Farmers Cooperative operation, reflects a response to each of these issues. With the closure of a major molybdenum mine in the area, many individuals began full-time diversified agriculture. The nearest feedyards and other infrastructure were several hundred miles away in any direction, and the hauling costs for most ranchers, who had only a handful of animals to market each month, were too high to be worth the effort. A local non-profit organization developed a mobile slaughter unit in conjunction with a small processing plant to bring beef, buffalo, lamb, and pork to market and improve ranch profits.

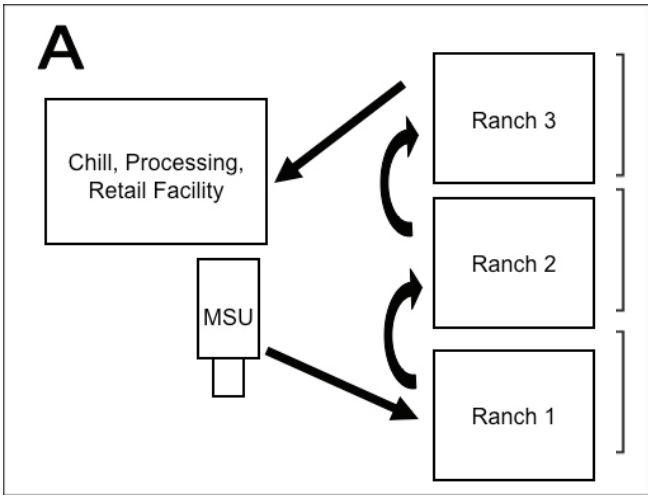

Figure 3. Mobile system where an MSU travels to individual ranches to perform slaughter and initial processing before returning to a central aging, processing, or retail facility.

What Is Mobile/Modular Slaughter and Processing?

A mobile or modular unit consists of a prefabricated trailer or structure designed to meet USDA and local Department of Health standards for slaughter and some degree of processing of livestock carcasses. Units may be designed for either slaughter or processing separately, but most are designed to accommodate slaughter, chill, and initial processing into halves or quarters in a single unit. Mobile units are trailers with chill space, whereas modular units are fixed structures that can be arranged to meet capacity needs of the operation. Most mobile/modular systems are comprised of some combination of four basic parts: a slaughter unit or trailer, a chill unit for aging or storage, a processing unit, and a retail outlet.

Most mobile/modular systems function in one of two ways. In system A, a mobile slaughter unit (MSU) will travel from a central location to various ranches (Figure 3). When all animals are completed for a particular ranch, the rancher is responsible for burial or composting of offal depending on local regulations. The MSU will

Figure 4. An example of a modular chill and processing unit used in New Mexico where the mobile unit unloads carcasses for aging and retail cut and wrap.

Table 2. Approximate costs of selected Mobile Slaughter/Processing Units currently in operation as per www.nichemeatprocessing.org[1] and www.tcedc.org[2]. Costs are for a trailer unit only.

Operator, Location	MSU Cost (trailer only)	Year Built	No. Head of Beef per Day
Island Grown Farmers Cooperative, WA[1]	$150,000	2000	9-10
Central Coast Agricultural Cooperative, CA[1]	~$150,000	2002	5-6
Taos County Economic Development Corp., NM[2]	$200,000	2006	10
Puget Sound Meat Producers Cooperative, WA[1]	$250,000	2009	8-10
Nebraska Prairie Harvest Project, NE[3]	~$150,000 (refurbished)	2010	10

then return to the central location where carcasses are unloaded into a fixed chill unit for aging and eventual cut, wrap, and sale (Figure 4).

In system B, ranchers haul animals to a central site where holding pens and the modular or mobile unit is located (Figure 5). Animals will be processed as above; then the carcasses are hauled via the MSU to an offsite chill, processing, and retail facility. Where conditions permit, a modular system can function as a traditional brick-and-mortar slaughterhouse.

How Do Mobile Slaughter Units Work?

Animals are restrained and killed outside the unit, and are immediately brought into the back of the trailer via a top-mounted winch. The unit door is shut to keep out flies and dust, and one or two workers will remove the hide, head, and offal and split the carcass in half. Most units have a small door near the floor where offal can be pushed out into a barrel. In Hawai'i, a USDA inspector must be present for all non-custom-exempt kills. After this initial processing, the halves are moved into a central refrigerated compartment, the rear compartment is washed down, and the next animal is then processed (Figure 6). Most units have a third compartment in the forward-most portion of the trailer that holds a water tank, generator, inspector office, or other operational equipment. MSUs also have storage tanks for wash-down water and blood, and the Nebraska unit has an onboard wastewater treatment system. Wastewater is typically received at a sewage treatment plant or spread on pasture depending on local regulations.

Who Operates These Systems, and How Are They Funded?

The MSU systems in operation to date are run by various types of organizational structures. Farmers' cooperatives, private and public non-profit organizations, and private businesses all operate MSU or modular systems. MSU systems are typically used as fee-for-service to meet operational costs. In other words, the slaughter and processing segment does not function as a stand alone business for profit. Meat sales and marketing are left to co-op members or other users of the service.

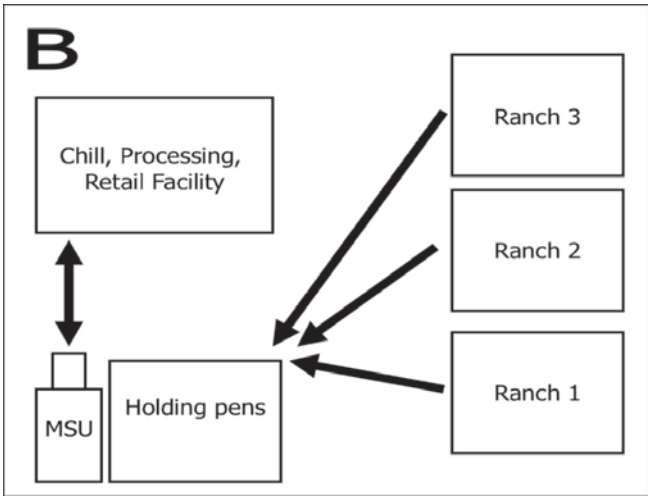

Figure 5. Mobile system where the MSU is relatively fixed at a site for slaughter and used to haul carcasses to a central facility for further aging, processing, or retail.

Financing for most units has come from a combination of public and private sources. Most units currently in operation have been primarily funded through federal and other grant sources; however, some have been completely privately financed. The costs vary widely depending on the type of system used, the capacity needed, and regulatory requirements. See Table 2 for approximate trailer only costs for selected units in operation.

How Are Mobile/Modular Slaughter and Processing Units Regulated?

Regardless of the size or capacity of a slaughter plant, whether a fixed or mobile facility, USDA inspection requirements are the same for all slaughter and processing of meats for sale. The USDA Food Safety and Inspection Service issues grants of inspection for slaughter and processing establishments. The USDA has issued guidelines for small and very small slaughter plants; see the "Resources for More Information" section of this publication. To obtain a USDA grant of inspection, local agencies such as the Hawaii Department of Health would have to approve a planned operation. Regulatory Performance Standards include the considerations for approved labeling, water-source verification, sewage and waste-disposal plan, sanitation standard operating procedures (SSOP), and written Hazard Analysis and Critical Control Point (HACCP) plan. The operator must provide inspector facilities and animal-handling facilities.

Potential Strengths and Limitations of Mobile/Modular Systems

Strengths

- Island independence in regards to slaughter and processing
- Increased marketing opportunities for ranchers
- Potentially lower costs as compared to a traditional brick-and-mortar system
- Flexibility in scaling up to meet capacity

Limitations

- Overcoming startup costs
- New system, regulatory unknowns
- Meeting throughput required to keep costs reasonable
- Maintaining consistent quality through the production chain
- Maintaining skilled labor

Resources for More Information

Owing to the rapid increase in interest regarding MSU and modular systems, there is a constant influx of new information on the Internet. Listed below are sites and contacts of organizations which provide many more details on MSU and modular systems.

Niche Meat Processor Assistance Network (www.nichemeatprocessing.org) NMPAN is a national network of people and organizations working on issues related to small-scale meat processing. The NMPAN website has a comprehensive section on mobile slaughter units (go to homepage and click on "Mobile Units" for drop-down menu), which includes a Mobile Slaughter Unit Manual (complete with HACCP/SSOPs/SOPs for MSUs), videos, case studies, webinars, and other articles covering operations, regulations, and extensive information on the nine operating red meat MSUs and eight poultry MSUs. Note that NMPAN is also part of eXtension (www.extension.org).

Marianas Slaughterhouse and Meat Business Feasibility Study (http://www.agenergyenterprises.com/feasibility/overview.htm) - Prepared by Jim Wimberly of Ag/Energy Enterprises LLC for the CTAHR-led Marianas Grazing and Livestock Academy project, this site is an in-depth evaluation of the many factors involved in establishing a slaughter and meat business in the Pacific Islands of Guam, Saipan, Tinian, and

Figure 6. The general process of a mobile slaughter-type operation (clockwise from top left): Animals are restrained outside the unit and stunned; brought into the unit with a winch; the trailer door is closed, animals are minimally processed into halves and stored in the middle of the unit; the rear of the unit is cleaned, then the process begins again with the next animal.
Photos courtesy of the Niche Meat Processors Assistance Network/eXtension.org.

Rota. This report addresses in detail the complexities of such a project and can help guide individuals and groups considering undertaking similar endeavors.

NMPAN Business Planning Guide for Small Meat Processors (http://www.extension.org/pages/17166/meat-processor-business-development) - Developed by NMPAN, this site has extensive information and tools for those considering expanding or entering the slaughter and processing business.

USDA Food Safety and Inspection Service Small and Very Small Plant Outreach (http://www.fsis.usda.gov/small_very_small_plants/index.asp) - This official USDA site offers information on obtaining a federal grant of inspection for new slaughter/processing plants, compliance, workforce management, and other information specifically for small processing operations. The FSIS also maintains a toll-free Small Plant Help Desk at 1-877-374-7435 or InfoSource@fsis.usda.gov.

Modular Food Systems, LLC (www.thunderinghooves.net) - Headed by Joel Huesby, a Washington rancher who implemented a mobile slaughter and processing system at Thundering Hooves Ranch, this company offers planning consultation and fabrication of modular slaughter and processing plants. Contact joel.huesby@thunderhooves.net or (509) 522-0888 for more information.

www.mobileslaughter.com - Maintained by Bruce Dunlop, an early developer of MSU systems, this site offers pictures, videos, and design specifications for MSUs manufactured by TriVan and in use in Washington and New Mexico.

Island Grown Farmers Cooperative (http://www.igfcmeats.com/1.html) - Spearheaded by Bruce Dunlop, this cooperative of ranchers in the San Juan Islands was one of the early MSU systems developed to overcome geographic isolation issues. This system has been highlighted frequently in the literature and serves as the basic MSU model.

Taos County Economic Development Corporation (http://www.tcedc.org/mobileMan.html) - This New Mexico non-profit organization designed an MSU system modeled after the Island Grown Farmers Cooperative in Washington to assist area ranchers in their marketing.

Featherlite Trailers (http://www.fthr.com/) - A manufacturer of many types of trailers, this company has manufactured small MSU trailers.

Polar King (http://www.polarking.com/) - Manufacturer of pre-fabricated custom walk-in coolers and refrigeration systems. The MSU system in Taos, New Mexico, uses this type of chill unit for aging carcasses.

Acknowledgments

We would like to thank the Western Sustainable Agriculture Research and Education program and Dr. Theodore Radovich, CTAHR Western SARE coordinator, for sponsoring our attendance at the USDA-FSIS mobile slaughter conference held in Fort Collins, CO, in October 2010. We also thank Mr. Joel Huesby of Modular Food Systems and Thundering Hooves Ranch, and Pati Martinson and Terrie Bad Hand of the Taos County Economic Development Corporation for opening the doors to their operations and spending several hours sharing information. We are also indebted to Mr. Robert Ferreira of Olumau Angus Plus Ranch for being a driving force behind researching these systems and making the initial contacts with key individuals. Sara Bowen, CTAHR-Kaua‘i County, gave valuable feedback, and Laren Gwin of the Niche Meat Processor Assistance Network made critically important clarifications and edits in reviewing this publication.