University of Minnesota Extension

Feasibility Study: establishing halal meat processing in Central Minnesota

Study evaluates the local supply of halal animals, the demand for local processed halal meat, and a processing facility to facilitate this market

Presented by Michelle Klieger and Fawn Scheer, Helianth Partners

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September 18, 2023

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EXECUTIVE SUMMARY

The Muslim, and in particular Somali, community in St. Cloud Minnesota are exploring ways to increase food security and food access in their region. A major component of this effort is locally raised halal meat. Supply chain disruptions have created shortages and higher prices have pushed halal meat out of reach for many Somali community members. Previous research has indicated that lack of local livestock processing is a bottleneck for further expansion. This study explores the operational feasibility of halal meat processing in Central Minnesota.

The University of Minnesota Extension, including their producer and retailer surveys and the University of Minnesota Extension's report on Halal and Kosher Minnesota Meat Market Assessment (Kagan, Draeger, & Olive, 2020) show the demand exists for halal meat, primarily goat meat and to a lesser extent lamb and beef and could support a small processing facility. Minnesota goat and sheep inventories increased slightly in recent years. Plus, there are community members and potential investors interested in a project to increase food security and halal meat access in the region.

The Central Minnesota Somali community has several stated goals for the proposed facility:

- Increase food security through a constant supply of halal meat from animals sourced near the community to avoid supply chain disruptions.
- Increase access to culturally appropriate food by making halal meat available for low income or food insecure community members.
- Be economically sustainable, either through profitable meat sales or by obtaining outside funds to build and/or operate the facility.
- Employ Somali community members, include some who have meat processing experience.

Conclusion

Challenges exist aligning the supply, demand, and facility operations for this facility. There is demand for fresh, halal meat and a supply of small ruminants to support the facility. However, at the current scale the unit economics may be out of reach for consumers. Before moving forward on developing a new facility, additional investigation and decisions on community priorities are needed. To make the cost of meat attractive to consumers, the facility needs a higher throughput of animals than the local area can confidently support. If fewer animals are processed, the price of meat will be higher than most consumers are willing to pay, and demand may precipitously fall. Additional research may provide helpful insights to support a successful operation.

Halal Meat Demand Findings

Demand for halal meat is inelastic because observant Muslims will only eat halal meat. Halal meat is imported frozen from Oceania and South America at prices $1.00-$1.50 per pound below the domestic price. The UM Extension research suggests only 10% of buyers will pay more for fresh, locally produced halal meat. Demand for goat meat is seasonal. In total, the data show that the Minnesota Muslim community demands over 8,000 fresh whole goats annually, The St. Cloud and Somali community currently demand nearly 6,000 frozen goats per year. Freezing excess meat during periods of lower demand and making it available at other times could address this mismatch.

Livestock Supply Findings

The supply of locally raised halal goats and sheep is opaque. USDA data show that Minnesotan goat and sheep inventories are expanding (National Agricultural Statistics Service, 2022). The 2022 University of Minnesota producer survey, of 98 producers, provides more local information. The survey found small-scale operations that raised nearly 10,000 small ruminants.

Seasonality of supply and price is another supply concern. Lambs and goat kids are born during a three-month period and harvested in the late summer and early fall. There are large price spreads which increase producer risk, making it difficult to expand production during low price seasons. Supply is low the rest of the year; this can cause the processing facility to be underutilized and costly. Further challenging the available supply is a new halal facility opening later this year in Willmar, Minnesota, which would compete for animals. Contracts can help secure supply and address seasonality but are not widely used in this market.

To fully utilize this facility's capacity, it could process local halal beef cattle (potentially from the same producers), import livestock from southern states with year-round production, or temporarily suspend processing and restart when market conditions improve.

Facility Findings

To produce meat at prices that are competitive, a facility will need to have a high throughput or obtain funding such as grants that can be used to subsidize costs. If the local demand is insufficient, the meat could be exported or further processed.

Supply and demand data support a facility that harvests 100 small ruminants per week or 3,500 pounds of meat. The community is interested in a Friesla® 38' Mobile Harvest Unit to harvest the animals. This facility enables the harvesting and carcass drawdown of up to 225 small ruminants per week. A break-even analysis conducted for this facility shows that it must process 200 goats per week, with a market price (cost) of $2 per pound for goats, and a wholesale price of $8 per pound (fresh meat). Under these conditions, the facility would **lose $578** per week, provide the community with **7,000 pounds of fresh goat meat** per week, plus create **four new jobs**.

A sensitivity analysis shows that the cost of goats and the price of the goat meat sold have a larger impact on the facility's profitability than the number of goats processed weekly. The analysis uses a wholesale goat meat price of $8 per pound and an estimated retail price of $10 per pound. Based on previous research, the market may support a higher retail price, especially on a seasonal basis.

The Friesla® Mobile Harvest Unit enables harvesting into whole carcasses and primal cuts, which aligns with the Somali community's market demands. A larger plant, the Friesla® PS-1 System, adds carcass aging, cut and wrap, and frozen storage capabilities. The Mobile Harvest Unit can meet the buyers' needs because they can break down their own animals.

Next Steps

We've identified the following three research areas to further confirm the facility's feasibility.

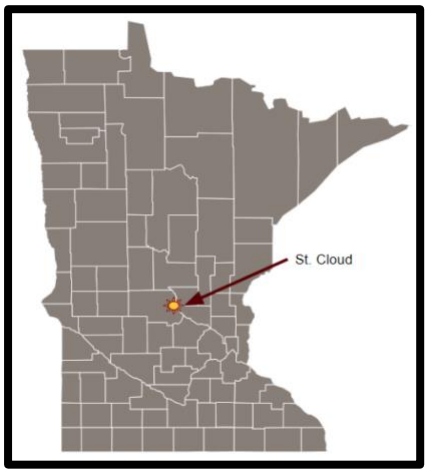
Explore funding options available: Funding to expand meat processing plants is available, and additional research can identify what grants are suitable, what resources are needed to access these grants, and what impact they might have on the overall feasibility of this processing plant.

Update and deepen market knowledge: Meat prices increased significantly since the demand research was conducted. Higher baseline prices may reduce demand or increase price sensitivity. Quantifying consumers' willingness to pay for fresh, local halal meat will improve this analysis. On the supply side, understanding what price producers need to raise goats and sheep year-round is critical to assess the feasibility of a specific facility.

Outreach to Willmar facility: The Willmar facility will change the market. It could increase the feasibility or create new challenges by competing for animals or saturating the market.

Introduction

Overview



The population of St. Cloud, Minnesota is culturally and ethnically diverse, including a sizable Somali population. The Somali immigrant's community includes a dozen ethnic grocery stores plus restaurants. Starting five years ago, the community began investigating increasing access to halal meat and the possibility of adding additional halal meat processing capacity to support local halal livestock producers. They strive to improve year-round access to culturally relevant food, in particular halal meat, and address food insecurity among people with limited resources.

Most Somali immigrants are Muslims and eat according to the laws of halal, including exclusively halal meat. Ethnic grocery stores offer the lowest priced, frozen halal meats that are imported from Oceania and South America. There is limited fresh, locally raised, and processed halal meat available. It is more expensive and generally considered higher quality.

Recently, long supply chains have struggled with acute shortages. Empty shelves cause food insecurity even among consumers with means. Thus, the UMN Extension, prominent St. Cloud Somali community leaders, and livestock producers collectively explored sustainable ways to increase availability of fresh halal meat at local grocery stores.

Local halal processing was proposed to increase the supply of halal meat and provide the community with a halal certification that they trust. There are some Minnesota meat processing facilities that implement "halal slaughter practices," however the Somali community prefers a facility that is supported by a completely halal supply chain. This includes animal producers, abattoirs, processors, distributors, wholesalers, retailers, and consumers.

This study builds on previous research data provided specifically by the University of Minnesota Extension, including their producer and retailer surveys, Rachel Stolzman's Master's Thesis (Stolzmann, 2022), and the Agricultural Utilization Research Institute (AURI), the Minnesota Department of Agriculture (MDA), and University of Minnesota Extension's joint report on Halal and Kosher Minnesota Meat Market Assessment (Kagan, Draeger, & Olive, 2020). Additional information comes from USDA, Minnesota Dept. of Agriculture, and industry sources.

The study outlines demand for local, fresh, halal meat, the possible supply of animals to this facility, and an overview of an ideal facility that could increase the capacity of fresh, halal meat for the community. It primarily focuses on the feasibility of halal processing for small ruminants. However, the facility could process cattle, which could offset the seasonality of small ruminants' supply. Therefore, cattle are mentioned in this study.

Facility Goals

The Somali Community identified several goals for this facility. They have supported data collection and analysis over the last five years, leading to this study. They want to increase food security by providing a constant supply of halal meat to the Somali community from animals sourced near the community to avoid supply chain disruptions. Locally produced meat can be sold fresh or frozen. Some will be available for low income or food insecure community members providing them with culturally appropriate food access. The facility must be sustainable from an economic perspective,

this means it is profitable or able to obtain outside funds to build or operate and provide halal meat to all segments of the community. The facility will also employ community members.

COMMUNITY GOALS:
Food Access: Avoid Halal Meat Shortages
Food Security: Increase Halal Meat for Low Income Populations
Financial Viability: Profitable or Subsidized Operation
Economic Resilience: Generate Economic Returns & Local Jobs

Meat Markets: Traditional vs. Non-Traditional Markets

In the United States, goat meat – called either "cabrito" or "chevon" – is only sold to non-traditional (or ethnic) markets. Cabrito is from kids harvested at 4 to 12 weeks old. Chevon is from older kids harvested close to or after weaning (Schweihofer, 2012). Goat meat has a unique flavor and is leaner and less tender than other red meats. Meat goats are marketed through livestock 0061uction markets, private buyers, consignment sales, and on-farm sales. To a lesser extent, they are sold to local grocery stores and direct-to-consumer.

The lamb meat market is divided into traditional and non-traditional markets, who prefer different sized animals and final products. This context is important when reviewing the ability to extend the processing season and better utilize the proposed facility.

The **traditional market** lambs with a live weight of 120 to 160 pounds. These lambs are used for restaurants and retail to get individual cuts of meat, like racks or chops. Lambs are sold off the ranch as feeder lambs and sent to a feeding facility for 50 to 150 days. They are sold at Minnesota regional auctions or in Sioux Falls, South Dakota.

The **non-traditional and ethnic market** prefers smaller animals, those weighing under 100 pounds. These animals are sold direct-to-consumer or at an auction barn that represents these markets. Ethnic populations use whole lambs for religious feasts. Ethnic grocery stores purchase whole carcasses and process the animals into cubed meat for customers, which also find the smaller animals more manageable. Halal meat is sold in non-traditional and ethnic markets.

Halal Meat

Halal products are prepared according to Islamic law. Halal certification covers a wide variety of potential products, processes, and operations, from farming to textiles, chemical manufacture, medicines, and cosmetics. This study focuses on halal meat and animal slaughter (including the facilities and companies involved in this field).

Certified halal processing facilities and producers must be certified by a halal certification body (HCB). The HCB consists of Muslim technical and religious experts to verify the religious and technical requirements needed for halal production. HCBs are paid to carry out conformity assessment and surveillance activities for the company/facility obtaining a halal certification.

An HCB must meet two requirements. First, it must be Muslim owned and operated. Muslim ownership and Muslim personnel are required to govern, make decisions, and work in the field of halal certification. Secondly, it must be recognized by Muslim countries and internationally accredited by the major international halal accreditation bodies. This standardizes halal practices globally and ensures reliability, trustworthiness, professionalism, and an acceptable level of quality in the verification of halal compliance.

Halal Standards

Halal standards address the requirements for how the halal-compliant products must be produced and how the business must operate. The observance of halal extends beyond meat; it is an institution and a comprehensive quality management system, with clear religious guidelines that have been practiced for many centuries. These guidelines span the supply chain from farm to point of delivery.

Jalot Al-Absy explains that for meat to achieve halal standards it must come from a halal species, including goat and sheep. A halal slaughterman is required at the plant as either a subcontractor or an employee of the facility. After the slaughterman is identified, the facility will seek a reputable HCB. Acceptability of the HCB depends on its accreditation, where the meat will be sold, what type of meat is being processed, and how recognizable the certification mark is. Knowledgeable HCBs may have staff with hands-on experience in their industry and knowledge of animal husbandry, animal handling, animal harvesting, and meat/poultry processing, rather than only being aware of the theory behind such industries.

HCBs can help the facility create its halal manual, which covers the basics such as the method of slaughter, the method of stunning (and acceptable stunning parameters), the halal slaughterman requirements, and segregation of the product throughout the production process. It also covers feed requirements, traceability and recall procedures for non-compliant halal products, handling nonconformances within production, and halal training of personnel and staff. The HCB may help identify other required technical standards like ISO 17021-1 and ISO 22000. The manual and facility will undergo a halal audit. All meat and poultry producers require certificates, known as a halal batch certification, for every batch. The certificate is an integral part of a trusted halal program.

Data Challenges

The unknown elasticity of demand, double-digit inflation in the last few years, and acute halal meat shortages all pose challenges to the reliability of the conclusions.

Elasticity of Demand

This study assesses the fresh, locally raised goat meat market. The data available is for frozen, imported goat meat, a less expensive substitute. Therefore, the demand is extrapolated from the available data. Fresh halal meat demand is highly elastic or sensitive to changes in price. If the price increases a little, the demand for fresh, locally raised goat meat will fall significantly, but the exact amount is unknown and therefore estimated. A complete study should conduct a profitability analysis to determine the impact of different elasticities and the impact of different combinations of fresh and frozen meats sold.

Double-Digit Inflation

The demand data was collected prior to 2021. In the last 18 months, the United States has experienced double-digit food inflation (Economic Research Service, USDA, 2023). With meat prices already significantly higher than they were in these studies, demand for meat might be depressed and demand for fresh, local meat might be lower than previously thought. With higher meat prices, demand might be lower for all meat and the willingness to pay for a premium product might be even lower than estimated here.

Acute Shortages

Part of the impetus for this facility was acute supply chain disruptions that left grocery store shelves empty in the past three years. This memory may encourage more people to make value-based purchases, like supporting local food systems to ensure the local players exist and to avoid future disruptions. In this case, the demand for local, fresh halal meat may be higher than estimated in this study.

Halal Meat Demand

This section of the study explores the potential demand for halal meat. Initially, the primary focus was fresh, locally raised, halal meat, particularly goat meat. The immediate consumers are Somali Muslims in the St. Cloud area. Since demand from this community alone will not support the facility, the study expanded its scope to include demand for halal meat beyond the St. Cloud Somali community, in other parts of Minnesota, and non-goat halal meat.

While demand is highest for halal goat and lamb meat, given the seasonality of small ruminant production, frozen meat is included because it is acceptable to the community. There is also demand for halal beef; therefore, cattle and beef are also explored to a lesser extent.

Findings

Animals: Based on the data reviewed, the Somali community purchases enough frozen meat each year to operate this facility at 100 goats per week, which might make the unit economics too expensive for the market. Sales data show that fresh meat demand is only about 10% of frozen meat demand. Demand for goat meat is stable throughout the year and lamb meat is highly seasonal. The larger Minnesota Muslim community demands over 8,000 fresh or whole goats per year. This would utilize most of this facility. Seasonality may still be a problem, but freezing meat during periods of lower demand and making it available at other times could address this mismatch.

Value: Demand for halal meat is inelastic, while value-added features on top of the halal labelling are elastic. This is the only meat that the community will eat and without halal meat available, food security is difficult to achieve. Halal meat sells for ~ $1 more per pound. Imports from Oceania and South America are $1.00-$1.50 per pound lower than domestic production. Imports set the market price and it is difficult to convince shoppers to pay more for local, fresh, or other specialty halal products. Additional value-add opportunities could increase the willingness of local consumers to pay, which could cover the added costs of local production and processing. However, outside funding and other subsidies might be necessary to achieve the dual mission of increased food security and local meat production.

Meat Consumption Per Capita

Minnesota's estimated Muslim population is around 150,000 people. One-third, roughly 46,000 people, are of Somali descent, making them the largest cohort within the Minnesota Muslim population (Kagan, Draeger, & Olive, 2020); note, according to more recent estimates, the Somali population may be nearly double the previously stated value.

Much of the population is in Central Minnesota. The halal meat markets are in metropolitan areas like the Twin Cities, Fargo/Moorhead, Rochester, and St. Cloud. However, halal consumers also live outside of these cities. In areas without halal meat, one person will visit the city to purchase halal groceries for their household and friends or family members.

Agricultural Utilization Research Institute (AURI), the Minnesota Department of Agriculture (MDA), and University of Minnesota Extension developed a joint report on Halal and Kosher Minnesota Meat Market Assessment (Kagan, Draeger, & Olive, 2020); the report estimates that the Minnesota-wide Somali community consumes approximately 10 pounds of goat meat per person per month for a total of 3.8 million pounds per year. Figure 1 below shows estimates by Ryan Pesch of University of Minnesota Extension of annual goat meat purchases.

	Quantity (pounds)	Goats
Whole Carcass	120,000	5,374
Fresh Meat	188,000	3,425
Frozen Meat	3.45 million	98,571

Figure 1: Pounds Purchased/Year (Source: Halal & Kosher Minnesota Meat Market Assessment)

Goats demanded is based on a finished yield of 35 pounds per animal. Total annual demand for whole carcass and fresh meat is equivalent to 8,799 goats (308,000 pounds). In the break-even analysis, 200 goats are processed weekly producing over 350,000 pounds of goat meat per year.

St. Cloud Halal Meat Sales Data

University of Minnesota Extension conducted a survey of 12 St. Cloud grocery stores that sell halal meat. All 12 locations sold frozen halal goat and beef, eight sold lamb, and 11 sold chicken. Stores answered based on one week of sales between April and October. The table below shows the total amount of meat sold by animal. If goat meat is extrapolated, then annual demand could be over 200,000 pounds. These grocery stores require over 5,900 goats annually.

	Quantity (pounds)	Weekly Animal Demand
Goat	4,123	118 (35 lb meat yield)
Sheep	1,512	38 (40 lb of meat yield)
Beef	3,085	4 steers (720 lb of meat yield)

Figure 2: Pounds Purchased Per Week (Source: UMN, Extension Retailer Survey)

Assuming the frozen meat sold at these 12 stores is replaced with fresh local meat, they demand 118 goats, 38 sheep, and 4 beef steers weekly. Fresh meat is more expensive than frozen, so the true demand will probably be much lower than these figures. Potential fresh goat meat demand is estimated at 10,000 to 30,000 pounds per year. The explanation is in the Price Challenge section below. Several of the grocery stores have restaurants that could use the meat; however, their total demand is unknown, especially with the price premium that local, fresh, halal meat carries.

Halal Goat and Lamb Products

Frozen goat and lamb meat is sold in small cubes. A retailer purchases a frozen carcass or boxes of primals that are packaged in cardboard boxes and stamped with an HCB logo. These products come from wholesale food suppliers in the Twin Cities. Retailers have saws required to break down the animal into cubes of meat. Customers purchase whole animals for special occasions and holidays.

Price Challenge

The data show that specialty goat meat demand is elastic: as the price increases, demand quickly falls. According to the UMN retailer survey and the Halal and Kosher Minnesota Meat Market Assessment, fresh meat accounts for 5-15% of total goat meat sales. Assuming the St. Cloud community purchases 200,000 pounds of frozen goat meat per year, the anticipated fresh goat meat sales demand is only 10,000 to 30,000 pounds of meat.

The U.S. imports small ruminant meat from South America and Oceania (USDA, Foreign Agricultural Service). Australia exports 85% of their goat production, and 90% of its goat herd is feral. This

business model keeps the cost of retail Australian goat meat $1.00 to $1.50 per pound less than domestically produced goat meat and these numbers are from before the recent double digit, meat inflation levels (Kagan, Draeger, & Olive, 2020).

Lower priced substitutes are a challenge for the supply chain. Retailers struggle to get the higher price from the consumer, making it harder for the processor to pay a higher price for the animal, which in turn lowers the price paid to the farmer and discourages sheep and goat production.

Exploring Price Premiums

If local, halal processing is going to be financially sustainable, it will require increasing the price of meat to cover the higher costs of production and processing or securing external funds to subsidize the cost of production. There are several ways that the processor and retailer can secure sales and achieve higher price premiums. Further examination could help assess the financial feasibility of the facility depending on how the goals of the facility are prioritized.

Topic	Comments
Somali Owned & Operated	From the Halal and Kosher Minnesota Meat Market Assessment, many of the older Somalis interviewed would be willing to pay a higher price from another Somali over halal from other Muslim communities.
Selective Sales	The older Somalis also expressed a preference toward purchasing halal meat at a grocery store over a supermarket or club store. By restricting the sale of halal meat to local markets, it could keep the fresh price higher.
Prepared Foods	Non-Somali Muslims interviewed noted the need for halal meats in other foods such as sausage, pizzas, Chinese food, or burritos. Many noted that their children, having grown up in Minnesota, would like to eat more “American-style” foods but that there are not many available made with halal meats.
Exports	This facility is principally meant to support the St. Cloud Somali community. The facility’s capacity may exceed demand. Excess could be sold statewide. Currently, frozen meat from the Twin Cities goes to St. Cloud. Distributors could backhaul fresh goat meat to the large cities, where they could sell the meat at a higher price.
Cut Meats	Further processing at a cut and wrap facility could result in high value products like lamb racks, ribs, and shanks. These products require more labor, equipment, and skill to produce, but also carry a significant price premium.
Non-Halal Markets	Non-Muslim consumers, particularly on the East Coast, are buying halal meats and products with the intention of buying healthy and fresh meat, and few non-Muslim consumers would reject halal meat based on its label.
Other Labels	Consumers expressed interest in sustainable, local, and organic products. Each of these carries a price premium. If the meat was natural, sustainable, or organic, that might help overcome the additional cost of production.
Kosher Meat	A deeper understanding of the price premium for kosher meat might provide insight into the halal market. According to the Minnesota study, halal meat was $0.96 per pound more than conventional; kosher was $6.20 per pound more.

Livestock Supply

This section explores the livestock supply available to support a new halal processing plant in Minnesota. The supply is based on the Minnesota livestock inventories, the willingness of processors

to expand production, the seasonality of small ruminant production and harvest, and the overall feasibility of the local livestock industry to fill demand at this facility.

Findings

Animals: Minnesota goat and sheep inventories are expanding (USDA, National Agricultural Statistic Services). The 2022 the UMN producer survey provides a picture of the possible supply available and producer willingness to expand sheep flocks specifically for this facility. These producers represented 9,550 small ruminants (2,755 goats and 6,794 sheep). Of the 74 goat and 51 sheep producers surveyed, 73% and 69% respectively, expect to increase their herd or flock in 1-3 years.

Producers: Two-thirds (67%) of the producers from the UMN producer survey expressed a willingness to get halal certification. An additional 23% were unsure if they were willing to adopt halal standards.

Seasonality: The largest concern is the seasonality of lamb and goat production. The animals are born during a three-month period and the halal community generally prefers smaller animals, meaning that there would be high demand for processing services in the late summer and early fall and low demand the rest of the year. Seasonal fluctuations can lead to underutilized assets and, subsequently, more expensive products that struggle to be competitive in the market.

To spread out the supply of animals, the processors could work with producers (possibly through contracts) to keep their animals on feed longer, delaying some of the processing dates. Livestock prices range from under $1 per pound to over $3 per pound. This spread increases producer risk and will make it difficult to expand production during low price seasons.

Excess Capacity: Ideally the facility is well-utilized. During the times when small ruminant supply is low, the facility could process local halal beef cattle (potentially from the same producers) or import livestock from southern states that produce throughout more of the year.

Inventory

Minnesotan goat, kid, sheep, and lamb production have grown in recent years, but are below the levels seen during the 2017 Census of Agriculture (USDA National Agricultural Statistics Service , 2017). The table below includes National Agricultural Statistics Service (NASS) data from the USDA for 2022 and 2023. **Figure 3** lists the Minnesota inventories. Meat goats are harvested for meat. Milk goats are also an important source of animals for processing. Some “open” (fail to get pregnant) milk goats and breeding sheep might be culled to avoid the added feeding expense.

	January 2022	January 2023	Percent Change
Goat Total	**26,000**	**30,000**	**0%**
Milk Goats	13,000	19,000	46%
Meat Goats	13,000	11,000	-15%
Sheep Total	**112,000**	**115,000**	**3%**
Breeding Sheep	80,000	80,000	0%
Market Lambs	32,000	35,000	9%

Figure 3: Minnesota Goat & Sheep Inventories (Source: USDA, NASS)

USDA county-level inventory data for Minnesota are only available through the Census of Agriculture. The most recent survey is based on 2017 data. In 2017, 81 of 86 counties had goats. At the time there were 36,104 goats in the state. Six counties had more than 1,000 goats, Todd (2,772), Mower (1,291), Otter Tail (1,291), Fillmore (1,224), Goodhue (1,029), and Washington (1,013). There

were 1,996 operations with goats, however 12 of those operations were in counties without goats reported.

In the 2017 Census of Agriculture, the sheep and lamb inventory were 114,389, with 2,248 operations with inventories. There were 33 counties with over 1,000 sheep. The top five counties were Renville (13,779), Murray (5,101), Lyon (4,354), Kandiyohi (4,101), and Pipestone (3,964). Together these counties contained 31,299 sheep and lambs or 27% of the state total.

Looking deeper at the inventories, the Upper Midwest saw an influx of hair breeds such as the Katahdin and Dorper/White Dorper. These are good for ethnic markets because they are smaller animals, and they can be marketed early.

UMN Research Results

In 2022, researchers at University of Minnesota (UMN) surveyed producers to gauge their willingness to expand goat and sheep production as well as adopt halal standards to supply a processing plant that would provide the St. Cloud community with halal meat. This information provides more clarity and granularity to the state-wide statistics listed above. UMN connected with 98 producers and 52% reported raising goats, 35% reported raising sheep, and 35% reported raising cattle.

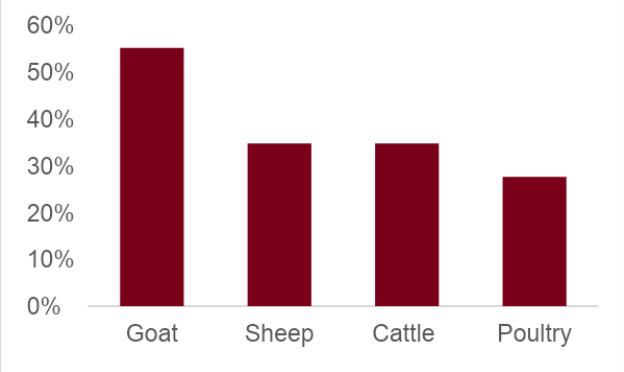


Figure 4: Results of UMN producer survey results showing the percent of producers raising goat, sheep, cattle and poultry.

Although more operations had goats, the number of goats on these farms was lower than the number of sheep. There were 2,755 goats and 6,794 sheep. The age or type of animal was not shared (i.e., breeding, milk, mature animals). The results revealed that most of the producers that responded were small producers with under 50 goats, sheep, or cattle. The largest (over 200 animals) were sheep operations, only nine operations had more than 200 sheep in 2021.

An advantage of small producers is that they can more readily pivot their operations. This makes it easier to enter a new market, like halal. There are also fewer decision makers, less bureaucracy, and fewer standing contracts that need to be changed to enter the halal market. Value chain coordination producers can smooth out supply and decrease operational risk.

The challenge with small producers is that they are small. To achieve the supply needed for the processing facility would require working with more producers; this means extra logistics and costs for the processor. There will be more producers to recruit, contracts to negotiate, delivery times to manage, producers to educate about halal, and livestock to grade or meet quality expectations. However, diversification - working with multiple small producers - does protect against an over-reliance on one large producer and minimizes the risk that a large producer withdraws their animals and leaves the facility with excess capacity.

Willmar, MN Halal Processing Plant

A new meat processing plant is scheduled to open in the fall of 2023, in Willmar, Minnesota. The facility will process halal goats. While there is limited information available, an article from the Star Tribune states the facility is processing goats from Kandi Acres, a farm with 500-head of goats. The article also says, "Meanwhile, input costs like hay, corn and oats have risen dramatically for farmers in the U.S., nearly tripling the live-weight sale price for Farrier's goats to $6-$8 a pound." This is a significantly higher price point that we explore in the Break-even Analysis below.

The impact of this facility on the feasibility of additional halal meat processing in St. Cloud could be positive or negative. Willmar could have the first mover advantage. Since the supply of halal animals is low, Willmar could contract with a large portion of the market, making it difficult for the region to support another meat processor. Or a potential St. Cloud facility could have a second mover advantage, allowing the Willmar plant to have done the hard work of bringing halal processing to Minnesota. They would have educated producers and built relationships to support the new business. A St. Cloud facility could build on that experience and get to market faster, at a lower cost, and potentially with a faster learning curve. If a market is building around the Willmar facility, then a St. Cloud facility could benefit from it as well.

Seasonality

Seasonality is a serious challenge for the small ruminant markets. Lambs and kids are born from February through April. The breeding season is fixed because the animals are more fertile in the fall. Producers prefer spring births since forage is abundant and cheaper to feed livestock in the summer, and the harsh Minnesotan conditions cause hypothermia and death in young animals.

The seasonality of lambing and kidding could create a major challenge for a processor that is trying to operate a facility year-round. Since the animals are all born in a three-month period, they should reach market weight during a three-month period as well and need to be processed at the same time. A facility operating in this market will have excess demand during peak processing times and excess capacity the rest of the year. Since these facilities are capital intensive and have high fixed costs, if they are only used for a few months of the year, the costs are not distributed across enough animals. The cost of production is higher, compared to a facility that is better utilized.

Market Weight

The breed and age of the animal both impact the market weight of livestock. Some breeds produce smaller animals regardless of the age of the animal, others produce larger animals. The age of the animal can also impact its size at harvesting. Older animals are kept on feed longer and may be larger than younger animals. To manage the seasonality of small ruminant production, the processor might work with producers to raise the right mix of small and large breed animals as well as younger and older animals.

Large processing facilities cannot efficiently handle different sized animals because the mechanization and automation require every animal to be roughly the same size. However, small processing facilities, like the one explored in this study, are generally not mechanized. People harvest and process the animals and they can adjust to smaller and larger animals, where machines cannot. This creates flexibility since the facility will accept smaller and larger animals.

Lamb Markets

Lamb meat is sold in traditional and non-traditional markets, which were explained in the report's Overview: Meat Markets Section. Both markets want animals under one year old. However, the non-traditional market prefers smaller breeds that produce smaller animals, while the traditional market wants larger animals. Since the animals are not interchangeable, producers must raise animals for a specific market.

This study focuses on non-traditional markets which prefer lambs under 100 pounds. These small-breed lambs are sold direct-to-consumer or at an auction barn that represents these markets. Ethnic markets sell animals as whole carcasses or in primal cuts. These large pieces of meat are more manageable when they come from smaller animals. These animals are not put on feed, making it harder to extend the harvest season.

The traditional market prefers larger breed lambs with a live weight of 120 to 160 pounds. These animals are on feed and are more likely to be available for harvest year-round. They are harvested and further processed into cuts of meat. The racks, ribs, and shanks get a premium in the market. Larger animals also produce larger cuts of meat which are more profitable.

Longer Feeding

Kids and lambs can be harvested between 3 to 12 months of age or 40 pounds and 150 pounds, depending on the breed and market. If some animals are harvested at 3 to 6 months and others are harvested from 6 to 12 months, it could spread out the supply of the livestock and lead to better utilization. This is easier to achieve on feed and most non-traditional lambs are not put on feed. Therefore, the facility might need to explore lambs for both markets and the willingness of producers to keep animals on the farm longer, which increases costs and delays payment. Producers must also be able to transport the animals year-round.

This season-extension does not work for nationwide domestic sheep and goat facilities because it is unrealistic to coordinate production across thousands of farms in the United States. The proposed facility reviewed in this study would source somewhere between 5,000 and 20,000 small ruminants per year. Given the small scale, close proximately, and mission driven nature of supplying halal meat to local consumers, value-chain coordination is much easier to facilitate, and a schedule could be devised to spread out demand for processing throughout the year.

Goat Markets & Prices

The Demand Section focuses primarily on goat meat and if there is enough demand to support a proposed facility. Goat meat is primarily sold in ethnic markets, but not all is halal. Goats are eaten year-round and there is more consumer flexibility in the market weight of the animal (Yang, 2019). If the goat demand is sufficient to support this facility, then the intense seasonality of the lamb markets might be avoided, unless the operators specifically want to process lambs.

Limited auction price data is available from the Zumbrota meat auction in Minnesota. Sample weekly prices are reported by goat type and average weight for all the animals sold by one producer. The data spans one year and captures data on does (females) <100 pounds, wethers (castrated males) <100 pounds, and kids <40 pounds. Data is also available for Billy, nanny, and mixed lots of goats. The graphs below show an estimated market price for each type of goat per pound over the course of the year starting in August 2022 and ending July 2023. Months with zeros, had no sales of this type of animal.

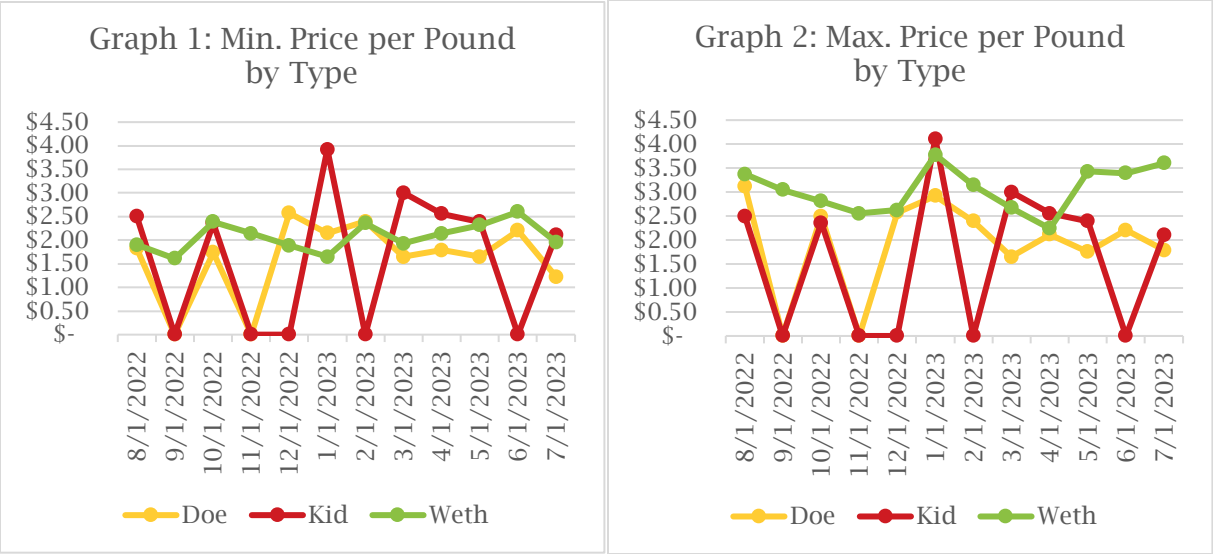


Figure 5: Graphs 1 and 2 show price data from the Zumbrota meat auction in Minnesota.

Graphs 1 & 2 above show that the market price of goats drastically swings throughout the year and in many months no kids or does are brought to the auction. Producers want to sell when the price is high and will try to avoid selling when the price is low. The large price spreads disincentivize producers from bringing animals to market year-round, which is something that the facility operators will have to counteract to stabilize their supply.

These huge price swings are risky for producers. Animals might be profitable to raise when the market weight is $2.00 per pound, but not at $1.00. However, producers are price takers. They must accept the market price and cannot influence it. The goat market is characterized by a lot of producers and not a lot of buyers, therefore the buyers can influence the price.

Producer risk can be mitigated with forward contracts and direct-to-consumers sales. Small producers often look for contracts from processors or feedlots, so they can avoid auctions and lock in their sale price before raising the animal, hopefully ensuring a profitable season (Kopf, 2021). To ensure an adequate supply of sheep, the proposed facility could use contracts to secure its supply. Contracts can also even out the supply throughout the year.

Facility Assessment

The connection between the supply of livestock and the demand for meat is a facility for harvesting and processing. Adding a halal meat processing facility will increase the supply and availability of fresh, local, halal meat in the St. Cloud area for the Somali community. This section explores the type, size, and structure of the facility. The community can assess and prioritize its specific needs and then align the processing equipment and capacity to it.

Key Findings

Capacity: The local St. Cloud community could support a facility that harvests ~100 small ruminants per week producing 175,000 pounds of meat per year. This size facility will have excess capacity allowing it to expand output during busy seasons and support livestock producers that are considering expanding their herds or flocks. However, operating the facility closer to full capacity, 225 small ruminants per week increases the profitability of the operation.

Services: Goat and lamb meat are sold as whole carcasses or primal cuts. The buyers are typically grocery stores that can break down the animals. Freezer and cooler space are needed to store the

product until buyers purchase it. Extra freezer space could provide capacity to store excess meat and smooth out the seasonality of the markets. A smaller facility that only has harvest and processing capacity would be sufficient to support the local market. Such a facility requires less labor, skill, and capital because it does not have further processing or cutting and wrapping capabilities (which are not deemed necessary given the buyer characteristics).

Expanding: Starting with a small facility that supports the minimal services required (harvesting, cutting, and some freezing) could give the community an opportunity to begin serving the local market while the business operation gains experience, collects more data, builds relationships, and, most importantly, successfully coordinates the value chain. Some of the facilities explored are modular and can be expanded as needed. Both the Meat Demand and Livestock Supply sections of this report are theoretical and could be tested with a small, expandable facility.

Meat Processing Facilities

This section explores three different facility options. Members of the community have already explored Friesla® Mobile or Modular Meat Processing Systems. These systems are reviewed in this section. Alternatively, a fixed (brick-and-mortar) facility could be built or updated.

Friesla®

Friesla® is a meat processing equipment and services company that designs, builds, and helps clients to implement USDA-compliant Mobile and Modular Meat Processing Systems. These systems are customizable based on the buyer's conditions, schedule, location, and required harvest and processing capacity. The systems explored in this study support a harvest volume of 150-225 small ruminants per week, which can be increased by expanding the footprint with additional Friesla® Mobile or Modular units. The actual harvest and processing volume of each system depends on the operational efficiency of the team, the number of employees and their skill level, the species, the amount of aging time, and how the meat will be packaged.

The **38' Mobile Harvest Unit** is a moveable unit divided into three areas: processing, cooling, and a mechanical room for the refrigeration unit, generator, and water tank. The trailer is self-contained with a 20kW on-board diesel generator, 110V electrical system, hot water plumbing, insulation, and lining package, and tandem 12K axles (GVWR 36,000lbs). The cooler has a meat rail hanging system with a capacity of 30-45 head of goat or sheep and 12,000 pounds of meat.

Advantage: The mobile system is for harvesting and processing. There is typically no further processing or cut and wrap capacity in a standard Friesla® 38' Mobile Harvest Unit, though these features can be added by expanding the Mobile Harvest Unit to a larger 45' or 53' unit. These features might not be necessary for this market because the retailers purchase primal cuts and further process them into cubes onsite and because they require additional staff and training that are not required by customers.

The **Meat Processing System (PS-1)** is a modular harvest-to-package processing system that enables on-site meat processing from slaughter to meat sale. The PS-1 System offers four interlocking modules—ranging between 50'-58' in length per module—that enable knock and bleed, harvest, chill, cut and wrap, freeze, and storage.

Advantages: The system allows for further processing on-site into packaged, branded products, supporting the option to offer high value meat cuts. The systems can be relocated, rearranged, or added onto as the operation grows.

Compared to a fixed structure, Friesla® says its Mobile and Modular Meat Processing Systems require less power, water, and other resources to operate. They are depreciable over 7 years and may not require some of the permits or long approval periods of a fixed facility. Their systems are delivered with hardware and software to support product traceability and digital workflows, and with written

Hazard Analysis and Critical Control Points (HACCP) Plans that enable operation under USDA inspection.

Fixed Facility

This facility could be a meat processing building that is built new or renovated from an existing building. A review of local sites and facilities is required to determine what is available and what building and zoning requirements apply. A fixed facility could be customized to meet the needs of the community, once the desired features are outlined, but it will require higher up-front costs for professional services and capital investment in equipment and will likely require a business plan to justify project financing.

Facility Capacity

The facility is a fixed asset and has fixed operating cost that does not expand or contract capacity to match the season or demand. As fixed costs are used more, the cost is spread across many products. Therefore, higher utilization rates increase the likelihood that the facility is financially viable. The ideal facility size is one that can capture the market during the high season and stay afloat in the low season. The Friesla® PS-1 System is scalable and additional units could be added as needed.

Processing capacity is often expressed in the number of beef head per day. One beef head equals three small ruminants. A small facility can harvest 15 beef per day or 45 goats/sheep. If goat and sheep are processed four days a week, that is 180 animals, plus up to 15 steers on the fifth day. A multi-species meat processing facility will be slightly different from a small ruminant facility.

The Friesla® Systems discussed in this study can be used to process between 150-225 small ruminants weekly. Assuming the average yield is 35 pounds of meat per goat, the facility's maximum output is 630,000 pounds of goat meat annually. Operational efficiency and livestock supply could increase over time. It is unlikely to reach its maximum capacity because halal slaughter requires severance of trachea, esophagus, and both the carotid arteries and jugular veins of the animal using a sharp knife without cutting the spinal cord, which is slower than stunning the animal (a common American practice) (Mamedov, 2022).

Processing Services

Meat processing service fees are broken into two categories, the kill fee to slaughter or harvest the animal and a processing or cut and wrap fee to process the meat into packages and cuts that can be sold. A meat processor can either charge the kill and processing fee and return the meat to the producer or it can purchase the animals from the producers and sell the processed meat to buyers.

Facility Operational Costs

For this study, we estimate that wages in the St. Cloud area are $26 per hour for employees at the processing facility and $40 per hour for the site manager. Employees will earn benefits at 30% of their wages. We estimate the daily costs of operating a 38' Mobile Harvesting Unit are just under $1,800 per day. These figures are used in the break-even analysis below.

Depreciation

Friesla® advises that both its Mobile and Modular Meat Processing Systems can be eligible for Section 179 and/or special depreciation allowances because they are tangible personal property – they can be touched and moved. They are in the asset class of being depreciable over seven years under the United States' standard tax depreciation system, the Modified Accelerated Cost Recovery System (MACRS).

Break-even Analysis

A break-even price analysis was based on harvesting 200 goats into primals, assuming liveweight of 100 pounds and a meat yield of 35 pounds and estimated daily costs (operations and labor) of $3,300. The operating costs exclude the cost of halal certification, which varies by certifier (Al-Absy).

If the cost of a goat is $2 per pound of liveweight and 200 goats are processed in this facility per week, the break-even wholesale price is $8.08 per pound. If we assume a 25% retail markup, the fresh meat will retail for $10.10 per pound. In the survey conducted by University of Minnesota Extension, retailers reported selling some fresh goat meat for $9 and $13 per pound.

Sensitivity Analysis

In the sensitivity analysis, we assumed a baseline of 200 goats processed per week, a live cost of $2.00 per pound and weight of 100 pounds, a marketable meat yield of 35 pounds, and a wholesale price of $8.00 per pound.

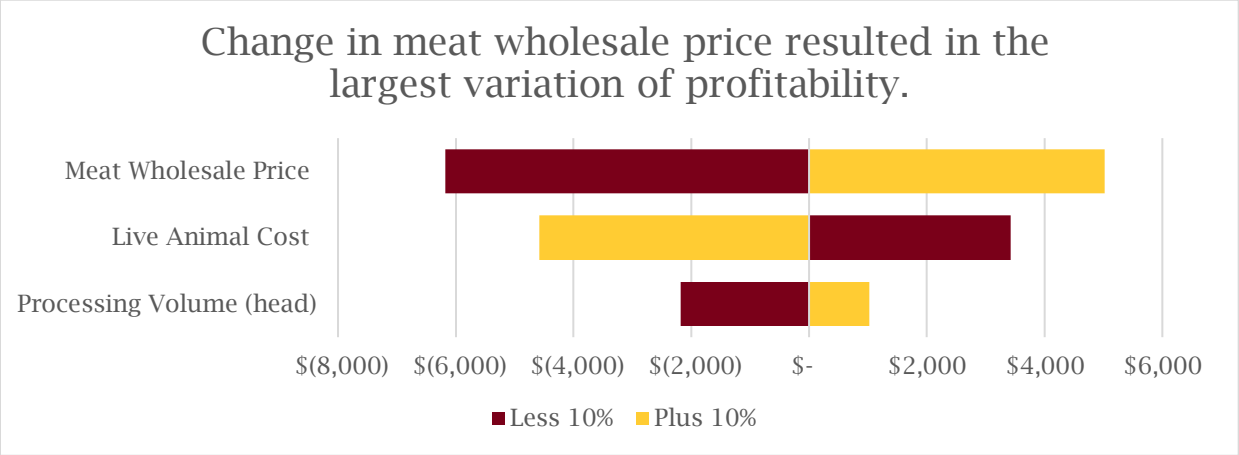


Figure 6: A sensitivity analysis explored how a 10-percent variation in meat wholesale price, live animal costs, and processing volume, may impact profitability.

When the wholesale price of meat increased by 10%, to $8.80 per pound, profits rose by about $5,000. When the price fell to $7.20, the profits fell by over $6,000. In contrast, the processing volume had the smallest impact on the profitability of the operation. When the facility harvested 220 goats per week the profitability reached $1,000 and was -$2,000 when the number of goats processed fell to 180 goats per week.

If profitability is important, or if there is a maximum amount of loss acceptable per day, limiting operations to match seasonality of supply and demand should be explored. A facility that harvests livestock when affordable goats are on the market or when the consumer market will support the necessary price premium could be viable.

Expandability

Starting with a small facility that supports the minimal services required (harvesting, cutting, and some freezing) could give the community an opportunity to begin serving this the local market while the business operation gains experience, collects more data, builds relationships, and, most importantly, successfully coordinates the value chain. Some of the facilities explored are modular and can be expanded as needed.

Conclusions

This study assesses the feasibility of a halal meat processing facility in Central Minnesota. It considers the demand for fresh, local halal meat, the supply of halal animals, and the economics of operating a processing plant in this market. Individually the three aspects are feasible; bringing them together in the form of a meat harvest and processing facility requires additional investigation and decisions from the community.

Demand research supports that statewide demand for fresh halal goat meat could be 8,000 goats per year. Local inventories could supply 8,000 goats per year, however, if the facility only processes 150 goats per week, the wholesale and retail price of meat will be too high for most consumers. The high price will decrease demand. In contrast, if the facility processes 200 to 225 goats per week, the unit economics make sense for consumers. However, the availability of supply and the meat demand at this level is less certain.

There are options to address this misalignment.

Exploring additional markets

- **Multi-species processing** – the focus has primarily been on demand for halal goat meat, with the possibility of also having lamb and beef available as well. Multi-species processing would increase facility utilization without oversupplying any one market with meat.
- **New geographic or markets** – if the meat is sold outside of Minnesota to other nearby cities or into non-Muslim retail markets, it would increase demand for the meat, thereby lowering the unit price.
- **Higher value markets** – if the throughput stays low, the facility can increase its profitability by selling meat with additional attributes (value-added products, high-value cuts) that increase the consumer's willingness to pay. In this case, the consumer is willing to pay the higher price for meat that comes out of this facility.

Subsidizing the cost

- **Grants for construction costs** – grants to pay for the construction of new meat processing facilities are available. Building this facility with grants will reduce the fixed costs and increase profitability.
- **Volunteer labor** – labor is a major component of the facility's operational costs. Since the facility will support the community, it could use volunteer labor from the community. This is common in other community-owned, operated, or focused agricultural ventures. Volunteer labor or labor compensated with meat, translates to a lower whole meat price.
- **Subsidized goats** – the price of goats has the largest impact on the sensitivity analysis. To produce affordable meat this facility needs access to low-cost goats or livestock. The community has expressed interest in potentially raising its own goats. This would ensure there is a steady supply of livestock to the facility and could reduce the price paid for goats.

Operating seasonally

- The goat and sheep livestock and meat markets are highly seasonal. If the facility operates only when the goat prices are low or the meat prices are high, then it could be profitable during those times. When the market conditions are not conducive, the facility will stop producing temporarily.

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