A Review of Southeastern Farmers' Perspectives on the Nutritional Systems and Parasite Management Strategies of Dairy Goats

Isabella Roeske

Major Project/Report submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Online Master of Agricultural and Life Sciences

In

Agribusiness

Dr. Dixie Watts Dalton, Department of Agricultural and Applied Economics

Dr. Alex White, Department of Dairy Science

Dr. Larry Tranel, Iowa State University Extension and Outreach

(Date of Submission – 12/12/2025)

Keywords: Dairy Goats, Ruminant Livestock, Nutrition, Health, Parasite Management

ABSTRACT

This qualitative phenomenology evaluates nutritional systems in the context of dairy goat health and production in the Southeastern United States amid climatic pressures to enhance the understanding of farmer perspectives, including cost benefit analyses and operation-specific prioritizations, in this region. This study parses through interviews with dairy goat farmers across the Southeast who differ greatly in their systems of feeding and managing health, as well as in their operational goals. Insights offered by these farmers into their personal and financial decision-making highlight the opportunity costs of small ruminant nutritional systems, as well as the challenges currently facing dairy goat farmers. The discussion attempts to understand the optimal nutritional system for prioritizing production and health in dairy goats, while considering the environmental benefits of ruminant rotational grazing, and the practical balance of meeting the operational needs and preferences of individual farmers.

TABLE OF CONTENTS

INTRODUCTION

Ruminant livestock grazing takes place on up to one-third of non-ice terrestrial Earth (Gosnell et al., 2020). A ruminant includes any hooved animal that chews the cud, and livestock ruminants often refer to cattle, sheep, and goats. In the United States, there are 2.7 million goats, just under 450,000 of which are dairy breeds bred for milk production (Hempstead et al., 2021). The goat population globally surpasses one billion (Miller & Lu, 2019). While meat goats are effective in clearing overgrown understory, including invasive vines, dairy systems are unique in their ability to strengthen the small, family-owned farm while adapting to climatic pressures (Lee et al., 2013).

In the past 16 years, the dairy goat industry has increased by 57% with the percentage of goat operations dedicated to milk production up to 18.7% from 11.9% in 2009 (National Animal Health Monitoring System, 2020). Also in 2009 was the first national study conducted on the goat industry in the United States by the National Animal Health Monitoring System. In this study, the primary reason people stated for owning goats was for “personal consumption or use of meat, milk, or fiber, etc” (Animal and Plant Health Inspection Service, 2012). With current trends that lean towards “buying green” due to increased environmental awareness and a rise in health consciousness, consumers are rethinking their food choices. Goats offer a subsistence dairy alternative to store-bought dairy with minimal labor constraints at the household level, and still more freedom with labor and land at a business level compared to cows.

The ability for goats to be used as production livestock depends on their conditions, including their health, nutrition, and environment. All of these aspects of goat livelihood are impacted by the region in which they live and the climatic changes that are occurring in that region. The aim of this study was to explore the dairy goat industry in the Southeast by asking: How do farmers across different production levels make decisions about their management systems? More specifically, what guides their choices around nutrition and parasite management, and how do they explain the reasoning behind those strategies?

Additionally, this study examines the small- to mid-sized farm and is not representative of commercial dairies. The operations included in this study are all family-owned and primarily operated by just one or a few individuals. Therefore, the information presented in this review showcases the use of

dairy goats as a source of community nutrition and subsistence rather than a large-scale production animal. The environmental and health trade-offs, relative to monetary decision-making, will differ from what is typically expected in commercial dairies.

Statement of Problem

This study was inspired by the lack of academic resources on dairy goats in the Southeast United States regarding nutrition and health. Considering that the region is vastly different from California or Iowa, where one may more commonly think of dairy goats, the Southeast requires further study to understand the role these small ruminants play in dairy production and sustainable land management.

The future of agriculture in the Southeastern United States faces uncertain times as the effects of climate change continue across rural landscapes. From the 2024 floods in Asheville's apple orchards to increasingly warm winters, farmers are recognizing the need for adaptive agriculture to remain sustainable through unpredictable weather events (National Oceanic and Atmospheric Administration, 2024). These impacts extend beyond fluctuating temperatures and natural disasters to elevated CO_2 levels, increased weedy competitive exclusion and plant disease, harmful air pollutant interactions, and vulnerable carbon pools (Tubiello et al., 2007). Gosnell et al. highlight the importance of farmers' involvement in both adapting to and mitigating climate change (Gosnell et al., 2020), and livestock pasture management is one area where small shifts can influence carbon sequestration, biodiversity, livestock health, and the sustainability of rural landscapes.

Two major influences of goat production are nutrition and health, both of which are affected by climate. The questionnaire for this study was designed to primarily focus on nutrition and parasite management to understand the perspectives on these systems while taking current climate data under consideration. In general, though, farmers were less concerned with adjusting management systems to the climate, and were more focused on managing health largely through nutritional decisions.

Internal parasites are a major issue affecting small ruminants, especially due to an increased anthelmintic resistance in goats. These parasites are persistent in both conventional and organic management systems, requiring continuous monitoring. Rotational grazing systems are recommended to maintain proper hygiene for goats to avoid an increased parasite load (Pilarczyk et al., 2021). Nutritional

management is a primary agent in controlling internal parasites, even reducing risk of anemia, possibly due to parasites, in properly maintained rotational systems (Conway-Cunningham et al., 2024).

Project Purpose & Objectives

In this study, 20 goat farmers across the Southeast (Virginia, West Virginia, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi) were interviewed about their nutritional systems, including decision making factors when considering whether or not to rotationally graze. Through these interviews, themes around natural and purchased nutrition, goat behavior, climate, health, and more were recorded. These responses aided in understanding regional views on goat care, production, and policies.

The purpose of this study was to gather perspectives about dairy goats from a region that has little accessible information, both in formal literature or in informal online resources, which are often one-sided and include very individualized information not applicable to other farms. By bringing together the decision-making ideas and reasoning from farmers across nine states, the recommendations offered at the conclusion of the study are broadly applicable and be shaped to fit farms of all sizes and production levels.

This study began as a way to understand how farmers manage their herds in the context of climate change; however, even farmers who expressed concern about temperature extremes did not seem to alter their management in response to long-term weather changes. Therefore, the analysis and discussion focus more intensely on nutrition and health with the understanding that weather, and climate as a whole, serve as a foundation in the decision-making of how farmers have set up their management systems and adjust them through the seasons.

LITERATURE REVIEW

This review of scientific literature touches on the major topics that were discussed with farmers in the interviews, as well as provides context for the analysis and discussion sections. Because research on dairy goat operations in the Southeast identified region is limited, this review also pulls together literature from across the world, identifying gaps in United States-based research that this study begins to address.

Together, these sources provide a foundation for understanding the current state of dairy goats and the challenges that face farmers in the Southeast.

Goat Agricultural Systems

Dairy goat farming is expanding in the United States, especially in the Midwest (Hempstead et al., 2021). While the current literature shows that dairy cow productivity is quite sensitive to increased temperatures, similar effects have not yet been shown in dairy goats (Silanikove & Koluman (Darcan), 2015). This may present a resilient alternative for sustainable dairy production going forward and requires a closer look at how goat dairy agriculture currently stands in the United States.

There are 38 cattle per goat in the United States as of 2025 (Economics, Statistics, and Market Information System, n.d.; National Agricultural Statistics Service, 2025). Of the 38.1 million cows and heifers that have calved (from the over 94 million total cattle and calves), less than 8.5 million are milk cows, and over 28 million are beef cows (Economics, Statistics, and Market Information System, n.d.). Milk goats compose a small percentage of the overall goat population of over 2.5 million with 430,000 head, while angora goats, often bred for cashmere, totaled just over 100,000 head (National Agricultural Statistics Service, 2025). Due to the significant size difference of cows and goats, the land use and food requirements are much less for the latter, although it is also true that goats will produce less milk per animal. The feasibility, however, of smaller livestock can manifest in strengthening the small dairy farm system, as well as implementing regenerative ranching, defined below, in a more structured and cost effective setting.

The history of goats raised for agriculture is extensive, expanding significantly since the 1960s while sheep and cattle populations either saw limited growth or remained fairly stable. Goats are rising in popularity due to their nutritious dairy products, environmental benefits, and the practicality of smaller livestock for the average farmer. The largest population of goats exists in Asia, followed by Africa, and trailed by the Americas housing just three percent of the global goat population (Miller & Lu, 2019).

In addition to the utilization of goats for the agricultural production of meat, dairy, and cashmere, a North Carolina State University study found the effectiveness of ‘brush goats’ in reducing brush cover as a more environmentally-sound and economical means of managing land compared to repeated herbicide use, manual labor, or even use of other livestock species (Luginbuhl et al., n.d.). While some goat farmers

may be wary of utilizing dairy goats for such tasks due to reasons such as the effect of certain plants on the taste of the milk or the need to keep udders safe from high brush, meat goats may be a viable option for farmers who want dual purpose livestock. Regardless, dairy goats can remain in pastures with close attention and health monitoring for both the animal and her dairy products.

Rotational Grazing

As Gosnell et al. stated, 'It's not the cow, it's the how' in response to the differences between overgrazing and proper pasture management (Gosnell et al., 2020). Landscapes that are permitted to be grazed until bare cause issues with soil erosion and greenhouse gas emissions; however, strategically managed grazing can lead to increased carbon sequestration, among other environmental benefits. As stated previously, ruminant livestock grazing is critical to rural communities internationally, making these farms a convenient tool in mitigating environmental disruptions. As a practice that can be, at times, destructive to the natural environment, implementing 'regenerative ranching' as an alternative to a broader grazing system, as explained by Gosnell et al., can be a sustainable solution at the source. This style of ranching utilizes rotations for livestock with a deeper understanding of ecological processes to work with the environment, with an emphasis on the soils (Gosnell et al., 2020). While the required ecological framework may stand as a barrier for some farmers, rotational grazing has been a topic of debate since the early 20th Century in the United States, coupled with the origin of range science and developed alongside modern ecology (Briske et al., 2011). This system of grazing acts as a way for farmers to utilize all available land while promoting vegetative health in their fields.

Rotational grazing traditionally involves the movement of livestock across a landscape to strategically stagger paddocks or other enclosure types to allow a period of rest for pasture species between grazing terms. The length of optimal rest is debated and specific to forage species, but it is often discussed in tandem with the issue of internal parasites, especially when related to goats, as discussed in a later section. Historically, wild herbivores would move in herds, grazing patches of land until it no longer met their nutritional needs, and then would return to that area a full year later, allowing the land to rest and grow without grazing pressure (Grandin, 2022). As of 2007, 60% of ranchers and pasture managers in the United States utilized a form of rotational grazing called 'deferred-rotation' which just means at least four pastures are grazed sequentially, often in line with the seasons (Smith, 2007). In the case of goats,

however, more management-intensive grazing is often utilized by moving herds every few days or weeks, depending on pasture size and stocking rate. This technique, though, is not nearly as common.

How rotational grazing differs for goats specifically depends on the farmer's goals and ethical view of animal agriculture. While Yeates 2018 argues that 'naturalness' in terms of how humans interact with animals is a vague concept and not a realistic or standardized expectation to adhere to, the French Agency for Food, Environmental and Occupational Health & Safety offers a more precise, but flexible, definition: "The welfare of an animal is the positive mental and physical state related to the satisfaction of its physiological and behavioral needs as well as to its expectations. This state varies according to the animal's perception of the situation" (Cellier et al., 2022; Yeates, 2018). Based on this understanding, it is fair to assume that the welfare of goats is specific to their natural nutritional preferences within reason to the farmer's operational abilities and production quotas, although some animal activists or concerned farmers may argue with the importance of the latter distinguisher.

While goat-specific information is limited for the United States, cattle ranchers have expressed potential barriers to rotational grazing, including a high installation cost, labor and management costs, water source constraints, lease agreement restrictions, and a lack of information/education/support, among others (Wang, 2020). Despite these barriers, benefits can range from soil improvements with biodiversity and carbon sequestration to increasing forage due to rest periods and reducing herd health problems *Rotational grazing for climate resilience*, n.d.).

A recent 2024 Kentucky study compared pastures of goats who continuously grazed, meaning they had access to the full allotted acreage for a set amount of time, versus goats who rotationally grazed on the same amount of acreage, but were moved every few days to new sections. The rotational pasture was more evenly grazed, while the continuous pasture experienced bare patches from overgrazing of more desirable species and overgrowth of less desirable species (Conway-Cunningham et al., 2024). By rotationally grazing, goats do not have a choice of being as picky as in other circumstances. All herbaceous species are eaten down to reach fullness before moving pastures. In humid regions, rotationally grazing, as compared to continuous grazing, can allow for 20–30% greater forage production (Smith, 2007).

There exists an international issue of undeveloped lands in which growing crops is not a feasible option due to inhospitable climates and soil types. As such, an alternative agricultural solution is required. Rotationally grazed livestock allow for a sustainable method of raising meat and dairy animals while improving soil health and increasing plant biodiversity (Grandin, 2022). Additionally, these environmental benefits can be seen with rotationally grazed livestock in other conditions, such as alternated with crop cover, multi-species grazing, and in purely livestock-centered endeavors to allow for a more natural nutritional balance and to prevent internal parasites.

To effectively raise livestock with regenerative ranching, or pasture management, it is critical to understand what goes into growing quality forage. Understanding forage, including grasses and legumes, as well as soil biogeochemistry principles, may be time consuming and not worth the effort to some farmers or ranchers, thus creating a barrier to beginning the process of pasture management for rotational grazing. The 2020 study found that the greatest incentive for farmers to take on this extra burden of knowledge and labor was not carbon credits but rather the ecological benefits, including an increase in ‘deep ground cover’, perennialization, and more resilient forage (Gosnell et al., 2020).

Another important aspect of rotational grazing is stocking rates. Rotational grazing is a constant balance of under- versus over-stocking, pasture rest times, paddock size, season, weather, and so on. While goats may be seen as a viable option compared to cattle for a smaller tract of land, being sure not to overstock, or have too many animals on the land, is critical for those who wish to rotationally graze rather than feed primarily purchased nutrition (i.e. hay, grain, and concentrate). High stocking rates have been associated with not only depleted grasses and shrubs from pasture, but also with negatively impacted health. By altering the goats’ natural diets over years by forcing them to eat toxic plant species, the risk of abortion increased, along with reduced fertility rates (Mellado et al., 2003).

At minimum, 20% of habitable lands fall into the category of not being suitable for crops; however, goats can fulfill a need in these spaces as they are more adaptive to environments than cattle or sheep and are more naturally able to navigate rocky and hilly terrain (Grandin, 2022; El Aich et al., 2006). With proper consideration taken to adequate stocking rates and forage production, dairy goats can be adaptive to the land, as well as beneficial for human nutrition.

Graze vs. Browse

Askins and Turner (1972) defined the key differences between grazing and browsing that continue to divide the modern day goat community. Grazing includes feeding on “herbaceous plants in their natural state”, which includes pasture grasses and fallen leaves, whereas, browsing refers to feeding on woody plants, including the “buds, flowers, fruits, twigs, and foliage” of trees and shrubs. These terms are used for explaining forms of nutrition for goats, often differentiating grass pasture from shrubbery and trees.

A 2022 study researched goat feeding preference for foraging height and type of feed. Results showed that goats chose leaves over grass whenever given a choice, regardless of the height of the feeder, although when presented with only leaves, the goats chose the path of least resistance with a lower feeder option (Cellier et al., 2022). While the researchers set out to gain insights into a hypothesis that goats naturally choose to ‘eat up’ while browsing, the reality may be that the preferred forage is simply usually higher up in shrubs or trees rather than on the ground. That being said, goats have been observed browsing on plants 1.65 meters off the ground, higher than both their cattle and sheep counterparts (Sanon et al., 2007). Indeed, goats are situational animals, defined as both grazers and browsers depending on their environment and the choices available, including herbaceous groundcover and woody plants. Lu (1988) in his work through the American Institute for Goat Research described goats as “mixed-feeding opportunists”, contributing that they travel long distances while eating forage at eye-level, on the ground, and even, at times, climbing trees for vines or leaves.

The feeding and food-seeking behavior of goats varies under different conditions, such as whether they are roaming in natural wooded areas or are confined in maintained pastures, as well as whether trees and shrubs are present or if there are only tall grasses available. Foraging behavior is also impacted by both seasonal and day-to-day or hour-by-hour weather changes (Goetsch et al., 2010; Sanon et al., 2007). On a daily basis, goats have been observed partaking in two primary meals revolving around sunrise and sunset, while shorter feeding periods occurred mid-day. Additionally, daily weather patterns affect feeding behaviors, such as goats resting in shade on hotter days and grazing after dark when temperatures are cooler (Askins & Turner, 1972). In more mild climates, goats have been observed feeding more heavily on browse in winter months when herbaceous ground cover struggles (Lu, 1988). It

has been widely observed that goats across the world exhibit greater browsing behavior in dry seasons compared to rainy seasons (Kronberg & Malechek, 1997; Sanon et al., 2007). This is due to a decreased quality in forage and the need to browse in woody species that are more resilient to seasonal changes rather than being able to pair this diet with grazed grasses and leaf litter. Heightened foraging behavior is required to meet nutritional needs during the dry seasons. Additionally, documented goat behavior in captivity shows a preference for shelter cover rather than pasture on rainy days, while feral goats reduce feeding behavior in rainy conditions (Stachowicz et al., 2019). There are a number of theorized reasons why this might be, including avoidance of heightened parasite loads in wet pasture and increased heat loss from a wet coat of fur.

In Goetsch et al's (2008) review of historical papers investigating the feeding behavior of goats, a "nutritional wisdom" is mentioned, a conceptual term meaning that goats, if given the choice, will feed on the most nutritious option for their growth stage and season, including pregnancy. Goats maintain a diverse palette, when allowed, eating a daily selection of over 20 plant species compared to the 10 species chosen by cattle in a study conducted in Burkina Faso. In this study, goats overwhelmingly chose to browse woody plants, but also strategically avoided non-browsable plants (Sanon et al., 2007). Furthermore, while goats are utilized to clear invasives and weedy plants, it is unclear whether or not they possess an ability to avoid toxic plants while foraging. Berman et al., though, found that goats are able to avoid noxious insects and, consequently, their negative health impacts while foraging by utilizing touch and taste to choose non-infected leaves or to spit out unwanted insects (Berman et al., 2017). Additionally, many farmers believe that goats have a natural ability to freely choose minerals based on need (see analysis section).

Goats may naturally seek out forage, when available, due to the increased nutritional quality in comparison to grass. Forbs, non-woody plants, and shrubs, woody plants, contain more crude protein than grasses. Grasses are better suited for larger ruminant animals, such as cattle, due to their lesser nutritional value. Forbs have a low fiber content, making them easily and quickly digestible in the rumen, while goats in particular are able to pick around the woody parts of shrubs for leaves, berries, buds, and young twigs due to their small mouths. These forage options allow for a diversified diet with higher levels of protein, as well as phosphorus and Vitamin A (Hoiechek, 1984). Additionally, grasslands grown under

tree canopy have been shown to be healthier in regards to soil pH, total N, and organic carbon than open grasslands, thus showing the ecosystem benefits to increased biodiversity (Abule et al., 2005).

In a 2001 study, 30 goat dairy farms in the Midwestern region were surveyed to gain insights on husbandry practices pertaining to health, welfare, and production. Interestingly, the most common diet among the responses of the 30 producers for their herds was hay and grain/concentrate. Access to outdoor spaces was available on 73% of the farms, or 22 out of 30 (Hempstead et al., 2021). Despite the outdoor access for the majority of the farms, many still chose to feed primarily a purchased or dried feed diet. This paper delves into this decision-making process specifically in the Southeast to understand the cost-benefits of a purchased/dried or a natural diet for dairy goats.

Climate Impacts

Considering that agriculture is a major contributor to land degradation, the challenge of a rapidly growing population creates concerns over increased land use needs for food production and the simultaneous need for conserving soil and water resources (Tubiello et al., 2007). While the continental Northwest and Northeast may benefit in the short term from increased temperature, and, therefore, longer growing seasons, the Southwest and Southeast are the most vulnerable regions to climatic change. Some crops, such as wheat and soybeans, may see uptakes in productivity up to certain temperature thresholds. Beyond this point, though, agricultural production would likely slow and allow for weeds that thrive in higher temperatures and increased CO_2 to populate more voraciously, costing the American farmer greatly in time, effort, and cash (Lal et al., 2022).

Increases in weeds and invasive species can outcompete the desired nutritional forage for livestock, in addition to the nutritional disadvantage of plant nitrogen and crude protein declines in the presence of increased atmospheric CO_2. Contrastly, with the proper pasture management, an increase in temperatures also means a lengthened forage season, allowing livestock to stay on pasture longer and reduce supplementary food requirements and costs (Backlund et al., 2008). Regenerative agricultural practices may be useful in mitigating the negative impacts of climate change and most productively incorporating the few advantages.

Goats have been called the “world’s most sustainable meat”, celebrated globally for their production and more recent growth in the United States. These small ruminants can utilize land not suited

for crops, turning unwanted plants into meat and dairy, a green alternative to cattle that require large, cleared swaths of land. As goats clear weeds and invasives, they fertilize the soil with minimal concerns about regrowth or the need for chemical herbicides as seeds that have passed through goats are 80% less likely to be viable. Restored soils can contribute to carbon sequestration, while goat-browsed woods can contribute to fire suppression and invasive plant control (Curtis, 2022). Managing goats, therefore, with climatic pressures in mind, can be advantageous in turning depleted and overgrown lands into production opportunities while simultaneously improving ecosystem health.

While concerns have been steadily rising about climatic pressures around the globe, farmers have been more dedicated to modifying land and nutrition to improve production over the last 25 years than to improving stress resistance in livestock herds. The process of thermal plasticity, or how animals respond to environmental temperature fluctuation, often reduces production and, therefore, profit in the short-run. Heat stress, though, with reduced resistance, has a similar impact by suppressing immunity, among other issues, which can ultimately lead to infections and death. Extreme heat events can also impact reproductive processes in livestock, as well as dairy quality and quantity, both of which are major issues on a production farm (Bernabucci, 2019). According to Nair, et al., “Compared to other domestic species, goats are considered the ideal animal model for climate change due to its high thermal and drought resilience, ability to survive on limited pastures, and high disease resistance” (2021). Thus, it is important to turn to these small ruminants as a reliable production source for meat, as well as dairy, as the Southeast faces the brunt of climatic stress.

Internal Parasites

For the purposes of this study, it will be important to understand the differences between antibiotics and anthelmintics. Antibiotics target bacteria and are helpful for illnesses, like pneumonia, while anthelmintics target parasitic worms. While not pertaining to internal parasites, an important note for goat health is that, in 2023, following the COVID-19 pandemic, the FDA Center for Veterinary Medicine made it so that all previously over-the-counter livestock antibiotics that could be bought at farm stores, such as Tractor Supply, now require a prescription from a licensed veterinarian (Estill, 2023). This policy change has created an extra step for farmers to receive critical medicine for their livestock, especially in moments of emergency. With that distinction in mind, and with a quick insight into the challenges farmers

face in maintaining livestock health, it becomes easier to understand the role internal parasites play in dairy goat operations.

There are a number of internal parasites that commonly infest small ruminants, including goats. Different worms prefer different organs, and the risk for these parasites exists primarily in the lungs, liver, stomach, and intestines. These parasites persist in goat populations often due to the living conditions of the goats themselves. This includes drinking stagnant water, which poses a risk for lung worms, and, more often, grazing in wet vegetation and in overstocked paddocks. Often, farmers are unaware which parasite is infesting her animal, but rather notices general symptoms and treats with an anthelmintic or an antibiotic. These symptoms can vary per which organ is being affected, such as a cough for lung worms, and anemia, diarrhea, and a rough hair coat for parasite infestation (Villarroel, 2013).

The most prevalent goat parasite, particularly in tropical and sub-tropical regions where humidity and rain are prevalent, is *Haemonchus contortus,* or barber's pole worm, which infests the stomach. Barber's pole worms suck blood from the stomach lining, causing harmful physical side effects for the goat, and reproducing with eggs that end up in the feces which poses a risk for reingestion to create an infestation cycle (The University of Queensland, 2024). Coccidiosis is another common goat parasite that most often occurs in goat children under four weeks of age. Farmers can diagnose coccidia by excessive diarrhea (*Coccidiosis of Goats - Digestive System*, 2024).

FAMACHA scoring is a technique that was developed in South Africa and brought to the United States by Dr. Adriano Vatta in 2002 (Storey et al., 2008). This technique allows a farmer to use a FAMACHA color chart card that allows a farmer to compare the color of her goat's eye mucous membrane with the corresponding colors which indicate levels of anemia (USDA Sustainable Agriculture Research and Education Program (LNE10-300), 2014). While each individual goat will present slightly differently, a strong red indicates a healthy goat while a pink might warrant a fecal egg count, and a paler sand or white color indicates a larger problem and likely an advanced worm infestation. Another diagnosis technique is testing fecal egg counts, which includes counting worm eggs per gram in a fecal sample, every two months or so. While this technique does not usually allow for species identification, it can allow a farmer to identify a high parasite level which indicates a need for deworming.

Anthelmintics are the most effective method used to treat and prevent internal parasites. As of 2023, there were only three on-label anthelmintics approved for use in goats, compared to eight approved anthelmintics for sheep. That being said, in 1996, Animal Medicinal Drug Use Clarification Act made it legal to use “extralabel” drugs on small ruminants with prescription by a veterinarian. The United States Food and Drug Administration defines extralabel drugs as: “Actual use or intended use of a drug in an animal in a manner that is not in accordance with the approved labeling. This includes, but is not limited to, use in species not listed in the labeling, use for indications (disease and other conditions) not listed in the labeling, use at dosage levels, frequencies, or routes of administration other than those stated in the labeling, and deviation from labeled withdrawal time based on these different uses” (Animal Medicinal Drug Use Clarification Act of 1994, 2024).

A 2008 study looked at sheep and goats from 46 farms, 20 of which were goat-specific, across the South Eastern, Puerto Rico, and the Virgin Islands to understand anthelmintic resistance in common small ruminant internal parasites. The researchers identified *H. contortus* resistance on all 46 farms, while *Trichostrongylus colubriformis,* or black scour worm, resistance was identified on 14 farms, 12 of which were goat farms (Howell et al., 2008). Information prior to 2000 for farmers was that livestock should be dewormed regularly to rid herds of parasite infestations; however, the rhetoric has changed due to the onset of anthelmintic resistance in many goat parasites. The current recommendations are to only deworm as needed for specific animals that indicate a high parasite load (Howell et al., 2008). Personal opinions still differ, and so, techniques on each farm will differ based on farmer opinion and herd, including herd genetic resistance to parasites.

For control of barber’s pole worm, some farmers utilize a copper bolus, or a “sustained-release multi-trace element/vitamin ruminal bolus (TEB) containing copper” (Burke & Miller, 2006). The use of copper bolus is especially popular in the Southeast as farmers struggle to understand how best to control barber’s pole worms which thrive in hot and humid environments. Researchers warn, though, that farmers should avoid administering this bolus more than once in a six month period to avoid copper mineral toxicity and that the bolus should be used in conjunction with other means of parasite control to ensure efficacy (Burke & Miller, 2006). This may involve other on-label or extralabel anthelmintics, as well as herd/pasture management techniques.

To prevent the overuse of anthelmintics, farmers need to take measures to avoid parasite infestation in their herds. Studies have found that rotational grazing with proper paddock size and rotation periods, as well herds with no access to plant material, a technique known as dry-lotting, result in lower parasite loads (Barger et al., 1994; Stadalienė et al., 2014). By moving goats around a pasture in smaller increments, reingestion of parasites in fecal matter is less likely to occur. This is not to say that parasites are not present, but rather, they are not able to reproduce at a harmful level without reingestion. Multi-species grazing is another management technique that has been widely studied for livestock. Benefits of multi-species grazing include: increased biodiversity of pastures, weedy plant suppression, reduced predation for smaller ruminants, decreased parasite load, and more (Walker et al., 2006). Additionally, when grazed sequentially, horses and cattle can act as a dead end host for the parasites that infect goats (Brady, 2019). These larger livestock will also eat shorter grass that is not ideal for goats. In some cases, farmers have noted that natural dewormers are seemingly effective in keeping parasite loads in their herds at bay. Specifically, it is supposed that the tannins in long leaf pine needles deter parasites (*Natural goat wormers*, 2019; *Naturally deworming goats: a holistic approach to goat health*, n.d.). However, *Sericea lespedeza,* a type of hay, has been scientifically backed as reducing fecal egg counts and abomasal worms in adult goats at a 75% hay and 25% commercial goat concentrate (Terrill et al., 2009). While herbal dewormers have not proved to be an effective means of parasite control (Burke et al., 2009).

To add to the intricacies of goat health, large animal vets, also called food animal vets for their role in food chains and safeguarding livestock raised for food production, are limited in number and quality when it comes to small ruminants. The dramatic decrease of 90% of large animal vets since the early 1940s, due to the high cost of a veterinary degree, as well as the pay disparity between large animal and companion animal health, has been in direct contrast with the number of livestock in the United States, which has increased substantially in the same timespan (*Large animal veterinary shortage*, 2025). As of 2023, only 5% of all licensed veterinarians specialize in large animals (Weltzien, 2023). Considering cattle make up a much larger proportion of livestock in the U.S., it is understandable that an even smaller percentage of vets are focused on small ruminants versus cattle. Across all 50 states, over 700 counties reported shortages in food animal vets (Weltzien, 2023). In response, the USDA launched its Rural

Veterinary Action Plan (RVAP) in August of this year to increase “rural food veterinarians … and recruit new veterinarians to join the agency” (American Veterinary Medical Association, 2025). Despite this effort, in addition to multiple state-wide commitments to addressing the shortage, this strain may only worsen with the recent onset of the 2023 antibiotic prescription law, wearing large animal veterinarians thin in an already understaffed role.

Taken together, the literature supports a more natural foraging-based diet for dairy goats to both mitigate climate impacts and prevent parasite ingestion while acknowledging the nuances of land availability and quality, as well as the challenges that impact management decisions.

METHODS

This project utilized narrative interviews to understand best practices and decision-making in rotational grazing systems for dairy goats in the Southeastern United States. The objective was to evaluate how climate change and seasonal variation affected pasture management and forage quality, as well as to examine the economic and nutritional trade-offs of rotational versus non-rotational systems.

Sample Population

Considering the wide reach of this investigation, as well as the limited number of goat dairy farms implementing rotational grazing systems in the designated region, the sample population was widened to any farmer who owns goats (whether for dairy, meat, or show) in the Southeast, including Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

Across the Southeastern states, 97 farms or individuals were contacted. To identify these farms and individuals, a few key words were used to conduct broad Google searches. These searches included “(State) + Goat Farm” and “(State) + Dairy Goat” for each of the eight states. Each resulting website was then evaluated to ensure goats were mentioned as part of an agricultural or personal operation. For those where they were, contact information was recorded, most often an email, although some websites offered a direct inquiry option. Initial emails were sent to the 97 identified farms or individuals across all included states; seven in Alabama, 17 in Florida, 13 in Georgia, eight in Mississippi, 16 in North Carolina, nine in South Carolina, 15 in Tennessee, and 12 in Virginia.

Follow-up emails were sent to non-responding farms in Alabama, Florida, Mississippi, and North Carolina (prioritized by state alphabetical order) until 20 respondents were selected for the study. Any responding farms that worked with dairy goats were accepted into the study. At the recommendation of one of the interviewees, a public post inviting members to participate in the study was made in the 'ADGA (American Dairy Goat Association) District III Members' Facebook Group. When interest was expressed, the communication channels in Facebook Messenger were used to coordinate phone interviews. Seven individuals joined the study in response to the Facebook posting. The other 13 participants were respondents to the recruitment emails or website inquiries. The participating farms, coded for anonymity, are listed below with their coordinating states.

Farm Code	*State*	*Farm Code*	*State*
Farm #1	Alabama	Farm #11	Virginia
Farm #2	Florida	Farm #12	Alabama
Farm #3	Florida	Farm #13	Virginia
Farm #4	Georgia	Farm #14	Georgia
Farm #5	Georgia	Farm #15	West Virginia
Farm #6	Mississippi	Farm #16	North Carolina
Farm #7	South Carolina	Farm #17	North Carolina
Farm #8	South Carolina	Farm #18	South Carolina
Farm #9	Tennessee	Farm #19	South Carolina
Farm #10	Tennessee	Farm #20	West Virginia

Participating farms spanned every state in the Southeast, but representation varied by state with two farms each from Alabama, Florida, North Carolina, Tennessee, and Virginia; three farms in Georgia;

one farm in Mississippi; and four farms in South Carolina. Two farms from West Virginia were also included in the study, despite West Virginia not being included in the original list of Southeastern states.

Data Collection

Prior to phone interviews, participants were sent a document of possible interview questions (*Appendix A*), and consent forms (*Appendix B*). Verbal consent to record the conversation for transcript coding was attained at the beginning of each call. Phone interviews ranged from 17 minutes to just under an hour, depending on the interviewee. Questions from the document previously sent to participants were asked one-by-one, with follow-up questions in response to interviewee stories and answers. Upon completing all initial interviews, additional phone calls were requested with select farmers from whom information was either missing or additional insights into a discussed topic were desired.

Due to the nature of this study, replication is fairly simple due to the standardized questionnaire for interviews. While there is a degree of subjectivity when conversing with interviewees, the main ideas should be replicable as management systems are not impacted by the questions, which means responses should contain the same or similar information every time the same questions is asked for a single farm. In terms of validity, interviews were guided with semi-structured questions that tied to the primary research questions and were responded to with experience-based answers. Bias was controlled by using neutral language and avoiding leading language. Reliability was also ensured by maintaining the same questions in the same order throughout the interviews and utilizing audio recordings of the transcripts. Limitations are noted in the discussion section.

Language Coding

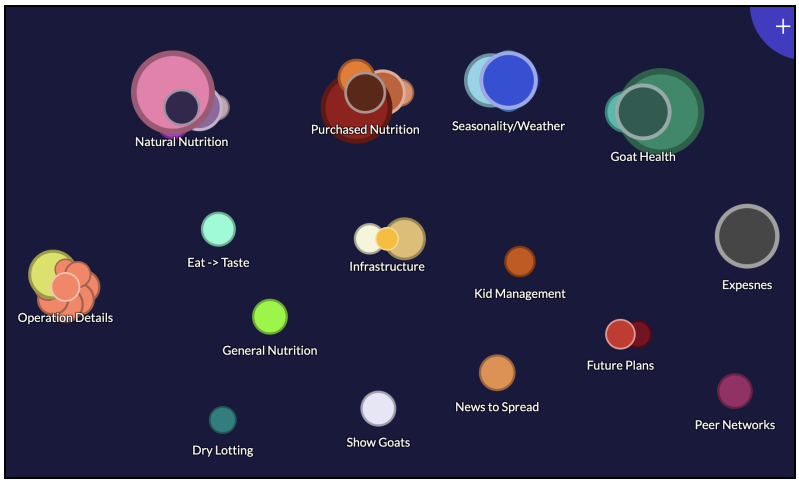
Upon completion of interviewing the participants and transcribing the interviews, the British software, Quirkos, was used for qualitative analysis. The 20 transcripts were uploaded into Quirkos and then individually coded for language patterns. During the initial coding of the transcripts, very general patterns were discerned, including “natural nutrition” versus “purchased nutrition” and “goat health.” Any details related to these categories of information were coded into the designated ‘bubbles’ (*Figure 1*). After reading through the transcripts once, additional patterns were noticeable, including sub-categories

of prior ideas, due to increased understanding and familiarity with the language. The main ideas (with their accompanying sub-categories) became:

- Natural Nutrition
    - Pasture Information/Species
    - Rotational Grazing
    - Rotational Grazing Costs
    - Toxic Plants/Species Removal
- Purchased Nutrition
    - Grain/Concentrate
    - Hay
    - Minerals and Supplements
    - Well Water
    - Copper Bolus
- Seasonality/Weather
    - Rain/Snow/Wet
    - Soils/Natural Environment
    - Climate Differences
    - Cooling
- Goat Health
    - Internal Parasites
    - Veterinarians
- Expenses
    - Operational Costs
- Peer Networks
- News to Spread
- Future Plans
    - Grant
- Kid Management

- Infrastructure
    - Housing/Shelter
    - Fencing
- Show Goats
- Dry-Lotting
- General Nutrition
- Eat to Taste
- Operational Details
    - Dairy Production Details
    - Selling Goats
    - Experience in Years
    - Why Goats?
    - Prior Livestock Experience
    - Goat Breeds
    - # of Goats
    - Acreage

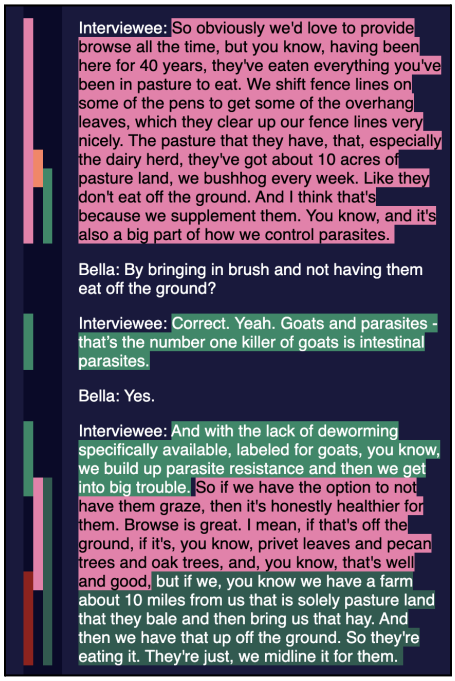
Figure 1: Quirkos Coding Categories



The more language that is coded into a category, the larger the bubble for that information becomes, showing a visual representation of the most common conversational topics during interviews.

Sentences and words could be coded for multiple categories and were analyzed for all related topics (*Figure 2)*.

Figure 2: Example of Language Coding



Statistical Analysis

Based on the language organization of the interviewees' responses, a cumulative table was created of the prescribed interview questions with each farmer's answer listed in an abbreviated format with key words or simply "yes" or "no." From this table, data sets were separated out for each question to be easily imported into R and coded into the figures in the next section.

ANALYSIS

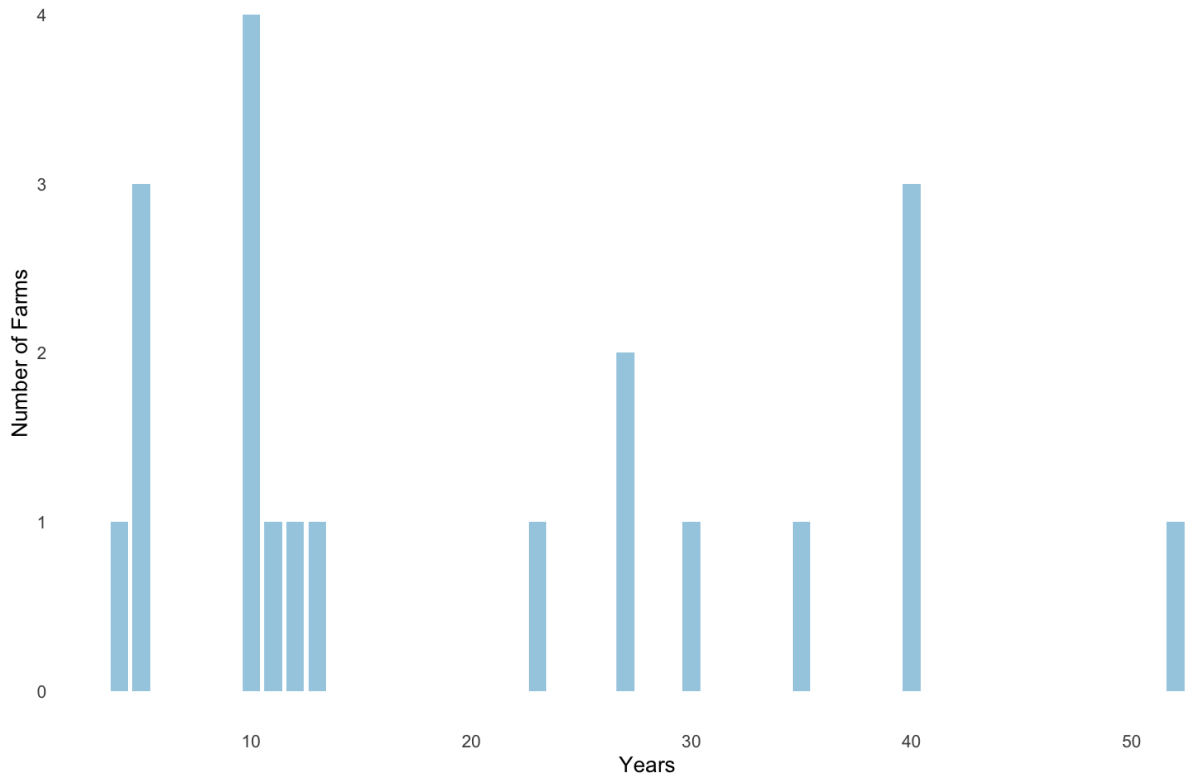
The results from this qualitative study combine quantitative measures of certain variables, such as how many farms feed grain or use different varieties of hay, with patterns identified within and across the 20 individual farm responses. The results presented below generally follow the sequence of the interview questions described earlier and can be found in the appendices. From the farmers' answers, data visualizations were created of individual variables, as well as visualizations comparing variables of

interest to understand farmer decision making with herd management. These visualizations are supported with quotes and paraphrased stories shared by the interviewed farmers.

Background Information

For each farm, a set of foundational questions were asked to provide background on the operation. Each of the 20 farms and farmers is unique, with varying levels of expertise and experience with dairy goats. These foundational questions covered the farmers' experience with dairy goats and other livestock; their reasons for choosing goats; the breeds they raise; their operation type, including how they use their goats' dairy products; whether or not they show goats; the number and composition of their herds (does, bucks, kids, wethers); and the amount of acreage accessible to their goats. This background information allows for context in terms of broader management systems, as farmers explained how land size, breed, location, and other variables were either limiting factors or opened up opportunities for their dairy goat herds.

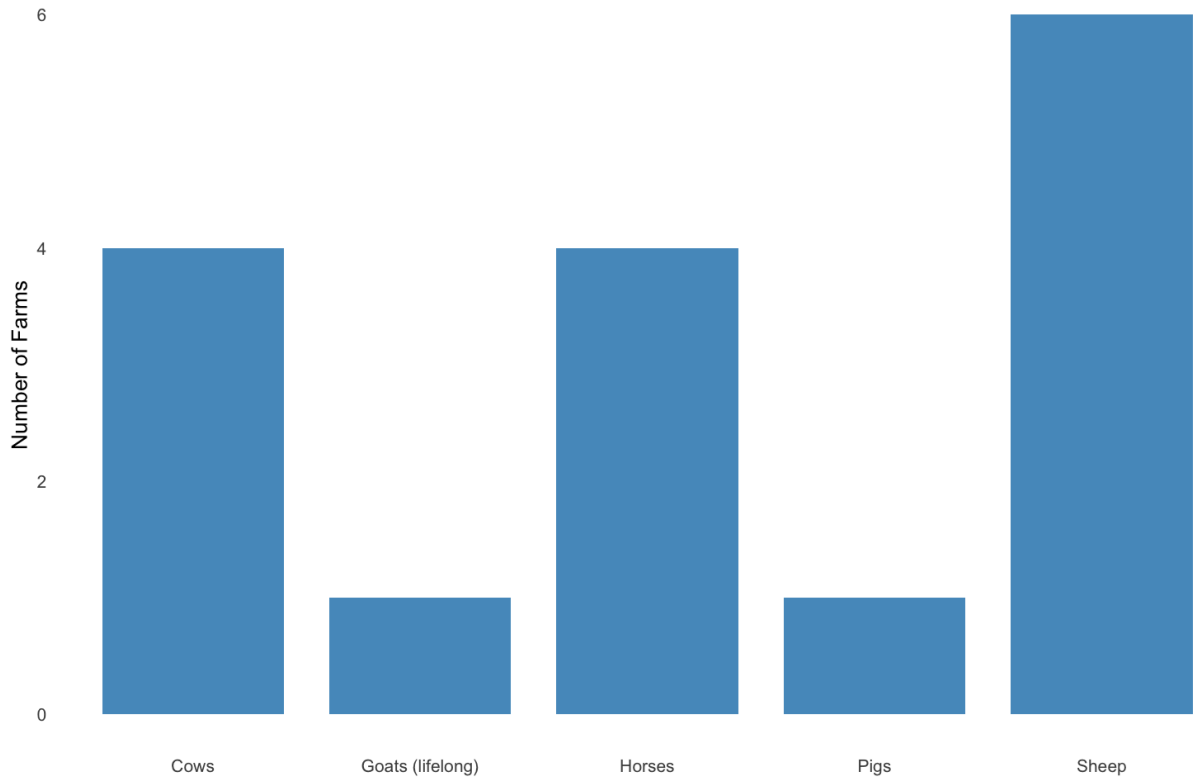
Figure 3: Years of Experience with Goats



The farmers interviewed varied widely in their experience with dairy goats. While some were just starting out, others had built their entire lives and careers around goats and were beginning to scale back their herds at the time of the interview. Experience ranged from four years to 52 years. Eight of the farms had 10 or fewer years of experience, three had between 11 and 20 years, four had between 21 and 30 years, another four had between 31 and 40 years, and one farm had over 50 years of experience.

Some interviewees grew up with goats or in rural areas surrounded by livestock, and others found dairy goats later in life as a second career or a personal passion. For example, Farm #16 was started after more than 20 years in the security business, and, for others, their children wanted to grow up showing goats and then they fell in love and continued as either a personal hobby or a business venture. Each farmer's story reflects a combination of background, motivation, and commitment to their animals. The ways in which these experiences influence farmers' decision-making and herd management are explored throughout the analysis section.

Figure 4: Livestock Experience of Goat Farmers

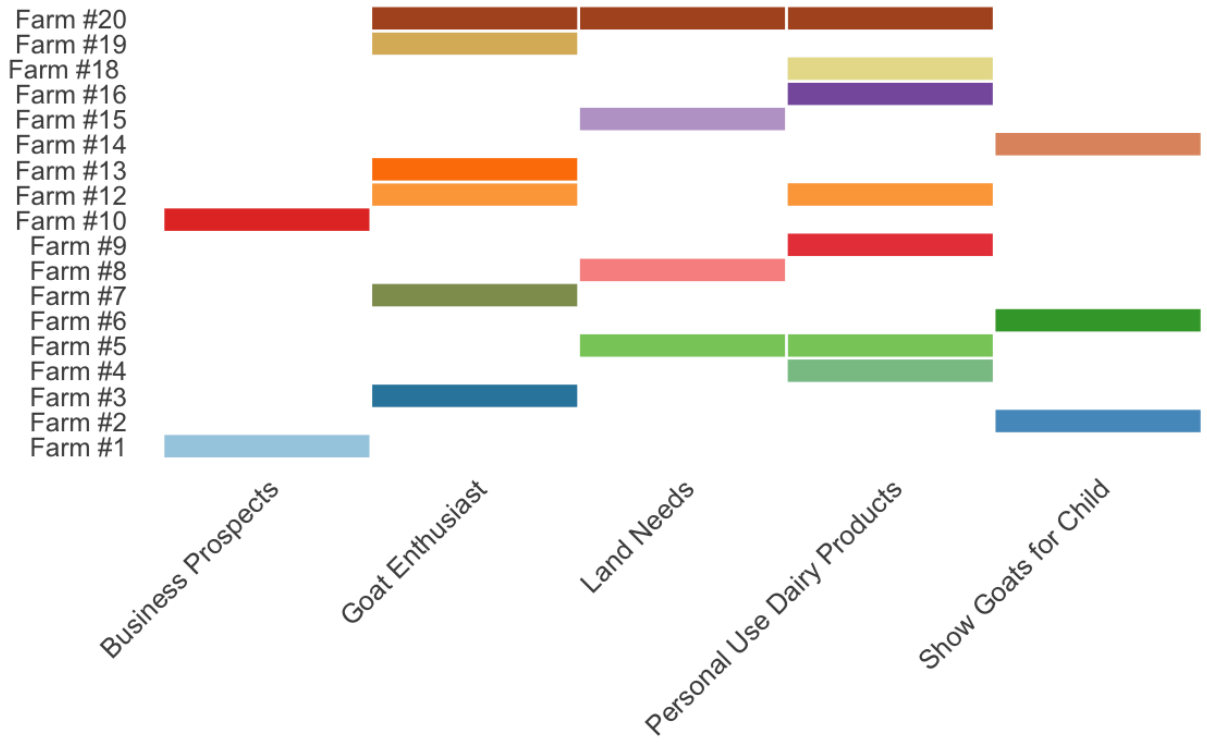


As with the length of experience each farmer has with dairy goats, they were also asked about their experience with other types of livestock, both before they began working with goats and in conjunction with them. Six of the farmers reported either working with sheep before getting goats or, at the time of interview, raised both species on their farms. While goats and sheep can appear similar and share many of the same parasites, they differ greatly in terms of behavior, grazing habits, and management needs. Cows were the only other dairy animal interviewees noted having experience with, and, when asked how they differed from goats, one farmer said:

> [W]hen you're looking at a business side of it, obviously, you need more goats to get the volume of a cow. But from the price standpoint, we can sell the products for more because of that fact. So that one sort of weighs itself out. But the benefit for us, we have 35 acres here. And if we were to have a cow operation, we would not have that many cows. So we can put more head of goats on a smaller amount of land.

This idea ties into the next figure describing the motivations to own goats, but is also an important reminder that experience with one type of livestock does not guarantee an easier learning curve for another as land, nutrition, and health needs are all going to greatly differ. That being said, 14 of 18 farmers responded that they either had previous or current experience owning multiple species of livestock. Some farmers mentioned multiple types of livestock, which is why the cumulative number of reported responses is greater than the number of farmers who worked with livestock. This significant proportion of farmers suggests that people with goats are likely to have worked with livestock in the past, currently own livestock, or are motivated to own other species of livestock after purchasing dairy goats.

Figure 5: Motivations to Own Goats by Farm



Considering dairy goats are a less common dairy animal in the United States, it was important to ask farmers why they chose to raise these animals. Their answers were categorized into five groups: Business Prospects, Goat Enthusiast, Land Needs, Personal Use Dairy Products, and Show Goats for Child. These categories help showcase the wide range of factors shaping farmers' decisions to invest in dairy goats.

The Business Prospects category includes two farmers who purchased dairy goats primarily to generate income through goat-related products. One business was founded on breeding and selling Nigerian Dwarf goats, while the other began with goat milk soap to tap into a niche agricultural market. While this is the smallest category, further analysis will show how several of these farms shifted from backyard hobbies into fully formed businesses over time.

Six farms were classified under the Goat Enthusiast category, which includes those who chose to own goats simply because they liked them or had grown up around them. For example, one farmer shared, "And we initially, we just have always loved goats. I mean, we knew once we got property and we got settled down, we wanted to get some goats for pets. I just started getting into the skincare kind of by

accident.” In this case, the farmer was classified as a Goat Enthusiast based on their initial motivation, but the current operation of their farm (*Figure 9*) is classified as a business.

In the Land Needs category, four farms described their interest in dairy goats as a practical choice based on their property. One farm, for example, cited having 12 wooded acres as the reason for choosing goats rather than cows or other livestock that thrive better on open pasture. Another farmer explained:

> In 1980, we bought an old farm, and it was covered with multiflora rose. And you know, I knew that I had been reading books and stuff like some back to land books and stuff like that. And a lots of people were getting goats then and talking up goats, you know, like that was the perfect dairy animal to get and that they eat brush and stuff and would eat the multiflora rose. So I went to the state fair of West Virginia and fell in love with goats.

The Personal Use Dairy Products category was the fourth and most common motivation among interviewees. These farmers purchased dairy goats primarily to produce milk for cheese and other dairy products for themselves and their families. Seven farmers identified this as their main reason for getting started with dairy goats, and all three farms that reported multiple motivations included personal dairy use among them. The reasons behind this interest varied from a love of mozzarella and cheesemaking to one farmer whose child was labeled “failure to thrive” until nutrient-rich goat milk helped them gain strength.

The final category, and the second least common motivation, was Show Goats for Child. This category includes farmers who initially purchased goats so their children could participate in goat shows and competitions. One farm that began with dairy goats through their daughter’s involvement in 4-H and FFA has continued her legacy even after she aged out of those programs and left home, creating a business that produces equipment to support other dairy goat farmers. Another farm transitioned their focus as their children aged out of youth competitions by creating a non-profit that uses raw milk to support animal rescues.

Three farms were classified under more than one category due to a mix of motivations for purchasing dairy goats. This highlights the highly subjective and complicated decision-making that factors in personal, practical, and economic factors when deciding to purchase livestock. Farms #11 and #17 were either not asked or did not respond to this question, so their motivations could not be classified.

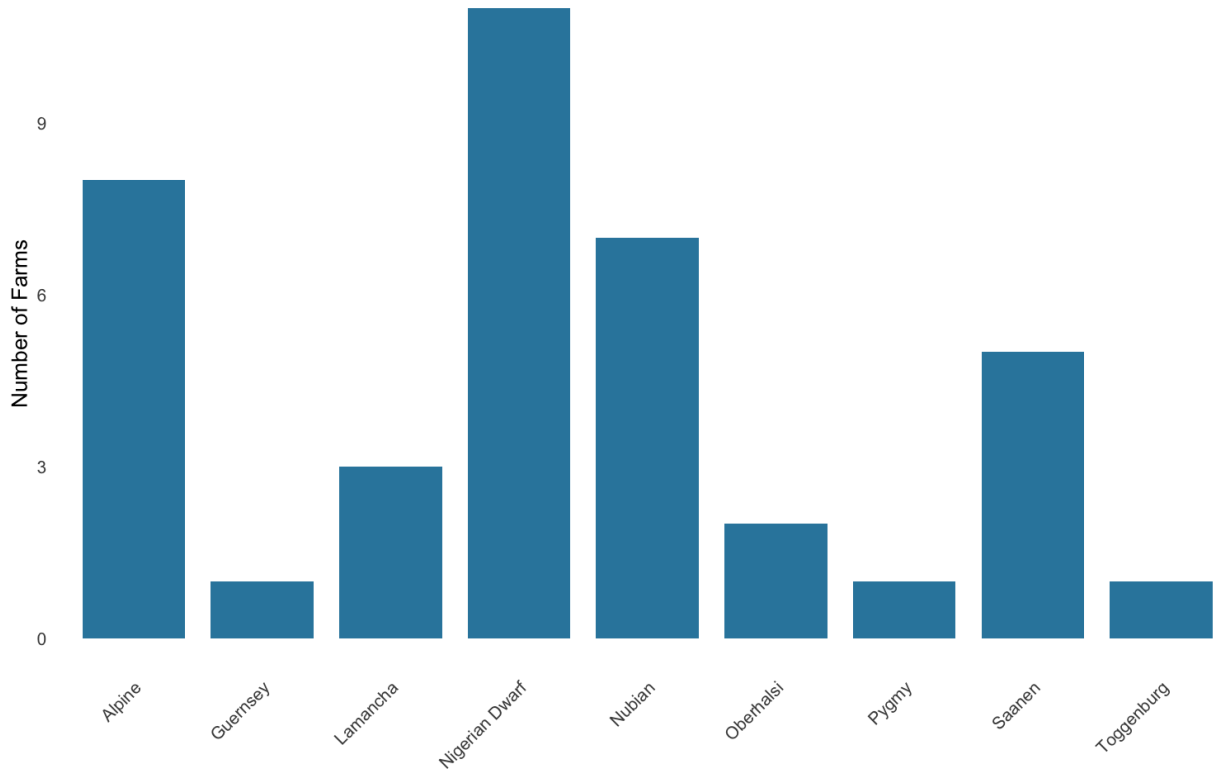
One pattern that became apparent while speaking with farmers was the accessibility of goats as livestock for new farmers and for single-person operations compared to cows. One farmer, who was an accident survivor with a lifting limit, explained that this restriction played a role in choosing dairy goats. Another noted, “And at the time, I was a single woman with property that was trying to create a farm business with livestock, and goats—I also had sheep at the time—are animals that I can physically handle by myself.” A third farmer described miniature dairy goats as “a more reasonable thing for me to try to do by myself as my own little hobby.”

Beyond accessibility, several farmers who wanted personal dairy production emphasized that they did not want a cow. One farmer referred to milking cows as “nasty” because of the mess created in a milking parlor compared to goats, who produce rabbit-like pellets that are easier to clean. They also explained that a dairy goat produces around a gallon of milk a day, which is manageable for their household, while a cow might produce six to eight gallons a day. Additionally, another farmer shared:

> Cows take a lot more resources and a lot more land and a lot bigger equipment. And you walk through a cow dairy and a cow kicks out at that system, you’re going to break your arm. And I was doing this to be [a] stay at home and cows need lots of pasture, and back 40 years ago … They talked about dairy buy-ins and dairy buy-outs, and all of that seemed a little over the top and ridiculous when you've got a very efficient converter of grass and kudzu into milk.

Dairy goats offered a practical solution to these farmers’ diverse and overlapping motivations, meeting personal and family needs while also accommodating land limitations and management considerations. Personal dairy use emerged as the most common motivation for owning dairy goats, reflecting a strong desire for self-sufficiency and health-focused decision-making, as several farmers emphasized the benefits of raw milk, which will be discussed in a further section.

Figure 6: Goat Breed Prevalence



The American Dairy Goat Association recognizes nine dairy goat breeds: Alpine, Guernsey, LaMancha, Nigerian Dwarf, Nubian, Oberhasli, Saanen, Sable, and Toggenburg. Pygmies are another dwarf breed, like Nigerians, but they are not typically bred for milking purposes and are considered a meat goat. Ten of the farms in this study have more than one breed. Eleven out of 19 farms who responded have Nigerian Dwarf goats as at least one of their breeds. Seven farms reported having crosses, or “recorded grades,” in their herd, which are goats with mixed pedigrees. One farmer even explained the concept of a “mini” breed, such as a mini Nubian, which is a cross between a Nubian and a Nigerian Dwarf. These “mini” breeds create a smaller, more manageable goat that still maintains the desirable qualities of both breeds. When explaining their choice of mini breeds, the farm stated:

> The hooves don't grow as fast on the Nigerians as on the Saanens … And so it's, you know, one goat may not, you may not need to trim its hooves but like once every six months or, you know, at all. And then the Saanens, like, if you have a full-blooded Saanens, you're trimming their hoofs

more often because they're in the mountain regions of, you know, France and the Swiss and stuff. And we don't have mountains in Tennessee. [We have] a creek bed and we have a gravel driveway. That's what they trim their hooves on naturally … It's nice that, you know, we have a good blend of the milk and then the other maintenance side of things.

Of the nine farms with just one breed, five of them reported raising Nigerian Dwarfs. This breed has grown increasingly popular due to their small size and friendly nature, especially when bottle-fed and handled regularly. In 1995, fewer than 4,000 Nigerians were registered in the United States. By 2023, that number had risen to an estimated 39,000 (Food and Agriculture Organization of the United States, n.d.), in part because they are easier to keep as family dairy animals or even as backyard "pets" than full-sized breeds. It is more common nowadays that farmers build their dairy goat business around breeding and selling Nigerian Dwarf goats due to this increase in demand, or they plan to sell kids after annual breeding as an additional revenue stream for their dairy operations. That being said, the market may be stalling due to the COVID-19 pandemic, according to one farmer, in response to a comment regarding the popularity of Nigerians:

> And everybody sold everything and slapped papers on anything. And now it's come back to bite us. And we do typically have like a five-year cycle with the market or a six-year market cycle, whatever. But this is worse than I've ever seen it. And, you know, I've been selling goats for 30 years … I think there is an equal parts where there was just, like, everybody and their cousin during COVID … I mean, this is true in the dog market, too, because the situation with dogs right now is, it's sad. You can hardly even give away a working dog.

While some farmers focused on size and practicality when choosing breeds, others highlighted traits such as milk flavor and adaptability. A key differentiator in dairy goat milk is the butterfat percentage in the different breeds. This ranges from about 2–3% in Saanens to around 6–10% butterfat in Nigerians (Menne, 2012). This variance is important to farmers when deciding what the end product of the dairy will be as a higher butterfat content is often preferred for cheesemaking compared to Saanens, for example, who offer a lighter milk drinking experience. Additionally, the flavor of milk varies between breeds, leading some dairy business owners to only raise one breed for consistency or multiple breeds specifically for flavor variance. Toggenburgs, a Swiss breed, is known to produce a strong, "goaty", tasting milk that can

be polarizing, while Alpines, a French breed, produce milk that is described as “nutty” and creamy (*How does goat milk taste? Factors affecting the flavor of goat milk*, 2025). One farmer noted these differences in milk between their own breeds and shared that they choose to utilize pygmies for their dairy needs because of their very high butterfat content, an unusual decision in the dairy world due to their low daily production. Another farmer stated they specifically crossed Nigerians and Nubians for the butterfat of the former and production of the latter, and one other mentioned they actually make cheese from Saanen milk and veer away from the milk of some of their other breeds due to a supposed elevated amount of capriolic acid, a fatty acid that may contribute to a “goaty” taste.

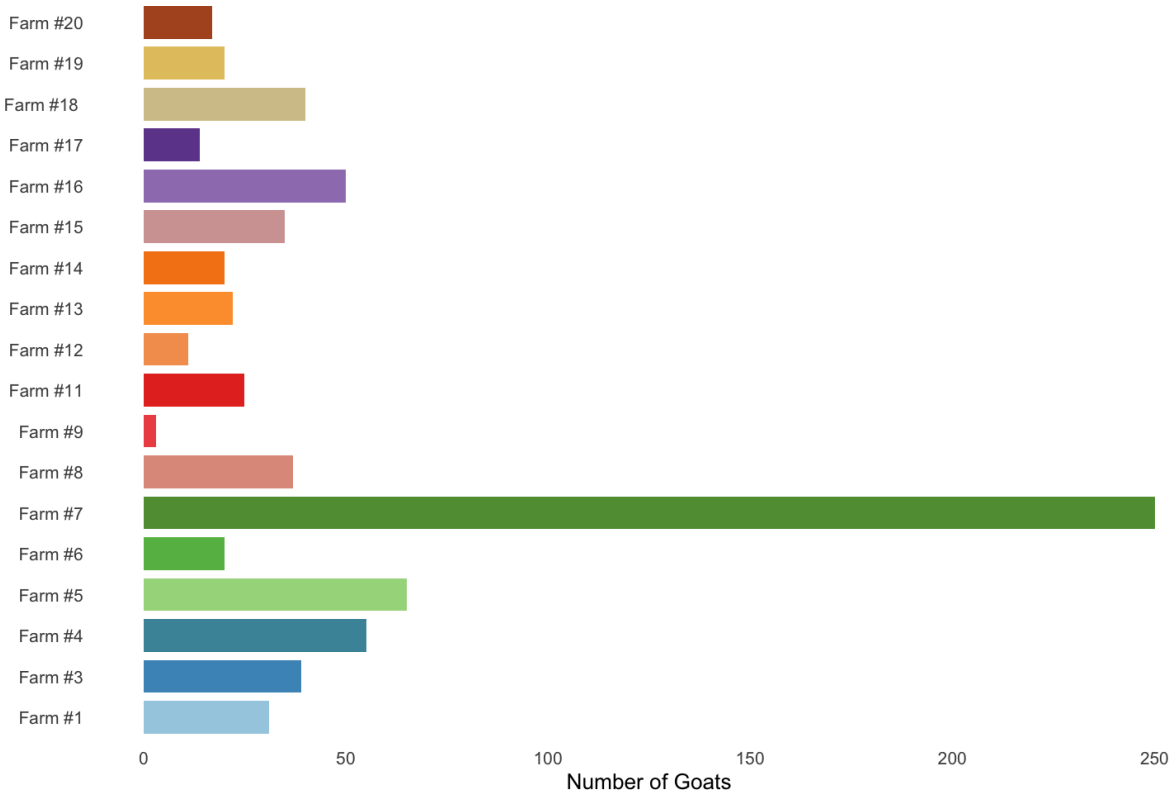
In terms of adaptability, breed responses to heat and humidity often reflect their native environments. One farmer stated, “The Nubian-Alpine cross does pretty well in the heat, you know, because we're very hot, very humid from June until October. And then we're very tropical”, while a few other farmers commented on the lesser tolerance of Swiss breeds (Saanens, Toggenburgs, and Oberhaslis) during the heat of the summer in the Southeast considering their cooler, mountainous native climate. This topic will be expanded in the weather-focused section below.

Which breeds a farmer chooses is entirely personal, but the reasons differ widely, from milk production and temperament to climate adaptation or simply creating the cross that best fits their lifestyle needs. For example, one farmer shared:

> Well, I always thought that goats were cute, cute little creatures … but they were also, like, super rude, annoying, you know, shoving each other, demanding food, and just bossy little creatures. And then I went to a zoo in Panama City and they had a Lamancha goat there and she came up to us and just followed us around like a little dog … And so I said, I could get that kind of goat.

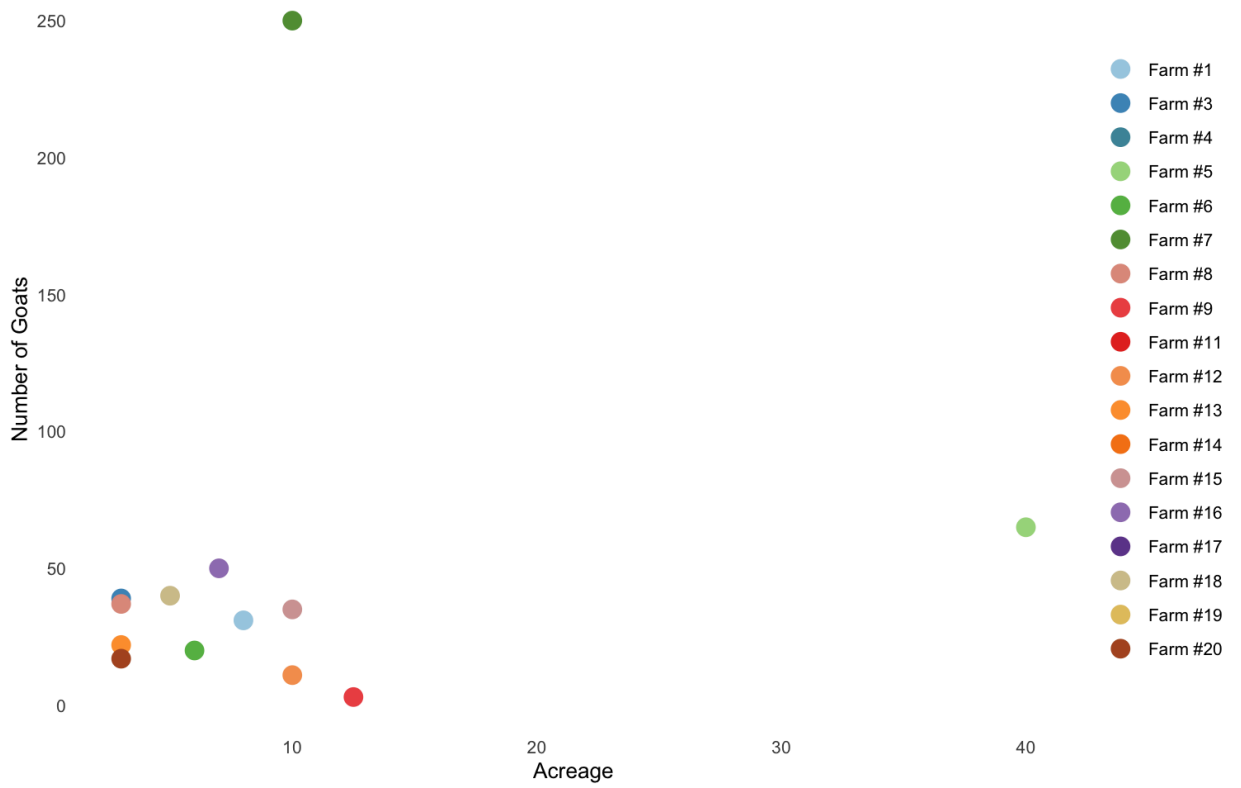
Regardless of the chosen breed, land resources will play a large role in determining factors, such as herd size and operation feasibility.

Figure 7: Herd Size by Farm



This graph is visually very telling with clear extremes for herd size with Farm #9 maintaining just three goats at the time of this study while Farm #7 boasted a herd of about 250 goats. This graph shows that primarily small- to mid-sized goat farms were interviewed, while some would even be classified as hobby farms. According to the United States Agricultural Department, herd size is classified as: 5–19 head is small, 20–99 head is medium, and 100 or more head large (Animal and Plant Health Inspection Service, 2020). Commercial dairy goat farms, though, can have upwards of 500 head. Farm #7 would qualify as a commercial dairy goat farm as it is a Grade A dairy with a herd over 100 goats. The following graphs will go into more depth comparing herd size to acreage and operations. Farms #2 and #10 were either not asked or did not respond to this question, so their herd sizes could not be utilized.

Figure 8: Goat Accessible Acreage and Herd Size by Farm



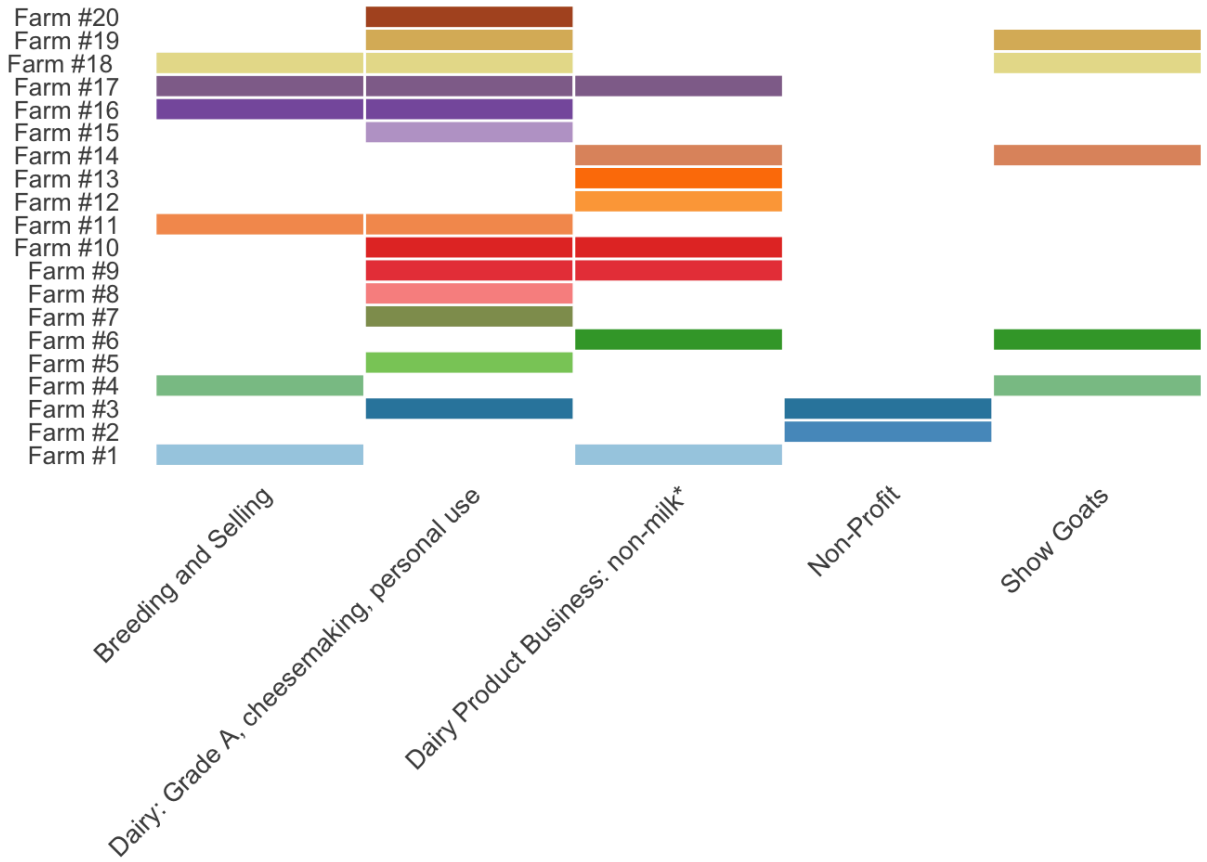
This scatterplot combines data for acreage and herd size, which are two variables that go hand-in-hand when considering nutritional management. Each farm has an individualized feeding system that influences in what manner and for what reasons their herds rely on grazing, browsing, or hay and grain feeding. Although Farm #5 has by far the greatest goat-accessible acreage, it has the second largest herd with more than 150 goats fewer than Farm #7. Among the 20 farms, 18 provide 10 acres or less acres for their goats. Along with the variation in accessible acreage, the variation in stocking density is also vast. Farms #2, #4, #10, #11, #14, #17, and #19 were either not asked or did not respond to this question, so their acreage could not be utilized, which does limit the analysis of these data.

The range of available acreage reflects farmer preferences relating to feeding strategies and land accessibility. Farms with less land likely depend more on purchased feed, such as hay and grain, and less on pasture, while farms with greater accessible acreage are likely able to depend more heavily on forage than purchased feed. The larger farms may also prefer the impact of a more diverse diet on milk flavor due to commercial needs, such as a Grade A dairy.

Land accessibility and quality is also one of the reasons farmers noted for purchasing dairy goats. An amount of land that would be a limiting factor for cows or other large ruminant animals is an opportunity for goat ownership.

This figure, along with the prior herd size figure, suggest that herd size does not scale directly with available acreage, indicating that other factors, such as feeding systems, management intensity, or production goals, play important roles in determining herd size.

Figure 9: Operation Type by Farm



**Note. Dairy Product Businesses includes dairy sold for pet consumption.*

The above figure represents the operation types of each of the 20 farms from the farmers' perspectives. This question was meant to capture how farmers define their own operations, not just how they function economically or publically

Only six of the 20 farms list breeding and selling kids as a primary part of their operation. However, it is likely that more farms sell does or bucks as an additional revenue stream or when herd size becomes too large, since annual breeding is required for dairy production. For example, one farmer said, “I sell kids. So generally, I don't make a profit off of them. I usually sell enough kids to cover the cost of managing the herd.” Selling often ends up being simply a byproduct of raising dairy animals.

Most farms report using dairy products from their goats for at least personal use, if not as part of a dairy business. Selling milk for human consumption often came up in interviews as a source of contention for farmers due to state-specific regulations. While a few farmers mentioned selling milk through a pet food license, another farmer shared this quote about the ambiguity and danger of the these regulations:

> So we have a business plan. My products were to fulfill my farm account so that I could put money back into the animals. My goal was to always just be strictly breeding and animal care Maintenance … We would milk for ourselves … But that was Alabama law. You're not allowed to sell raw milk … Unless it's pet consumption, but even then there's people doing it. But Alabama puts it in such a gray area on their logistics, you don't want to mess with it because they can take your house, your home, your farm.

Many farmers mentioned that they and their families choose to drink raw, unpasteurized milk from their own animals. There are known risks to consuming raw milk, such as possible exposure to pathogens like Salmonella and E. coli. Pasteurization is the process of heating and cooling milk which effectively eliminates these pathogens, and it is the process that milk in most grocery stores goes through to be able to be commercially sold to consumers. The farmers who choose to drink raw milk, though, feel that the health benefits outweigh the dangers. The supposed benefits include beneficial enzymes, probiotics, proteins, and so on that raw milk advocates argue are denatured or damaged during the pasteurization process (*About Raw Milk*, n.d.). One farmer shared:

> [W]hen we're out of milk, we end up buying, you know, just regular cow's milk just because it's, it's over $4 a gallon here … But again, on the other side of it is, you know, I'm on the raw milk fence, and I push for it because my point of it is I know the health of my three or four barrels that I have that I'm milking versus the thousands that or the hundreds that are going through a farm.

> You know, these machines are the ones that are touching these goats. There's not even a person touching the goat … I'm like, if you want raw milk or you're scared of raw milk, at least find a farmer that you can get a relationship with and you can try it … But, you know, it's, you know, the health of the animal presents itself in the milk.

Fifteen of the 20 farms use their goat dairy in some form of business, including cheese making, raw milk herd shares, and skin care products. This study also includes farmers from three Grade A dairies across the Southeast. In 1924, the United States Federal Food and Drug Administration created the Standard Milk Ordinance which eventually evolved into the Grade “A” Pasteurized Milk Ordinance (PMO), which exists to define and enforce dairy standards for public safety (Human Foods Program, 2024). Grade A is a measure of sanitation, not pasteurization, so there are some states that allow Grade A raw dairies. When discussing their operation as a hobby farm, one farmer noted that it would cost them $30,000 to become a Grade A dairy in Tennessee. Another farmer in Florida explained why they did not want to be Grade A due to the process adding another quarter of a million dollars in inspections and other litigation. A third farmer in Georgia said the following about the changing regulations of Grade A dairies:

> Twelve years after I started, I built the Grade A building to the specifications of the Department of Agriculture, the State of Georgia, which at the time made me put in a pipeline just like a 500 cow dairy would … Grade A specifications now say that you can just have a behind the animal milking Machine … And then, I guess dump it into a bulk tank. But what I have is a pipeline system.

This same farmer described the challenges of maintaining their pipeline system, including an electric bill that doubles in the summer and the high cost of required milk testing. They explained that, despite these difficulties, they want to remain Grade A to continue helping people in their community who rely on goat milk and related products as an alternative to cow dairy due to dietary restrictions and health needs.

More than five farms show goats, but the five included in the figure are the ones that described competition as a primary focus of their dairy goat operation. Of the 17 farmers who were asked whether they currently show goats or have shown in the past, 11 said yes. One farm leases goats to children as a way to teach them about agriculture, responsibility, and showing. Another farmer explained when their

daughter began showing goats, they learned a great deal from other exhibitors about managing their own herd.

While many farmers shared positive experiences with showing, a few felt strongly in the opposite direction. One farmer said they choose not to show goats because they disagree with the practice and requirement of disbudding goats for show. Another compared show goats to show dogs and expressed frustration that some farmers dump milk as a byproduct of showing rather than putting it to use.

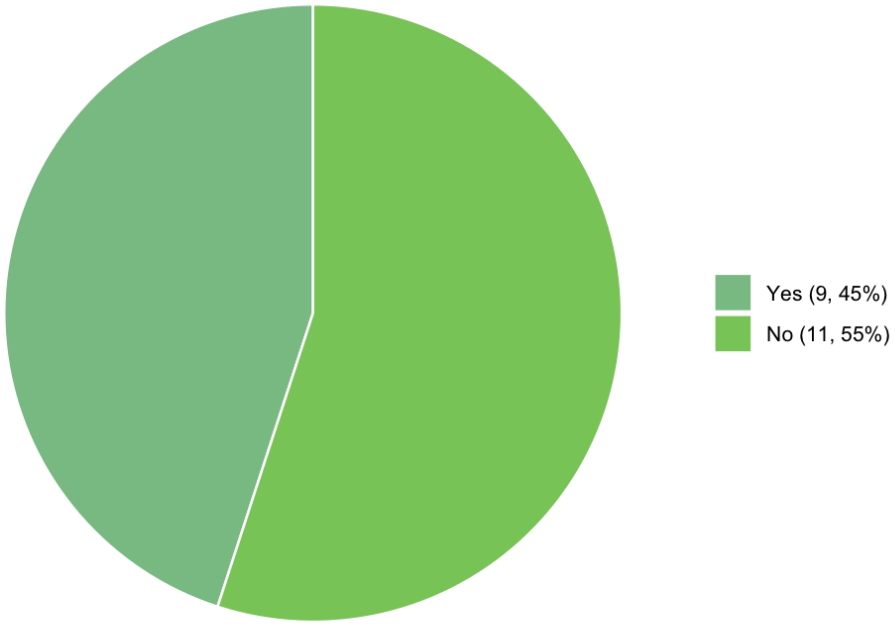
Farms involved in agritourism are not represented in this figure because some of the answers were ambiguous, meaning while a few farms did mention community interaction, it was not clear how many farms actually participated in agrotourism as a business. One of the farms that is centered on agrotourism, though, is focused on goat interactions, including goat tea parties, while others are open to hosting tours and visitors.

The foundational information about each dairy goat farm in this initial section will provide context for the rest of the analysis. Farm numbering and coloring remains consistent through the paper, so connections to this section from the farms discussed and shown in data visuals in the Nutrition, Weather, Health, Expenses, and Miscellaneous sections is possible.

Nutrition

This study aimed to investigate the nutritional programs farmers use and the decision-making processes that led them there. Each farmer's nutritional program is the central piece of information around which all other aspects of their management system fall into place. This section is greatly influenced by the prior information about available acreage and will tie in heavily to the Health section in reference to parasite management.

Figure 10: Farms Utilizing Rotational Grazing



Nine out of the 20 farms reported using rotational grazing as part of their dairy goat nutrition system. Only a slight majority reported not using rotational grazing as part of their management plan, which aligns with what was expected given the financial and management demands of land use (i.e. fencing, electric wire, labor).

According to 2022 USDA data, approximately 40% of cow-calf operations in the United States use rotational grazing (Whitt, 2022). Many of the farmers interviewed, however, emphasized that they chose dairy goats specifically because they require less land than cattle, and most did not purchase dairy goats with the plan to start a business, which requires more intensive management targeted at land and nutrition.

There are a few primary barriers to rotational grazing, as stated by the interviewed farmers, as well as in scientific literature, including the initial cost of fencing and the labor to move goats on a regular schedule between tracts of land, as well as the attention to land health and the species growing. The benefits, however, range from improved soil health to improved goat health and more, as explained in the

literature review. The primary concern of the farmers', though, was seemingly for the health of their goats rather than that of their land, as land was often discussed as a tool for herd nutrition.

While interviewing farmers, it became clear that the understanding of rotational grazing varies quite a bit from person-to-person. One farmer moves their herd every 30 days and alternates pastures with horses, while most others described rotating pastures based on when forage species regrow. A few farmers said they simply move their goats back and forth between two paddocks. Of the nine farms that self-reported not using rotational grazing, one clarified that although they answered "no", they do move the goats around between pastures, they just don't follow a set system. This reply emphasizes the ambiguity of the term "rotational grazing."

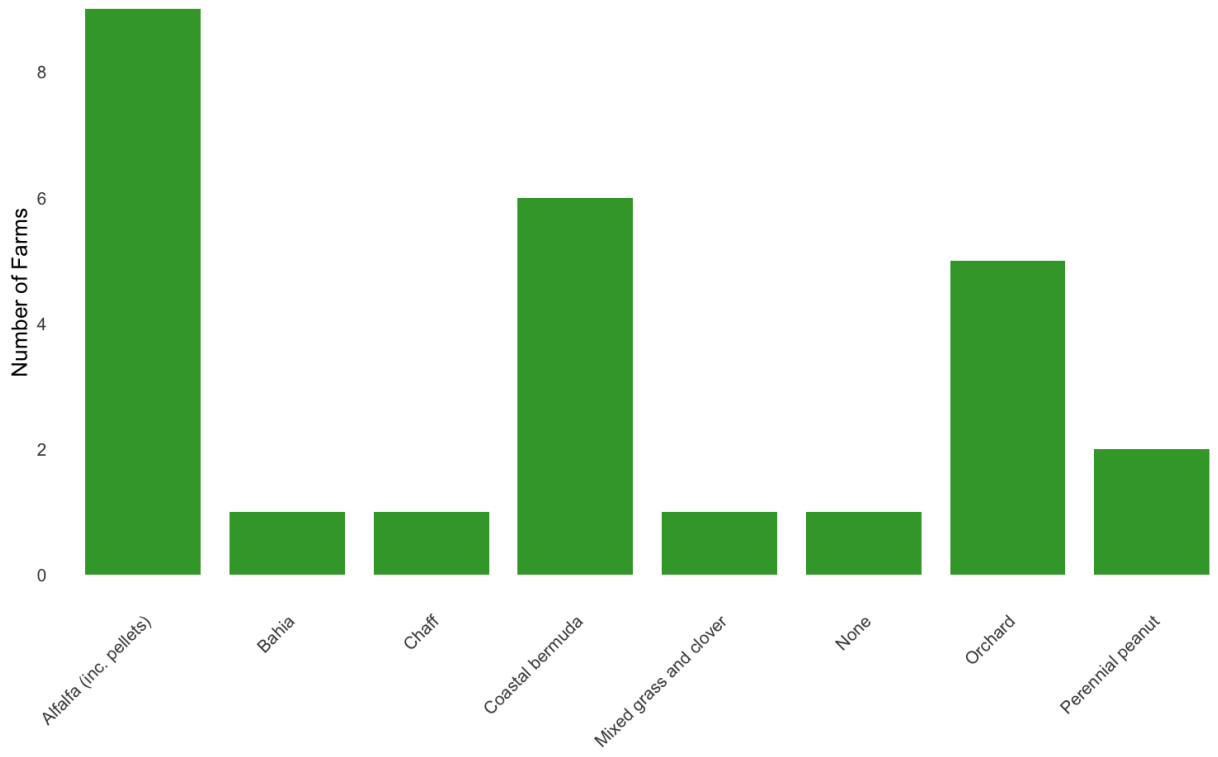
For those who move their goats around based on observation rather than set intervals, the signs to change pastures differed between farmers. One shared the following about how they decide when to move to their goats based on their land and climate, "[W]hen we rotate … the reason we do the woods in the summer is because they have more shade on those hot days … so they'll still go [out], because it's real hot and … [if] there's no shade from the go, they won't go out and forage."

Another farm that reported using rotational grazing explained that they only rotate their bucks and not their does. Several farmers also mentioned wanting to incorporate rotational grazing in the future. One farmer even noted that they hope to sell their bucks in order to free up enough pasture space to implement a rotational grazing system. Another farmer described rotating pastures as simply treating their herd as "regular goats," highlighting how personal beliefs form how farmers design their nutritional systems.

Of the farmers who rotational graze, the average herd size was 30 goats, and the average goat-accessible acreage was 12 acres. The farm with the largest herd and second largest tract of goat accessible acreage shared the following thoughts about rotational grazing:

> Ideally, you know, they're hooved animals. So the more you have in an area that you can't rotate them out of, the more torn up the ground is, the less vegetation that you'll have there. So it's really managing them at the appropriate number for the space available. And when we do have the opportunity, like, between kidding seasons to give certain pastures a break and let them rest and recuperate, then we take advantage of that.

Figure 11: Hay Varieties Utilized



Nineteen of 20 farms interviewed reported using hay as part of their dairy goat nutrition system. For some farms, hay is the primary feed source, and, for others, it is supplementary to pasture and browse or used only during periods of poor weather. For example, one farm that aims to dry-lot, keeping livestock in an area with no vegetation, keeps hay available at all times so their goats never feel the need to search for browse. On the other hand, the one farm that reported not using any hay is also the farm with the fewest goats (3). They shared: “The only time that I feed my animals anything other than what the, you know, the good Lord has provided on our farm, is when I'm milking them. Or if I need them to come to me, and that normally is sweet mix or a dairy mix.”

Ten of the farms mentioned using more than one type of hay, and nine of those included alfalfa grass or alfalfa pellets, which are a compressed, dehydrated form of the hay. A theme emerged around alfalfa of which most farmers praised its nutritional composition and expressed their wish that it grew in the South. Pelletized alfalfa was explained as the compromise considering it is accessible, nutrient-dense, and is easy to pair with other types of hay. Alfalfa pellets, though, have a higher up-front cost than hay

normally, meaning the farmers who choose to feed these pellets are prioritizing feed in the operation budget (Alfalfa Cost Comparison, 2025). No farm relied solely on pellets.

One farmer observed that feeding alfalfa and timothy hay increased their goats' water intake, which in turn boosted milk production, making the extra cost worth the price considering feeding alfalfa hay in the Southeast often requires shipping charges on top of the cost per bale. Another farmer, who previously lived in California where alfalfa is abundant, questioned the quality of the alfalfa shipped to the East Coast and said they rely on pellets as a second-choice option because the local hay cannot compare to what they were used to out West. However, one farmer took the opposite view, noting burnout in California dairy goats due to over-reliance on alfalfa.

Coastal bermuda and orchardgrass were the second and third most common hay varieties used by the interviewed farms. Coastal bermudagrass is considered one of the best perennial pasture and hay grasses in the Southeast because it grows well in both sandy and heavy clay soils (*Coastal Bermudagrass : USDA ARS*, n.d.). Orchardgrass is another versatile option that thrives in well-drained soils and persists through colder weather (*Orchardgrass*, 2025). According to the interviewed farmers, coastal bermudagrass was often the most accessible and affordable hay available. Two farms also reported using peanut hay, one of which explained their reasoning as:

> [T]he biggest problem I have with the coastal bermuda is that it's a biannual, and it it should be reseeded every other year. And what happens is the farmers cut costs, they don't reseed it, and fescue grows in. And so typically, my kids that come about May, June … a lot of times, I need to be present at their births, because, you know, you can tell that there's been a lot of fescue in the coastal, because the birthing sacks are so tight. You know, you really have to pull them out of there or you lose them.

Peanut hay is a perennial tropical legume that grows well in the southernmost states, such as Georgia and Florida (*Perennial Peanut Hay*, n.d.). To utilize this hay beyond those states, and even moving into north Georgia, would be more expensive due to shipping costs.

Most farms purchase hay from growers rather than using their own land to produce the feed. This comes down to the amount of land it would require, as well as the other costs, as explained by one farmer: "Oh, yeah yeah. A lot of laboring time. A lot of labor just to have the equipment to do it, and that's

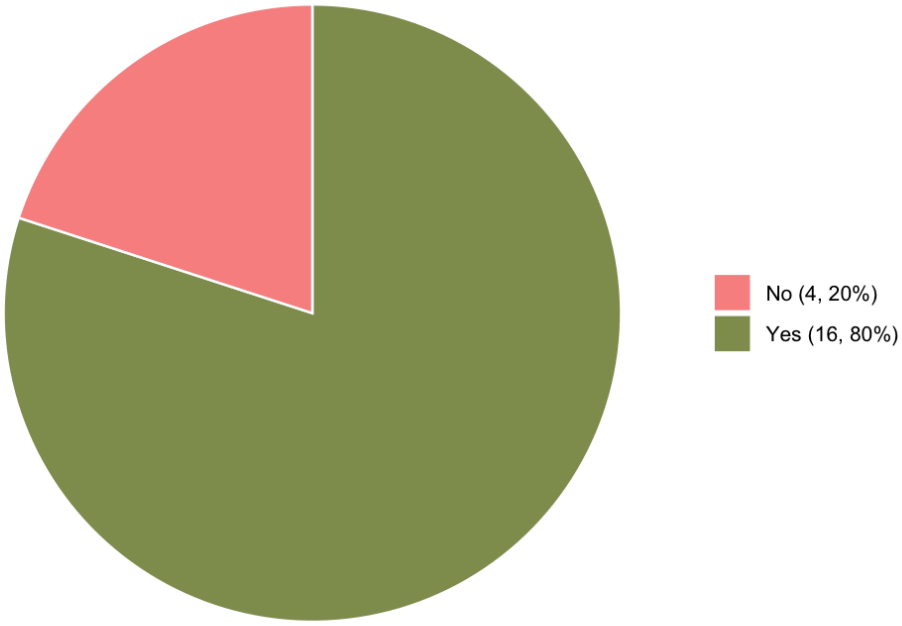
a lot of, you know, a lot of output for tractors and all that stuff and we just." Other farmers prioritize land availability for forage rather than crops.

The challenge with purchasing hay is finding consistent quality and accessibility throughout the year. Not all hay is created equal, and not every farmer produces hay with the same level of care or precision. One farmer shared their unfortunate early experience with sheep that shaped how they buy hay today:

> I don't just get hay from Joe down the street that sells it. I really did that one year. I learned a lesson … I had the babydolls (sheep). And when it came to the shearing time, it was a nightmare. I was embarrassed because when he sheared my sheep, they looked malnourished. And I found out that the hay that I've been giving them was not accurate. It was more of a brushcut, baled … But ever since that happened, I make sure that I get my hay and it actually has a sheet of paper that says it's this, this, and this TRD and this protein percentage because I would rather spend the money if I'm going to pay for hay and spend it correctly so I don't lose the confirmation.

A farmer in Virginia explained that this season was quite rainy, leaving the region with almost no accessible hay. This forced farmers to spend more money importing hay from out of state and to compromise on the nutritional consistency their goats are used to. Another farm echoed this concern, sharing that someone they knew had to switch suddenly from a high-quality alfalfa when their supplier ran out. They began alternating between the last of their alfalfa and coastal bermuda, and they ultimately lost a goat, supposedly due to the nutritional disruption.

Figure 12: Farms Utilizing Grain

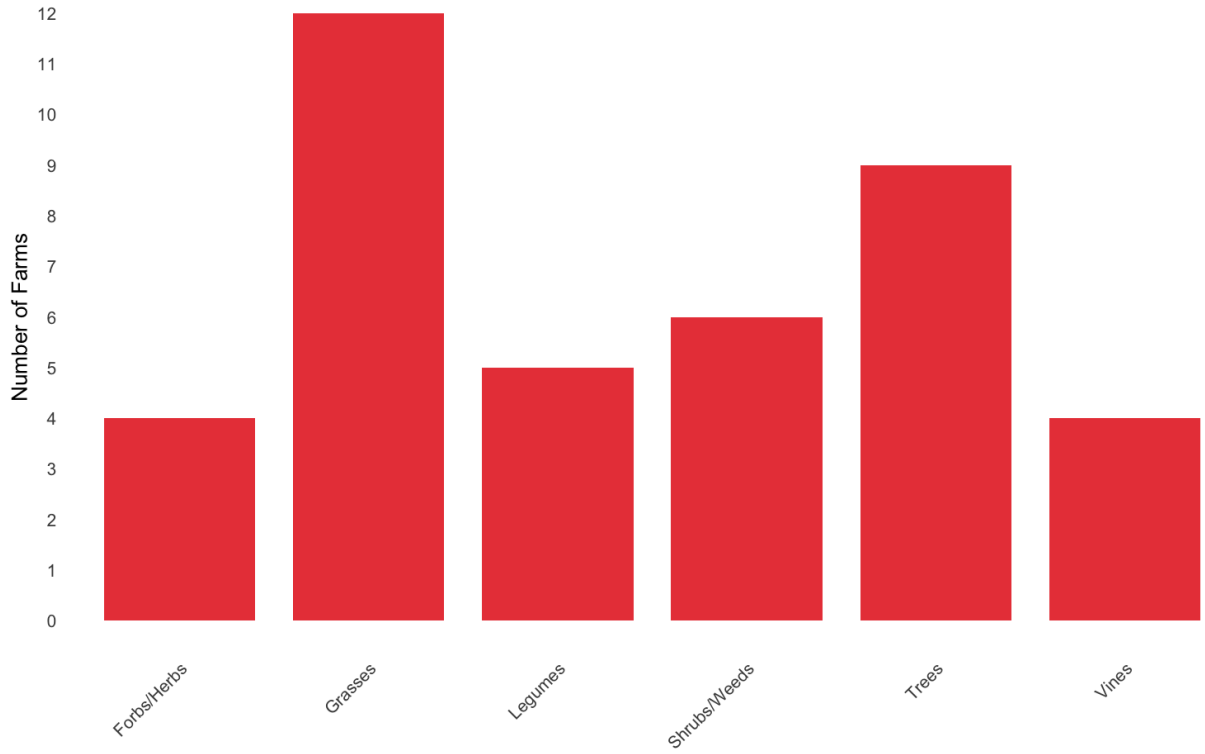


Eighty percent, or 16 out of 20, of the farmers interviewed reported supplementing their goats' diets with grain. As with hay, grain use and grain types vary across farms. Many farmers explained that they rely on grain to boost protein content in their goats' diets or to use as an enticement during milking or when calling goats. Several farmers also mentioned adjusting the type of grain based on the goats' life stage or condition (i.e. milking does, dry does, goats recovering from kidding, or bucks in rut). For example, one farm that relies almost 100% on purchased feed shared: "The only thing that we change is we need a 16% concentrate feed, when we're milking ... and we feed a 16% of texture of feed, dairy goat-feed, when we're milking, so for about 10 months of the year. And then when we're dried off, we get to dry stock, we use usually a 10 or 12% texture feed."

Another farmer explained why adding protein to dairy goats' diets is sometimes necessary: "Without a doubt, 100%. But, you know, we're expecting these does to milk maximum capacity longer than a lactation. And if we don't supplement with a grain to provide that extra nutrition, then we won't get the production and then we won't be in business because we won't have product to sell." This quote

explains that goats raised and bred for production often need supplementation due to the unnatural expectations of dairy output.

Figure 13: Pasture Species by Plant Type



During the interviews, farmers were asked to name any plant or tree species found within their goats' accessible acreage. Their responses were then grouped into six categories: Forbs/Herbs, Grasses, Legumes, Shrubs/Weeds, Trees, and Vines. Farmers were most familiar with grasses, which was expected, since many overlap with common hay varieties. Tree species were the second most frequently named, while the remaining four categories appeared at relatively similar rates.

A dairy goat's natural nutrition and behavior revolve around a diverse browse-based diet. This diversity not only supports a more complex nutritional palette but also provides mental enrichment (Zobel et al., 2019). Although most species named fell under the grasses category, all farms that listed grasses, or pasture broadly, also mentioned at least "wooded areas" or identified another plant species. This pattern suggests a general tendency among these farms to offer more than a single plant type, rather

than relying solely on monoculture systems. The figure below details which specific plants were mentioned within each category. It's important to note that experience level and knowledge of plant and tree species varied across the farmers. Some could name more species than others, and some described the plants and their goats' behavior toward them without knowing the scientific or common name.

Figure 14: Examples of Pasture Species

	Plant Type	Example Species Mentioned	Count of Farms
1	Grasses	Bermuda, Bahia, Fescue, Timothy, Rye	12
2	Legumes	Clover, Lespedeza, Austrian winter pea	5
3	Shrubs/Weeds	Privet, Multiflora rose, Autumn olive, Blueberry	6
4	Trees	Pinus sp., Quercus sp., Pecan, Sweet gum, Magnolia, Wax mrytle	9
5	Vines	Virginia creeper, Passionfruit vines, Grapes, Kudzu	4
6	Forbs/Herbs	Chicory, Burdock, Dandelion, Mayflowers, Plantain	4

This figure includes every type of plant farmers identified as goat-accessible nutrition on their land. In the grasses category, bermuda and bahia were both mentioned, which are both hay varieties in their dried forms that farmers use for their herds. A few farmers during interviews also mentioned fescue and timothy hay as options they had tried to produce and feed in the past that had ended up being too rich or caused gastrointestinal issues for their animals as a primary feed source. Three farmers mentioned rye as a good winter cover plant that they purposely seeded to maintain some natural feed in that season. These grasses compose a foundational forage that needs to be supplemented by plants in the other categories to create a well-rounded dairy goat diet.

Nine farms mentioned some sort of tree cover or wooded areas in their pasture. While four of these farms simply said "wooded areas," five farms offered specific examples. Tree cover allows goats to "eat up," preventing accidental consumption of parasites from the ground. Dried tree leaf hay holds a feed value similar to that of a well-managed hay meadow (Hanson, 2017). Browse is rich in phosphorus and crude protein, especially during peak browsing season in the spring and summer for many of these farms. Pine trees, in particular, have needles and bark that are high in tannins. In large amounts, these tannins can cause digestion issues; however, when eaten supplementary with other trees and plants, these

tannins can also aid in parasite suppression (Van Saun, 2025). Trees also provide shade in the hottest months, which will be discussed further in the Weather section below.

Shrubs and weeds were mentioned by six farms, and, like trees, they encourage goats to eat up and off the ground to avoid the parasite cycle. This category includes several invasive or fast-growing plants, such as privet and multiflora rose. These plants, along with blueberries, are known for spreading quickly and taking over land, while simultaneously being difficult to remove because of their dense growth. Goats tend to do especially well with these plants, eating all parts of the plant and effectively clearing these plants when that is the goal. They are also effective at keeping these plants in check when they're part of a more diverse browsing diet that reduces reliance on just a few species.

One farmer summarized their balance with browse, tree overhang, and pasture management by saying:

> So obviously we'd love to provide browse all the time, but you know, having been here for 40 years, they've eaten everything you've been in pasture to eat. We shift fence lines on some of the pens to get some of the overhang leaves, which they clear up our fence lines very nicely. The pasture that they have, especially the dairy herd, they've got about 10 acres of pasture land, we bushhog every week.

In this context, bush-hogging refers to mechanically cutting back or clearing overgrown areas and providing that plant browse on pasture for goats that cannot otherwise reach it. This typically includes a mix of leaf litter, weeds, and dense shrubbery.

Legumes have been widely studied in dairy goat nutrition, both as hay and as components of grain mixes. They are naturally high in protein and are effective nitrogen-fixing plants that can aid in pasture health. Lespedeza, in particular, came up in conversations with five farms, either as part of their current feeding system or as a species they hope to establish in their pastures. Beyond its 10–16% protein content, two farms mentioned its potential role as a natural dewormer for dairy goats (Mississippi State University Extension Service, n.d.). Like pine needles, lespedeza is high in tannins, which contributes to its shown ability to reduce fecal egg counts in adult dairy goats (Shaik et al., 2006). One downside, though, that was not mentioned, is that some species of lespedeza are considered invasive

species (*Lespedeza cuneata*, n.d.). This means that introduction of these species into new ecosystems can have negative effects on biodiversity if it spreads outside of the property on which it was planted.

The vines mentioned, while sometimes growing close to the ground, can also climb trees and weave through shrubs. Like the shrubs category, many of these vines spread quickly, and goats are naturally effective at keeping their growth contained. By browsing on them, goats not only convert those nutrients into milk but also help maintain a more biodiverse ecosystem by preventing invasive species from overtaking other native and beneficial plants.

Finally, forbs and herbs are small but mighty plants, playing an important role in overall ecosystem biodiversity. Their presence often reflects a less intensively managed pasture and more natural plant growth. Herbal feeds have also been shown to have a positive influence on milk composition for dairy goats, increasing both milk fat percentage and the fat:protein ratio (Wójtowski et al., 2025).

The farmers who used rotational grazing with their herds named more specific plant species and genera across every category except trees. This may suggest that farmers who rotationally graze tend to be more engaged in planting, monitoring, and identifying their pasture species, especially since those plants make up a larger share of their goats' diets.

Additionally, a few farmers mentioned other ways they maintain healthy pastures, such as spreading lime, and one farmer described how they would collect wood chips from neighbors whenever a tree was cut down. They use those chips to dry washed-out areas of pasture and slow erosion. That same farmer explained their pasture management in more detail:

> [N]ow, with the animals going through and moving along, I've got all kinds of different grasses. I've got plenty of plantain … And then in the winter, when all this other stuff drops back a little bit, I just walk around and broadcast the Austrian Winter Pea … and then I put some rye out as well. But then in the woods, where the tree leaves fall off, firstly, they're eating the leaves as they fall and then I broadcast the Austrian Winter Pea there as well, because the sunlight filtering through where all the leaves are gone, that stuff will grow. And then it holds the soil and more soil that's held, better things get.

Land management is ultimately a balance between how the natural environment functions and knowing one's land well enough to understand what species can grow where, in which season, and with how much hands-on monitoring.

Figure 15: Prevalence of Mentioned Toxic/Invasive Species

As discussed above, invasive and toxic plant species are present across many of the pastures and properties managed by the farmers. During the interviews, the farmers were asked if they could identify any plants that fall into these categories and how they handle them in their pastures. The word cloud above shows the plants mentioned, sized larger in accordance to how frequently the word was brought up. Some of these plants are ones farmers monitor closely and would remove if they appeared, but many are recurring and difficult to keep out of pasture completely.

When asked how they manage toxic or invasive plants, most farmers said they remove them by hand. Of the 13 farmers who responded to this question, none reported using herbicides for control. One farmer noted that they are selective about the hay they bring onto the farm to avoid accidentally

introducing unwanted species. Another echoed this more proactive strategy by keeping feed sources consistent to reduce the chance of new species showing up in pasture from the seeds in goat feces.

Continuing with the theme of being proactive, one farmer who expects their goats to encounter at least small amounts of toxic plants said, “But that's part of why I also top dress with the brewers yeast is because it is higher in vitamin B, and they say that when they eat these toxic substances, that you need to inject them with vitamin B, like the injectable. So I try and keep their vitamin B levels up.”

Other farmers described learning their pasture simply by walking the land with their goats. One explained that they monitor the space frequently enough to know what is growing and when something needs to be pulled. Another farmer added, “A lot of times when we do have a plant that we can tell the goats are avoiding, we'll check it out, and most of the time it's like they know to avoid something that's not good for them. It's amazing to me.”

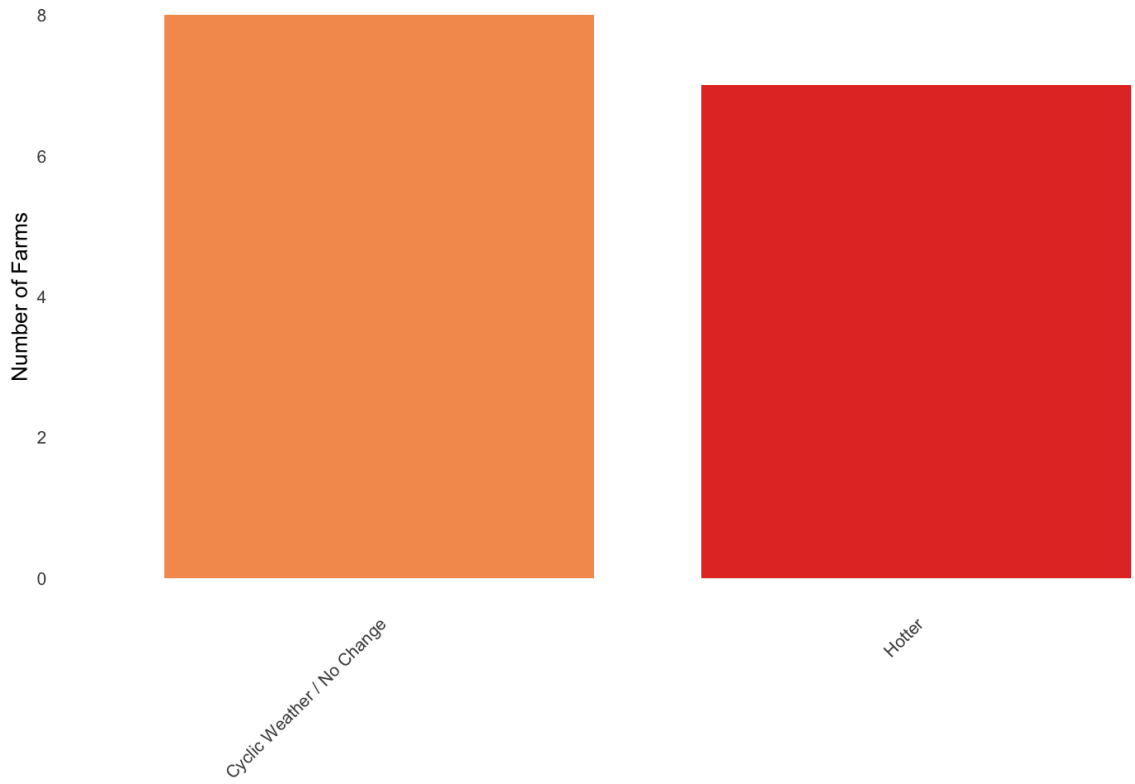
And when goats do get into a plant that can cause harm, one farmer explained their protocol for addressing that kind of health emergency:

> And I mean, if you have somebody who eats something that disagrees with their stomach and they get diarrhea, it's charcoal and clay and, you know, I have dex (dexamethasone) on hand. I've actually treated two goats, not for myself, but for somebody else in the last year. One of them ate a wilted cherry leaf, one wilted cherry leaf, and the other one had exposure to mountain laurel. And they both lived … Even those things can be, if you have the right meds, fixed.

Weather

The Southeast, while a large region encompassing about nine states, depending on map or context, is known for its unique humid, sub-tropical climate. This study looked at if farmers in this region have experienced long-term weather changes, and if those have impacted their management styles in any way. Particularly, this study aimed to understand how forage may be affected by temperature extremes and major changes in precipitation or inclement weather events.

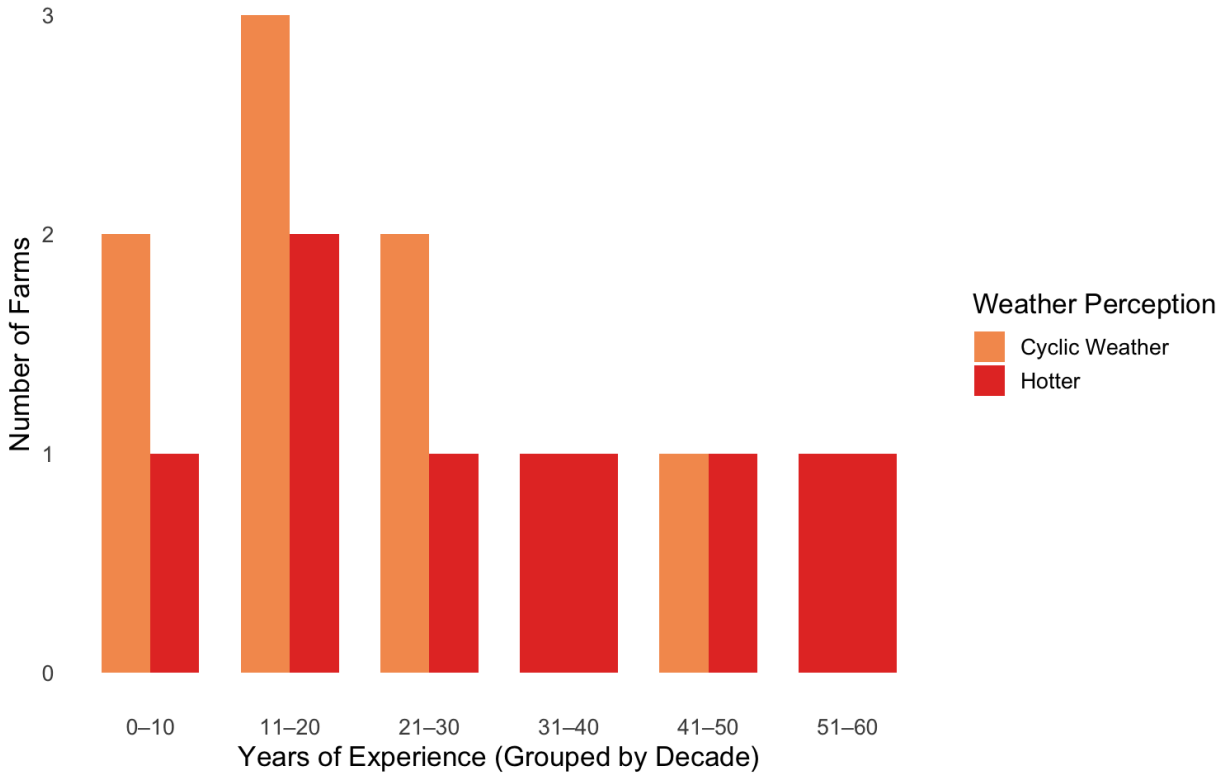
Figure 16: Long-Term Weather Perceptions



During the interviews, farmers were asked a more open-ended question about whether or not they had noticed any long-term weather patterns since beginning their operation, and, if so, to describe them. Fifteen of 20 responses grouped naturally into two categories: Cyclic Weather / No Change and Hotter. Eight farmers discussed cyclic weather patterns or said the weather has stayed the same, while seven farmers expressed concern that temperatures have been rising, making summers hotter and more humid.

Of the remaining responses, two farmers noted that conditions are drier than they used to be, one of which described the last five years as a drought. The final three farmers commented more on current weather rather than long-term patterns. The following figure breaks these opinions down by the farmers' decades of experience.

Figure 17: Weather Perceptions by Experience



Seven of the eight farmers who noted cyclic weather changes, and four of the seven farmers who noted long-term warming, have 30 or fewer years of experience. On the other end of the spectrum, only one of the eight farmers who mentioned cyclic weather changes and three of the seven farmers who mentioned long-term warming have more than 31 years of experience. Based on these results, weather perception does not appear to skew strongly in either direction when compared to decades of experience raising dairy goats. A larger sample size may help reveal whether any clearer patterns exist. Regardless, the farmers were still clear and outspoken in sharing their perspectives.

One farmer who mentioned the weather getting hotter with longer summers also talked about how there used to be quick afternoon showers “like clockwork”, but that it has been noticeably dry in recent years. Another farmer lamented, “Back in 2008, we hit some of our first 90 degree days just in August and just a few. Now it's every day.” On the other hand, a farmer in Mississippi described the current weather as “typical”, saying that the climate naturally cycles up and down. Another farmer shared a similar perspective:

> No, we've lived in this region for 13 years now. And … what's funny is … sometimes you're like, oh, it's so hot. And then you look at the … historical data and it's no hotter than what it was 10 years ago … We have had snow, you know, the other side of it is like, you know, we've had more snow before … And we're like, well, this is different, but Nashville used to get a lot of snow back in the day, like in the 70s when my mother-in-law is from this region. You know, she's like, we used to go sledding all the time in winter, you know, and, you know, and the summers were always really hot.

When looking at historical weather data, several long-term shifts do emerge. Rainfall during the summer months has decreased over time, leaving farmers more vulnerable during drought periods when hay is scarce and additional cuttings are not possible. Temperatures have also risen steadily across the region since the 1970s, with no clear sign of leveling off (Southeast Climate Hub, n.d.). Based on a calculated Climate Vulnerability Index (CVI), built from 184 indicators that combine baseline vulnerabilities (health, social/economic, infrastructure, and environment) with climate-related risks (health, social/economic, extreme events), the Southeast ranks as the most “at-risk” region in the United States (Tee Lewis et al., 2023).

These historical trends help contextualize the real-life experiences that the interviewees shared. During these conversations, another noticeable pattern emerged: many of the farmers who expressed concern about hotter summers also mentioned experiencing colder or wetter winters. Of the 17 farmers who talked about how rain, snow, dew, or general wetness affects their goats, 15 responded with the same sentiment: goats hate being wet. One farmer emphasized this by saying, "[W]hen it's rainy, goats absolutely hate the rain. They act like they're going to die if they get in the rain."

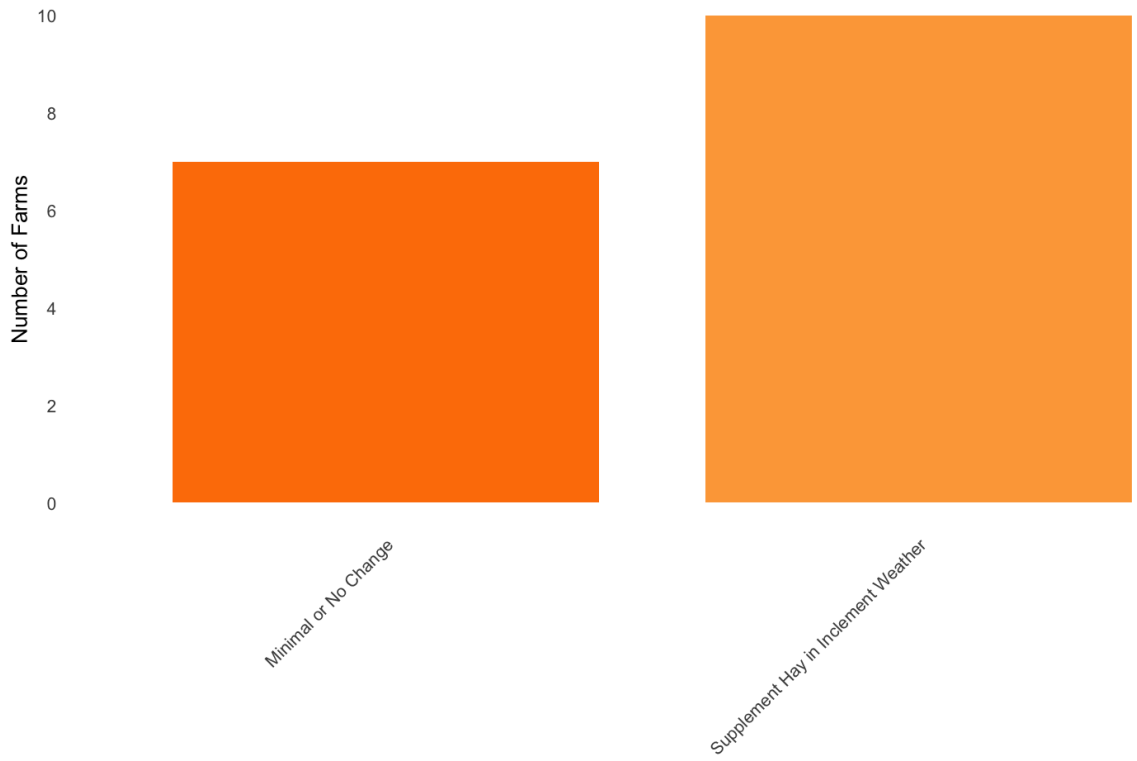
A second farmer took a different angle, noting the practical challenges of managing their herd around unavoidable moisture: “I don't wait for the dew to be burned off before they go out there, because if I did that, they'd never go outside.” The health implications of rain and wet pastures will be discussed in the Health section below.

Whether or not farmers feel that summers are getting hotter, keeping goats cool during peak heat is essential in any management system. Multiple farms also emphasized the importance of tree cover during these months, both for shade and for allowing the goats to continue foraging comfortably. Others

noted that their herds prefer to graze or browse in the mornings and evenings and then rest in the shade at midday when the sun is strongest. One farmer took the opposite view, though, and pointed out that a goat's internal temperature is over 100℉, which may make them even more comfortable in the summer than in the winter.

Several farmers mentioned differences between Swiss breeds and Nubians. One farmer with a Nubian herd said, "They don't mind the heat much. On the hottest days, they lay outside of the shaded barn area in the direct sun. Swiss breeds can't take the heat, though." Another farmer echoed this pattern: "Saanens and Alpines (Swiss breeds) are in the shade during the Summer. The Nubians will be laid out in the sunshine." Making sure the land and infrastructure of each operation are set up to accommodate the farmer's chosen breed(s) is important, including ensuring tree cover or another shade option in the summer, or a three-sided structure in the winters to shield from chilling winds.

Figure 18: Weather-Based Nutritional Changes



In addition to asking farmers about weather patterns, they were also asked how those patterns or seasonal changes affect their nutritional systems. Seventeen of the 20 farmers talked about whether or not they adjust their herds' diets throughout the year as conditions shift. Ten of those farms supplement with extra hay during inclement weather, including snow, excessive cold, rain, and drought, while seven farms reported minimal or no change to their feeding systems.

> Most farms noted supplementing with hay at some point during the year, often for an extended stretch. In the winter, one farmer explained how their goats consistently choose hay over forage:
>
> Even if we stockpile a section of the pasture, they still will go to the hay first. They always fill up on hay because goats are ridiculous when it comes to being too cold outside. They don't want to leave their warm spot. So they'll take that free hay choice, which is like right in their face, and they'll eat that like crazy.

Supplementing with hay seems necessary for some farmers because, as one explained, their goats will "run into their little barns" as soon as it rains. Providing hay in a barn or other structure gives the herd a way to remain dry while still eating, and they certainly take advantage of this luxury. Another farmer emphasized this preference by saying that they can expand their pasture and plant rye grass all they want, but it will still get cold every year, and their goats will rely more on hay in the barn regardless. For others, though, supplementing is more of a health-driven choice due to concerns about hoof rot and parasite issues that can increase in wet conditions. One farmer even remarked that goats seem to instinctually avoid the rain to protect themselves from ailments like pneumonia.

Among the farms that reported minimal or no changes in their feeding systems, two reasons stood out. First, some farmers keep their goats on pasture throughout the winter. Second, a few rely primarily on hay year-round, so weather does not significantly alter their routine. And, contrary to earlier frustrations about rain, one farmer described their delight at a wetter-than-usual season:

> But for the summer ... I would say that depending on the rainfall is really the thing that depends the most on what the grazing looks like, and how often they're getting grazed and things like that is just, you know, how well it's all growing. So we got a lot of rain recently … And so I've been able to graze this a lot this year because the pastures are actually more than they can handle right now.

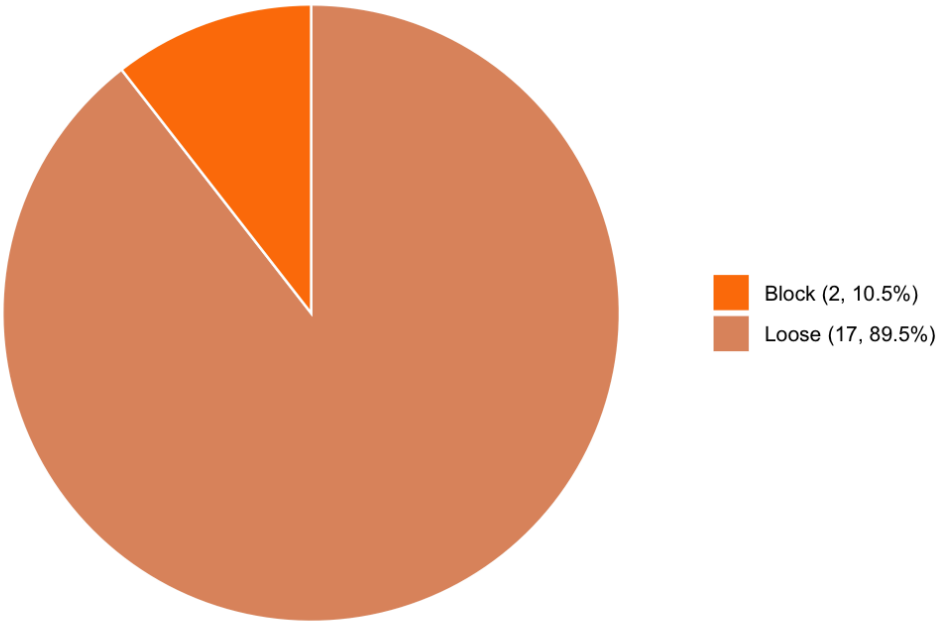
That said, even among the farmers who generally do not alter their nutritional systems, a few still mentioned offering additional hay on particularly rainy days, though not as much as the farms in the supplementation group.

Health

As a farmer and caretaker of livestock, monitoring health is one of the most important tasks. This includes learning from others, reading, studying, buying medications, creating relationships with veterinarians, knowing one's herd, and being able to identify warning signs of health issues. Additionally, as a note for going forward through this analysis, many farmers used the words 'antibiotic' and 'anthelmintic' interchangeably. Any discussion of dewormers that used the word 'antibiotic' was adjusted to use the correct language wherever possible.

Mississippi State Extension notes that dairy goats require 15 essential minerals: seven macrominerals and eight microminerals. The macrominerals include calcium, phosphorus, magnesium, potassium, sulfur, sodium, and chloride, while the microminerals are iron, copper, cobalt, zinc, manganese, selenium, molybdenum, and iodine (Mississippi State University Extension Service, n.d.). A deficiency in any of these can lead to negative health effects. While a balanced diet can meet many of these needs, most dairy goats raised in agricultural systems require a supplemental mineral source due to an uneven reliance on certain types of grass, grain, hay, or other feed.

Figure 19: Loose vs. Block Minerals



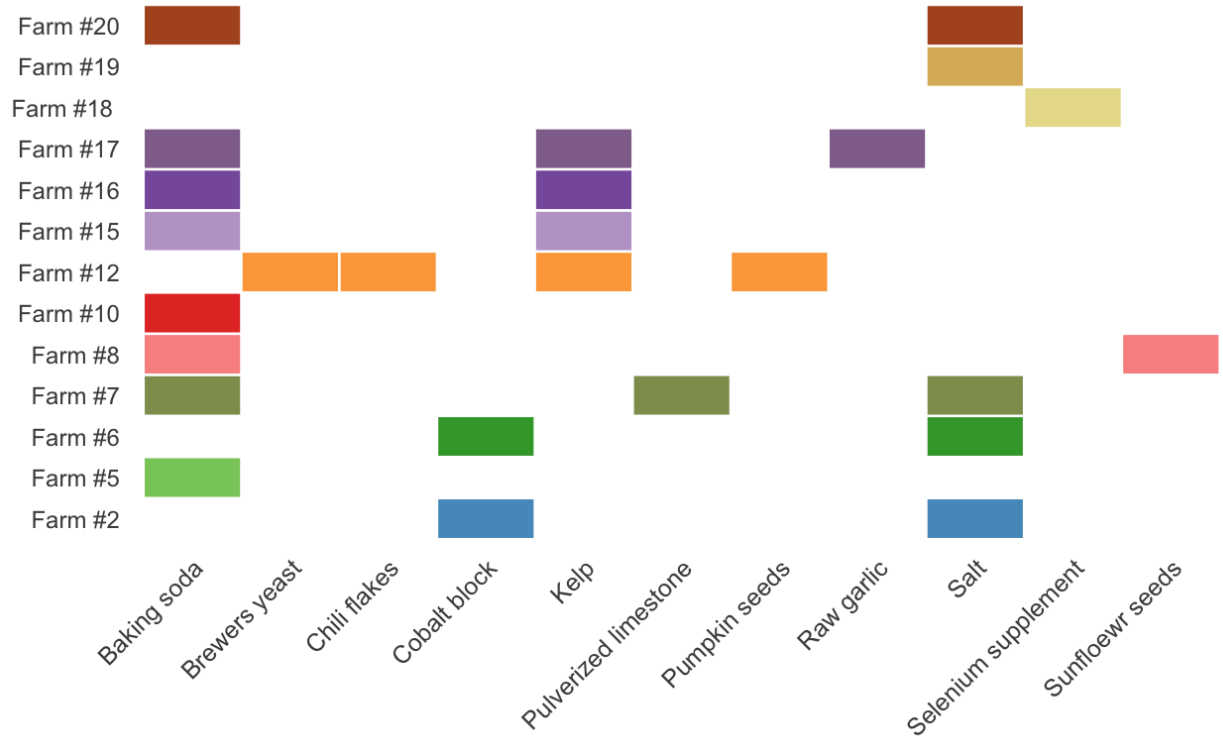
Every farm in this study provides minerals to their dairy goats in some form. Only one farm does not use a mineral mix in either loose or block form, as shown in the pie chart above. Across the 20 farmers, the following brands of mineral mixes were mentioned: Sweetlix, Zinpro, Kalmbach, Golden Blend, Shegogg Creek Goat Mineral, Duraferm, New Country Organics, Crystalyx, Manna Pro, and Orangeburg Milling Company.

Loose minerals were by far the preferred option: over 89% (17 of 19 farms) use them instead of blocks. Farmers gave a variety of reasons for this. One noted that loose minerals are more effective, another said blocks are simply harder for goats to use, and a third farmer top-dresses loose minerals on feed to make sure the herd gets what they need. One farmer explained that loose minerals offer goats the choice to instinctually supplement: “[T]hat's the difference between me and a lot of the nutritionists because they think that adding in with cattle, they may not be smart enough to eat what they need. But goats will eat what they need if you have it out for them.”

Several farmers also pointed out that mineral needs can shift depending on well water. Water drawn from underground aquifers often contains higher levels of dissolved minerals, such as calcium, sodium, and magnesium, making it “hard” water (*What you should know about common well water contaminants*, 2017). These differences, compared to municipal water, can influence what mineral supplementation a herd requires. One farmer shared:

> I feed loose minerals. I rotate, I alternate minerals. I have well water, and so it's interesting. The nutrition of my animals is really impacted by the well water because I have friends that are on city water that have to manage their animals completely differently. I have a few animals that, you know, there are certain lines that have higher mineral needs, usually specifically zinc and copper, that do not thrive on my property and I think it's well water, because when they move to a farm that has city water, they will thrive on the exact same nutrition as they had at my property.

Figure 20: Mineral Supplementation by Farm



Separate from loose or block minerals, 13 farms mentioned using additional mineral supplements. Nine of those used more than one. Baking soda was the supplement mentioned most often,

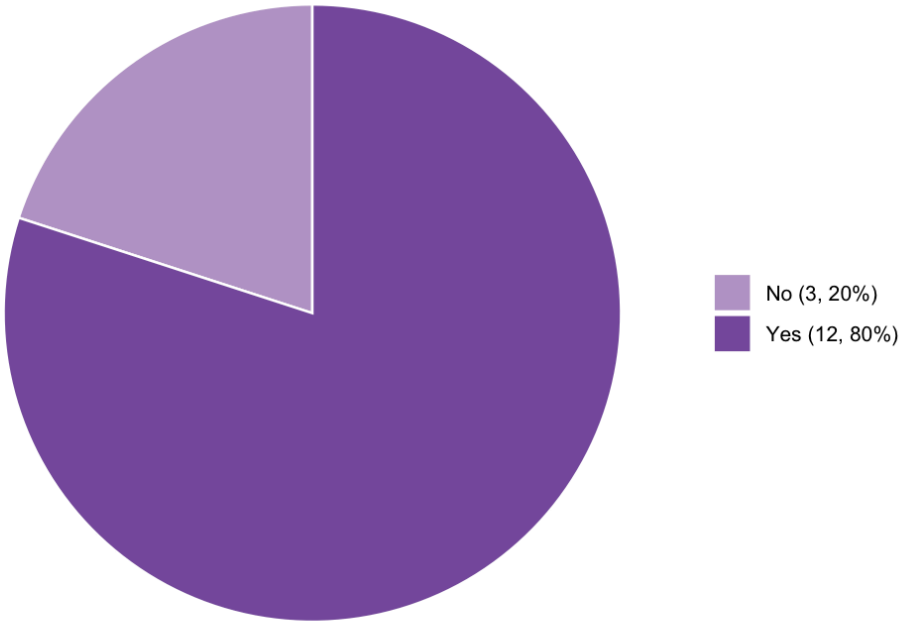
followed by salt. In agricultural systems, goats tend to eat more grass or concentrated feeds, such as grain, than they would in natural environments. These feeds can create excess fermentation in the rumen, and baking soda helps neutralize gas build up and bloat, a sometimes fatal condition (Sartell, 2018).

Supplementary salt ensures goats receive enough sodium and chloride to avoid growth or metabolic issues. Kelp was also frequently mentioned and is the primary supplement used by the one farm that does not offer any loose or block mineral mix. Kelp is nutrient-dense and contains a range of minerals, including iodine, magnesium, iron, copper, and calcium (Hunter & Peng, n.d.).

One farm goes an extra step to make sure their herd is receiving adequate mineral support: “So we have to make sure that we're using goat specific minerals. And we do trace mineral panels just to verify that we're providing the right thing and we can adjust our feed ration with those mineral compositions if needed.” This more diagnostic approach was unique among the farmers interviewed and reflects a proactive strategy toward maintaining herd health. The same farm also encouraged others to consider running mineral panels before jumping straight to a copper bolus when a health issue comes up, considering goats can be very sensitive to copper.

While they were not mentioned directly in relation to parasite management, supplements, like garlic and pumpkin seeds are frequently considered natural dewormers in online goat forums. It is possible that some farmers incorporate these supplements informally or as-needed even if they did not bring them up during the interviews. It is also likely that more than the five farms who only mentioned salt or baking soda use some of the additional supplements mentioned, or others, but did not note them during the conversations about mineral mixes since the interview questions did not directly ask about supplements in most interviews.

Figure 21: Copper Bolus Use



Throughout the interviews, a pattern emerged of farmers bringing up copper boluses, a slow-release supplement given manually in capsule form, that helps to treat or prevent copper deficiency. Of the 15 farmers who either mentioned copper boluses while talking about minerals or were asked once the pattern was noticed, 80% (12 of 15) reported using them, though how their use varied.

Two of the farmers who said they do not give copper boluses instead use an alternative copper supplement. One farmer praised a newer mineral mix, Shegogg Creek Mineral, which they said has essentially replaced the need for bolusing their herd. Another farmer uses a powder copper supplement from Hoegger Supply instead of boluses.

Copper boluses also serve as a targeted preventive and treatment for internal parasites. Copper oxide wire particles (COWP), which are contained in copper boluses, have been shown to help reduce parasite loads in small ruminants (Hale, 2014). One farmer even identified a specific parasite that prompts their use: “So, you know, if I see barber, if I see struggles, I will go ahead and treat for barber pole. I do feel like using a copper bolus regularly helps with my not needing to deworm as frequently.”

Several farmers emphasized the need for copper boluses especially in the Southeast due to naturally low soil copper levels (South et al., 2004). One farmer explained, “[W]ith the soil and you know, water is high in iron. It depletes the copper load from their bodies and they need that for immunity.” How farmers respond to this deficiency varies: one boluses quarterly, others bi-annually or annually, and a few only as needed. One farmer put it, “You know, like, I make sure that my goats get copper boluses. I only worm my goats, usually, especially the adults, once a year, unless there is something very specific and acute.”

One final farmer took a more cautious stance, stating that goats are particularly sensitive to copper and can easily be poisoned when given a bolus for a general health issue before running a chemistry or mineral panel. They also emphasized that over and under abundances of minerals share the same symptoms, so running those panels can offer a more telling diagnostic of a specific problem.

Figure 22: Examples of Mentioned Dewormers

As mentioned in earlier sections, internal parasites are one of the most persistent health challenges for dairy goats. In the Southeast, particularly, due to the hot and humid climate, *Haemonchus*

contortus, or the barber pole worm, is responsible for many parasite-related illnesses and deaths. These parasites, like others, survive by cycling through the environment: eggs are shed in manure and hatch in warm and wet conditions, larvae crawl three inches up blades of grass, and they are re-ingested when goats graze the same area again too soon. Infection with barber pole worms can lead to diarrhea, rapid weight loss, and other symptoms that can become fatal if not addressed quickly. In the interviews, farmers described techniques to detect and treat internal parasites, like barber pole, highlighting a few patterns.

Of the 19 farms asked if they employ FAMACHA scoring when assessing goat or herd health, everyone said yes. While several farms noted their reliance on FAMACHA scoring for alerting them to health issues, a few others expressed concerns. One farmer noted that it will only matter when it is almost too late and only if the issue is blood-sucking parasites, which makes the tool well-suited for barber pole worms. They also suggested that farmers invest in a microscope for fecal tests rather than solely relying on FAMACHA scoring. Indeed, 13 farmers mentioned checking fecal samples prior to deworming in addition to checking FAMACHA scores. While most farmers do this at home, a few noted sending fecal samples to veterinarians to check, which is perhaps more accurate at times, but often not time efficient in emergency situations.

Another farmer said, “I do use FAMACHA scoring, but I do it just by sight. I don't use the card. I just kind of learn, because quite honestly, the card is just a guide, and some goats are going to always be, you know, be more red than others, and that's completely normal."

A major similarity amongst the farms was that all 20 made a point of saying they do not deworm on a schedule, with quite a few emphasizing the importance of not doing so due to issues with anthelmintic resistance. The perception of ‘deworming on a schedule’ seemed to be inconsistent among farmers, though, as seven farms still brought up regular deworming around kidding for pregnant or freshly postpartum does. This is done as a preventive measure as that is the time when does are most vulnerable for internal parasites, but it also means they are likely dewormed at least once a year. This suggests a non-standardized dissemination of information about anthelmintic resistance and how often farmers can safely deworm their goats. One farmer shared their strategy of deciding when to deworm:

> So, rule number one is I never worm everybody at once and I do not worm on a schedule. So there's not, I don't worm every year. I wait until I see, I notice a problem. And a lot of this stuff,

you just have to, you learn from raising goats from so many years and looking at them every day, you learn to recognize little symptoms like their coat will kind of get rough and dull or even kind of curly. Obviously, we check regularly, we check their eyelids to assess them for anemia. And then if I notice that I have a problem, the first thing I'm going to do is whoever has the problem, and I don't, like, everybody with that goat does not necessarily get wormed.

Six farms brought up rotating wormers as a method to prevent resistance to one specific family of anthelmintics. Some farms also rotate drugs in sequence every few days when an issue arises for the same reason, but also to ensure the parasite population is depleted.

Among the farmers, there were two strong opinions on how nutritional systems impact parasite management. One side of the argument were farmers who noted that keeping their goats off pasture helped them avoid the re-ingestion of the parasite larvae:

So my bucks are dry-lotted just because I don't have enough pasture to also rotate bucks. So I'd rather have them on a dry-lot than on a static pasture where they're always grazing the same area. I have strong feelings that management, the way people manage their goats, has created [a] kind of abuse and overuse of dewormers, which has kind of brought us to crisis with, you know, dewormer resistance …

And while that farmer is in good company with a few others who dry-lot their herds to maintain consistent nutrient intake and prevent parasites, they also supported the other side of the argument that rotational grazing aids in preventing the parasite cycle from continuing:

[M]y adult doe herd is managed on pasture. And I have four pastures that I rotate them through. So every 30 days I rotate them to a new pasture. And after the goats have been on the pasture for 30 days, I put horses on the pasture for 30 days, and my goal with that is that the horses will consume the worm larvae, and they're kind of a dead end host for the worm larvae from what I've read and researched. So I'm using that to minimize, I'm using this particular strategy to minimize my need for chemical dewormers.

Several other farmers echoed this sentiment with one farmer saying that they tend to fight worms more on their dry side of pasture than with the does who rotational graze. Another farmer advocated for eating off the ground rather than specifically rotational grazing:

> And with the lack of deworming specifically available, labeled for goats, you know, we build up parasite resistance and then we get into big trouble. So if we have the option to not have them graze, then it's honestly healthier for them. Browse is great. I mean, if that's off the ground, if it's, you know, privet leaves and pecan trees and oak trees, and, you know, that's well and good …

Expenses

All of the sections so far lead naturally into questions about expenses. How much are farmers willing to spend on feed, weather-related adaptations, and herd health? And which of these costs ends up being the most significant? The interviews were conducted with these questions in mind to better understand the priorities and decision-making of goat farmers in the Southeast.

When asked about the most expensive cost in their dairy goat operations, 95% of farmers (19 out of 20) named some type of feed, whether that meant protein, grain, hay, or all of it together. The one farmer who did not name feed instead pointed to fencing as their highest expense:

> Fencing for sure. Because that, gosh, that cost us over $3,000 just to fence. We had a pasture here, but then we had to fence the rest of the property. And that cost us about $3,000. And that didn't include, we have logs every other post … You know, that's the first thing I tell people when they call and say, hey, yeah, we're thinking about getting a goat. And I'm like, do you have a fence? No. You need to get that put up. You need to do that first.

This farmer is also the only one who does not feed hay to their goats. Another farmer mentioned fencing as a major cost as well, second only to feed, describing fencing as an upfront investment, while feed is an ongoing financial commitment.

Among those who named feed as their biggest cost, several emphasized the importance of consistent, high-quality hay. One farmer talked about the challenge of finding good hay in bulk early in the year, just in case their supplier ran out later in the season. Another farmer described the need to spend more on feed in this region:

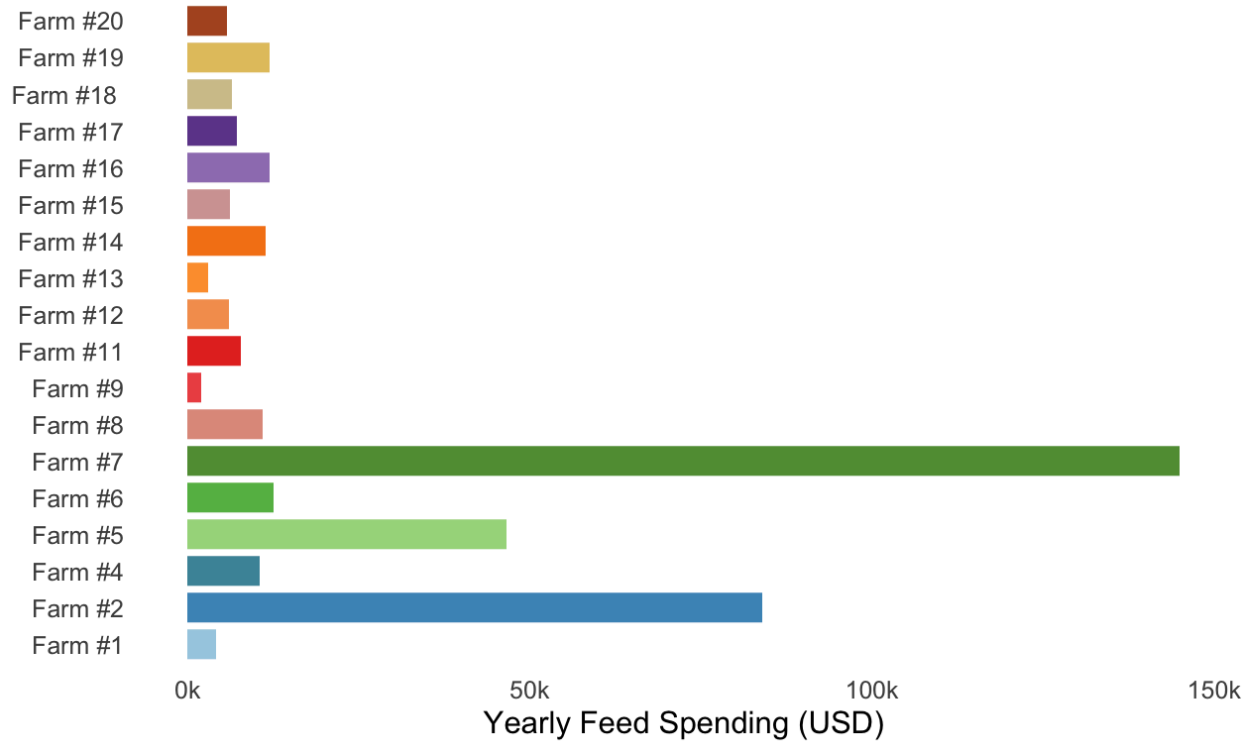
> Well, I mean, the thing is, the kind of feed that you need in order to make really good milk, that's doesn't grow in a pasture, unless you live in California ... I mean, you have to add stuff or you're not going to get any milk. | Yes, and feed has increased so much. I mean, I've literally had to cut

my goat herd in third so that we can continue to afford to feed them at the same level.

A third farmer focused primarily on grain rather than hay, explaining why they choose to spend more on a non-GMO brand. They noticed that as feed prices increased, more molasses was being added into the grain as a “cheap”, sugary, and calorie-rich ingredient. During this time, the farmer also began noticing ulcers in their herd, which was new for their operation, and some of their goats died. This led them to purchase a higher-quality feed and protect the health of their goats proactively.

A few farms also noted that their reported feed costs (seen below) include feed for all of their farm animals, such as chickens and livestock guardian dogs. This is a limitation when making direct comparisons; however, the overall pattern remains clear: feed is still the dominant and most consistently cited expense across these dairy goat operations, even for those who only raise goats and regardless of operation and herd sizes. Another limitation is that, since this study focused on small dairy operations, feed costs are subjective based on what the farmer considered to be costs, usually just hay and grain, not including minerals, fertilizers, or other feed inputs.

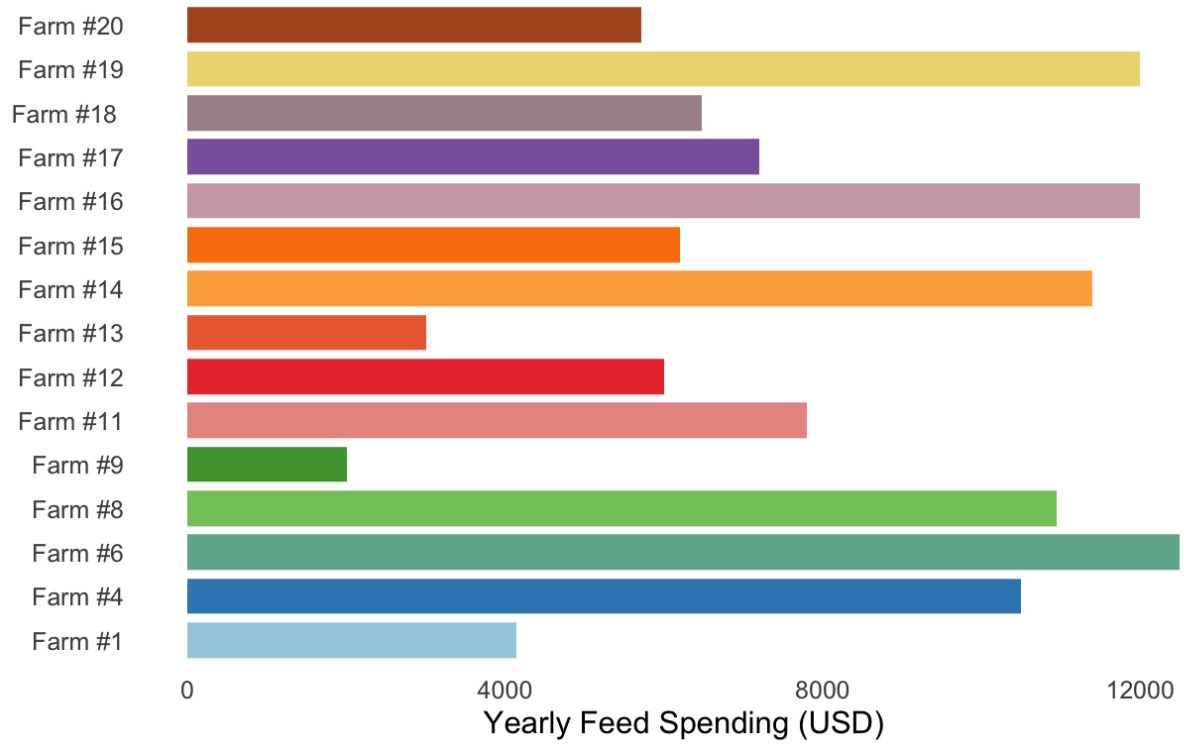
Figure 23: Yearly Feed Spending by Farm



In the graph above, one can clearly see how much each farm spends annually on food, keeping in mind that, for a few farms, this includes more than just goats. Farms #3 and #10 were either not asked or did not respond to this question, so their yearly costs could not be included. Interpreting the costs for all but three farms is difficult as Farms #7, #5, and #2 skew the scale. They are the only farms spending close to $50,000 or more.

Figure 23 shows that Farm #7 does have the largest herd size, which helps explain the higher feed costs. The farmer from Farm #7 shared their need to supplement with grain in order to support the unnatural dairy output expectations that allow for a profit. Farm #5 has the second largest herd, and the farmer explained that they milk “twice twice a day, every day, year round for the last 30 years”, which makes sense for maintaining consistent Grade A dairy production. Farm #2 is a non-profit that rescues multiple types of farm animals, and their feed costs reflect that inclusion.

Figure 24: Yearly Feed Spending by Farm (Excluding Farms #2, #5, #7)



This figure excludes Farms #7, #5, and #2 so the scale is not skewed, making it easier to understand how much the majority of farms spend on feed each year. These 15 farms all spend under

$12,000 annually, with most of them (nine farms) spending less than $8,000. Only three farms report spending roughly $4,000 or less. The next figure compares these feed costs to herd size for a closer look.

A few farms noted that their current spending is significantly higher than it was just five years ago. One farmer said “ever since 2020, prices have been … an insane roller coaster”, and another described how they used to make their own cost-effective grain mixes “until after COVID happened, the prices of just the raw grains nearly doubled.” Rising input costs are visible across livestock agriculture, with corn, sorghum, oats, and barley having reached their highest prices per bushel in 2022 since 2013 (Collins, 2022). In the dairy cattle industry, feed prices for forages and grains were higher in 2021 compared to the 2019 and 2020 seasons (Penn State Extension, 2021). Limited information is available specifically for dairy goat feed.

Additionally, one farmer said they have had to cut their herd in third to be able to afford to feed them at the same level, and another emphasized a recurring theme of increased feed use during the winter months in response to the question about the most expensive cost of their operation: “Probably, probably is the feed. You know, the hay through the winter … that's not cheap … We do our own, almost all of our own vet, necessary vet actions. We do the vaccinations, we do our own hoof trimming. We do all of those things. So that's, you know, that we keep those costs relatively low.”

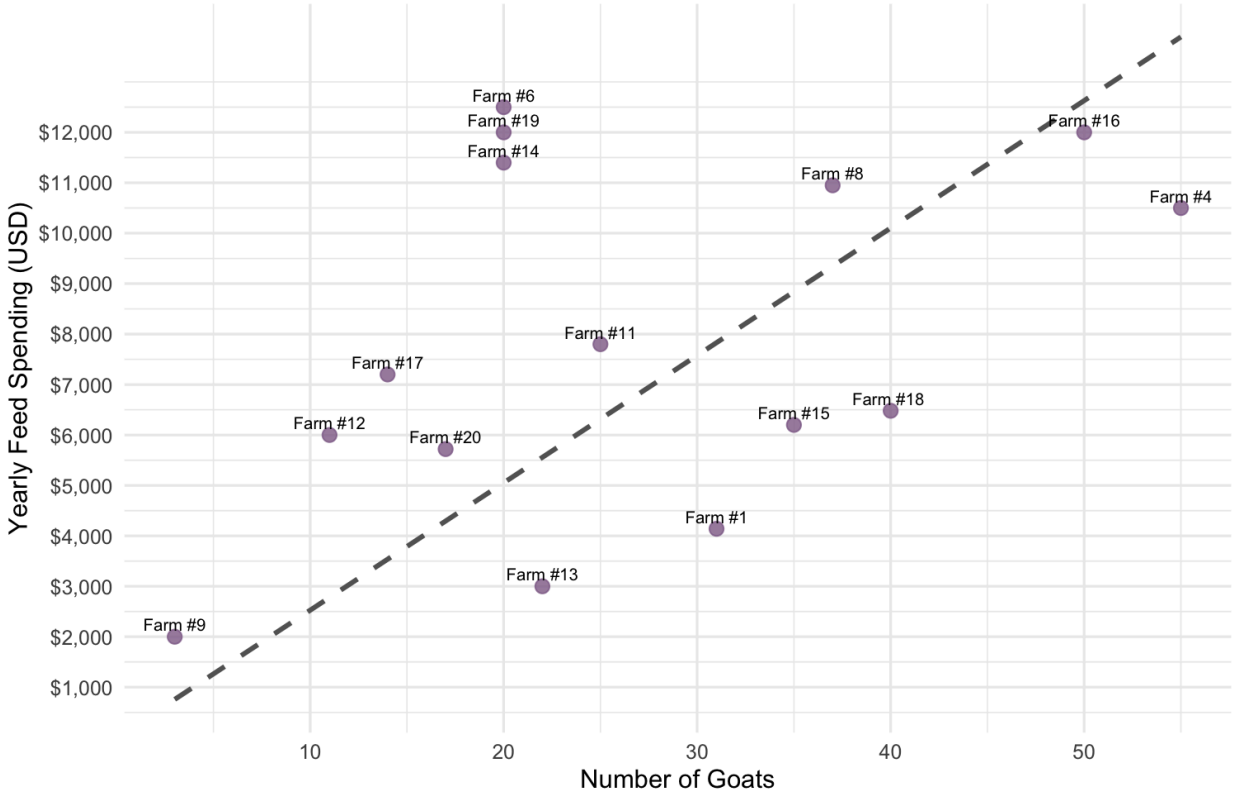
Sometimes the unexpected happens, though, and farmers, who are often both the business owner and the most reliable employee, take the brunt of the consequences. When something goes wrong, they are the ones who end up paying for medications, extra feed, and whatever is needed to keep the business running or the animals alive. For example, one farmer experienced an extreme weather event that brought down eight 50–60 year-old trees right onto their baby pens, completely destroying the fencing and making them unusable. Beyond the cost of clearing the trees and rebuilding, the change in feed needs was significant: the trees had provided leaf litter as nutrition, and with foraging space suddenly reduced, hay had to be supplemented.

Farm #6 spends the fourth most on feed annually and is the top spender in this non-skewed group. The farmer explained the reasoning behind these higher feed costs:

> You know, it's insane, but make sure I'm being clear here. I am a show herd. My goats are very well fed, whereas others may not be. So I have a very high, a very low tolerance for thin

goats ... Right? So we feed a lot of food. Alpines in particular need more food than any other breed out there to maintain weight. There's a thing called body condition. And they rate it from one to five, right? I want to see my goats in a body condition 3 all the time. 24/7, 365 days a year.

Figure 25: Relationship Between Herd Size and Yearly Feed Spending (Excluding Farms #5 & #7)



There is a slight positive correlation between herd size and annual feed spending with a few visual outliers and clusters. Farms #5 and #7 were excluded as they each reported spending over $80,000 which would make the figure difficult to read and the reasoning for their spending was explained above. Farms #12, #17, #20, #11, and #4 most closely follow the correlation. Farm #9 spends the least on feed and is also the farm with the smallest herd size, which is what was expected.

There are two primary clusters, one above the correlation, and one below. Farms #6, #19, and #14 are grouped together with about 20 goats each and spending between $11,000 and $12,500 annually. Farm #6 is quoted above explaining their reasoning for their heightened feed costs. Farm #19

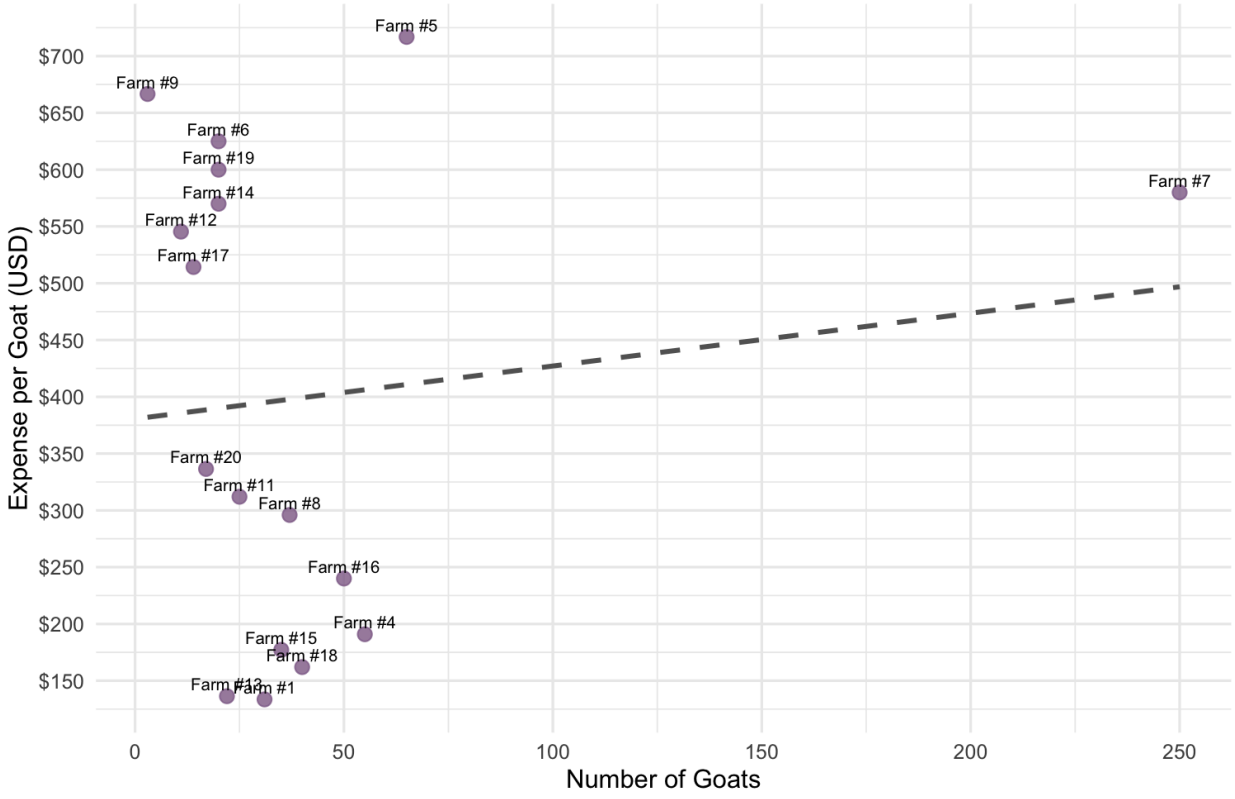
prioritizes the most expensive alfalfa pellets for protein intake, and Farm #14 feeds primarily hay for their does that choose to stay in and right around their barn.

On the underside of the correlation, Farms #13, #15, #1, and #18 form a loose cluster that follows the general pattern of spending less annually on feed than predicted by the trend line. Farm #13 does not offer grain, which is likely a major cost saver. Farms #15 and #18 employ rotational grazing, which may reduce the reliance on purchased feed (shown in the figure below). Farm #1 does not employ rotational grazing and does offer both hay and grain, but their goats are still on pasture and they explained their operation as the following:

> The biggest thing with my pasture is we would rotationally graze if we were overstocked, but we're understocked, and by a lot. So, our goats usually don't pass over the same spot within 24 to 48 hours, usually … It's an eight acre pasture … I still have a bunch of yearlings, some babies, and I have a bunch of adults. But our stocking ratio for our county, we should be right at it, but we're very much underneath it because I'm having to go in and cut the pasture, to keep it Maintained.

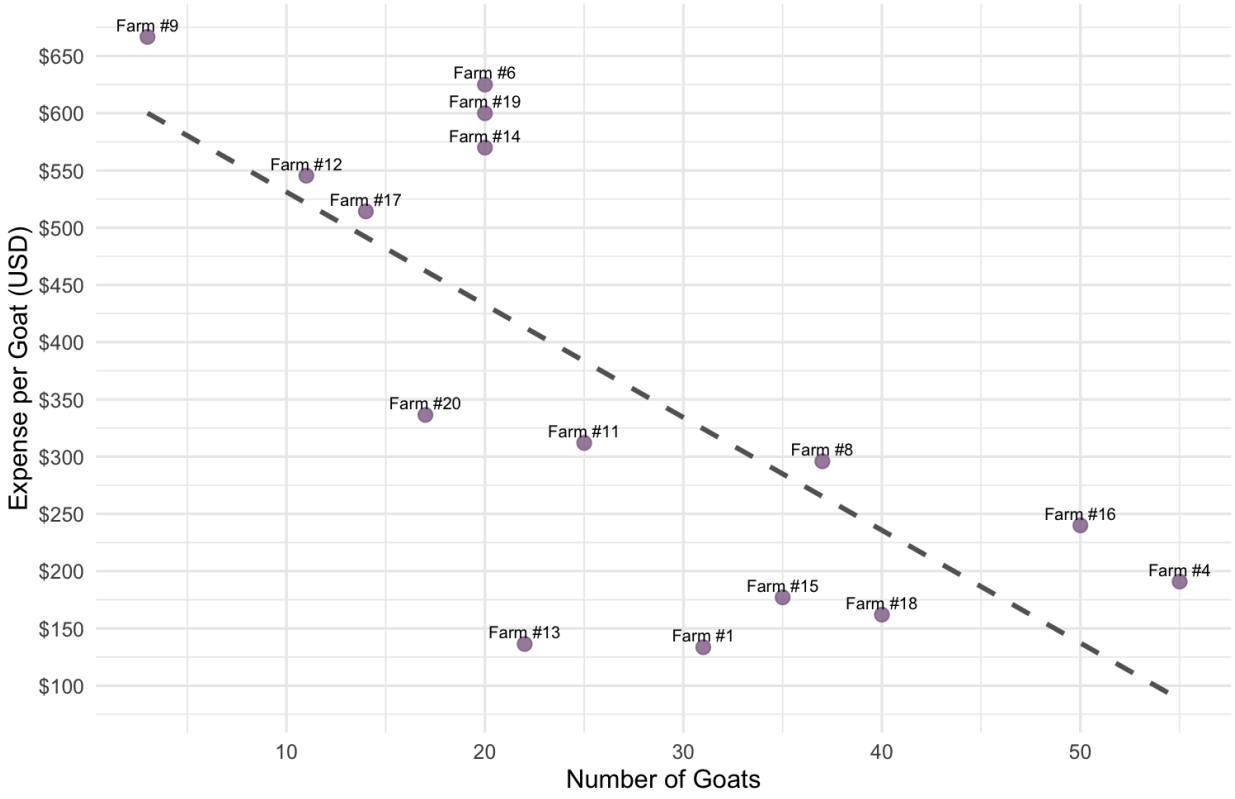
Farms #8 and #16 are above the correlation on the higher end of herd size and feed spending, but are not very far from the correlation line. Farm #8 also prioritizes the alfalfa pellets for protein, and Farm #16 emphasized grain as their highest operation cost, saying, “I do feed grain because I feed grain when the girls are in milk. And my dry side gets a little bit of grain each day, and that's only just to keep them quiet, because when I go to feed everybody else, they yell.”

Figure 26: Feed Cost per Goat



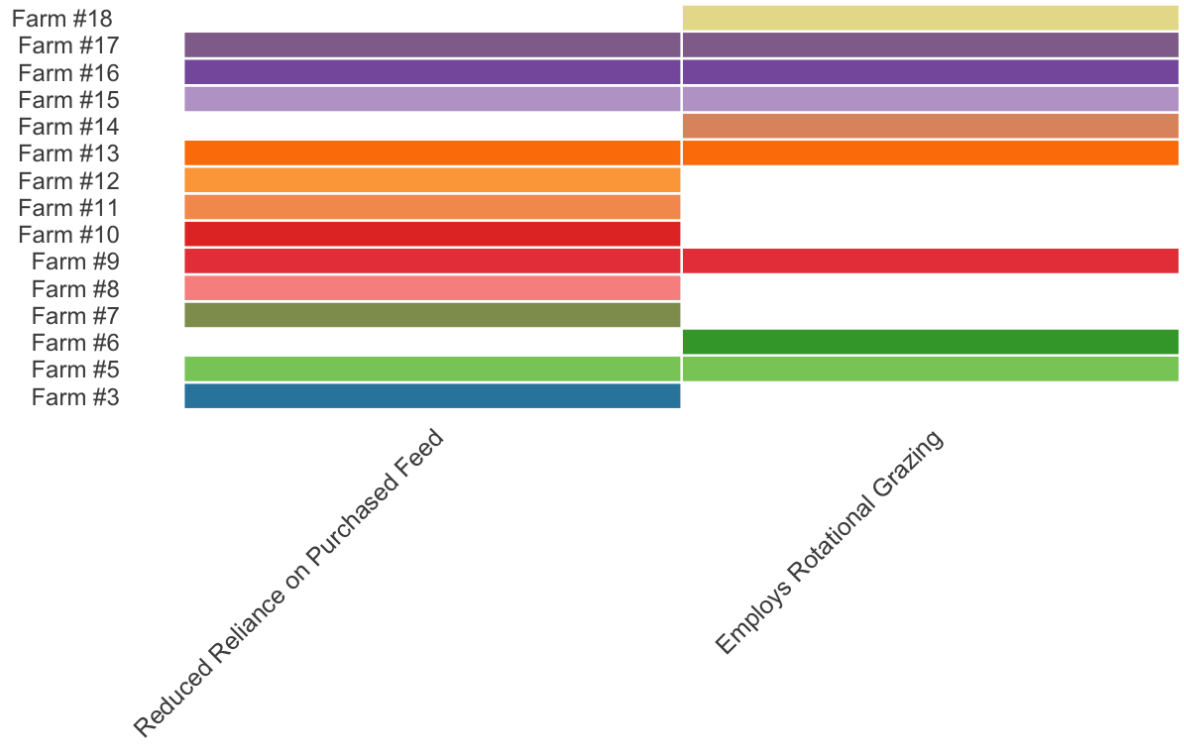
The figure above shows feed costs broken down per goat. Costs vary widely, from under $150 to over $700 per head, though some of the higher values may include feed expenses for other livestock on a few farms. This represents a very rough view of feeding costs per goat. The figure below excludes Farms #5 and #7, providing a clearer picture of what the majority of farms spend per goat in their operations.

Figure 27: Feed Cost per Goat (Excluding Farms #5 & #7)



In future studies, it would be helpful to examine cumulative cost breakdowns and detailed budgets. However, most of these small farmers did not track expenses in a formal way. They were generally able to provide only rough estimates of feed costs and could not specify how much each item contributed to the overall expenses. In the figure above, the trend line shows that as herd size increases, the cost of feed per goat decreases. Larger herds may allow farmers to buy in bulk, often allowing for a lower cost per unit of hay, grain, etc.

Figure 28: Rotational Grazing Impact on Feed Reliance



To understand how rotational grazing, and broader pasture management, fits into a farm's nutritional system, farmers were asked how foraging, grazing, or browsing impacts their reliance on purchased feed. Twelve farms said that giving their goats some access to pasture reduces how much feed they need to buy, including a few others that noted that if they were able to use pasture more, they believe it would reduce their reliance as well. Two farms said it does not reduce their reliance. These answers were plotted alongside whether each farm uses rotational grazing. Six farms were either not asked or did not respond to this question, so their input could not be included.

Among the farms that said forage does or would reduce reliance on purchased feed, six currently use rotational grazing. Only one rotational grazing farm answered "no," and the other two rotational grazing farms fell into the group that did not respond. The farmer that said "no" explained that their feed purchases occur mostly in the winter, when their goats are not grazing, regardless of pasture management.

One other farm, the second “no,” does not use rotational grazing. This farm manages a show-focused herd and emphasized the importance of high-quality purchased feed for maintaining production:

> [T]heir milk production in particular is going to drop. If you take a show quality herd that's producing, say, say one particular doe, and she's producing one and a half gallons in a day, and you cut her green out, you cut her extra alfalfa, and you put her on pasture, she's going to be down to three quarters of a gallon. Just by changing what she's eating, because she's not getting the nutrition and the protein needed, and the calcium needed to produce all of that milk.

One of the farms that did not respond directly to the question did mention wanting to expand their pasture in the future so their does could be on a rotational system, which suggests they view pasture as a productive and worthy feed source.

For the farms that answered “yes,” several elaborated on what that reduction in purchased feed looks like. One farmer explained that their goats stay out grazing longer when placed on fresh pasture and are less motivated to return to the barn for grain. They also shared a recent example:

> [A] real good example is like, so a couple, probably about two months ago or so we had just fenced in our wooded area. So we hadn't opened it yet because I still had a lot of real little babies … So we had them in one of our other pastures, but … they had eaten down so much that they weren't going out and eating. And I noticed the decrease in the milk production … So we moved them to the woods and the milk production went back to normal.

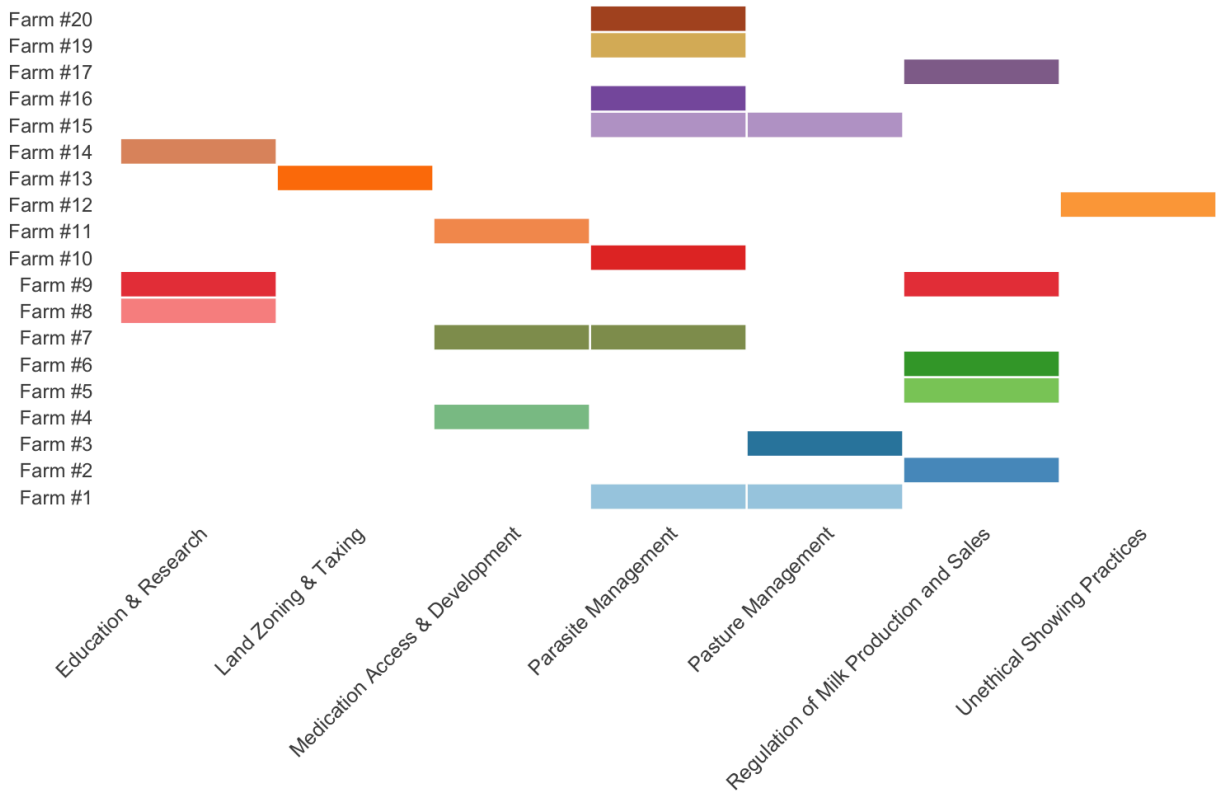
Another farm summed it up simply: “Yes, definitely. Yeah. You would notice a huge difference, especially in the summer, not having to buy so much hay.” And finally, one farm responded “yes” in a more theoretical way, as they explained that once they are able to free up additional land, they plan to plant legumes to reduce their reliance on purchased feed.

Miscellaneous

To wrap up the interviews, the farmers were asked a few closing questions to gauge broader perceptions and feelings about running a dairy goat operation. The first two questions focused on farmer priorities, specifically, what they would want others to know about dairy goats and how they would use grant money on their farm. The third question asked about the support systems available to dairy goat

farmers in their regions and communities, which proved especially interesting as more experienced farmers reflected on how these networks have changed over time. Overall, these questions confirmed earlier patterns that emerged throughout the interview and also offered new insights the priorities and challenges farmers are navigating today, as well as how these have evolved.

Figure 29: Farmer Opinions of News to Spread



Nineteen farmers were asked what piece of information would be most important to them to spread to policymakers, new farmers, or researchers about managing dairy goats in their region. Their answers were grouped into seven categories: Pasture Management, Parasite Management, Antibiotic Access & Development, Regulation of Milk Production and Sales, Education & Research, Land Zoning & Taxing, and Unethical Showing Practices. Five farmers mentioned two topics, and so both of their responses are represented in the above figure.

The most common group the farmers' responses fell into is Parasite Management. When coding the language from these interviews, a strong pattern emerged of farmers talking about parasites almost

as much as they discussed nutritional systems, the focus of these interviews. Because of this common concern, it is not surprising that most farmers would like to share information about management practices related to herd health. While one farmer discussed isolation pens to prevent parasite spread from new goats to existing herds, another shared this powerful statement:

> I would like to hear, you know, more on lespedeza and parasite management. I would like to hear more on what is Pfizer doing to come up with medication specifically for goats as opposed to just cows and pigs. You know, focus more on the animal that is probably the largest growth farm animal in this country and has been for eight years as the dairy goat. And yet we are still in this stagnant disregard to them as an economic influx in this area.

Regulation of Milk Production and Sales is the second most common group with diverse responses from farmers. One farmer urged for lessened regulations on producing and selling raw milk, saying that in their state, “[W]e're restricted on how we can sell it and where we can sell it, how many animals we have, you know, we can only have nine milkers at once if we're selling raw milk from the farm.” Another farm agreed that policymakers should continue to allow the sale of raw milk due to its importance for the raising and rehabilitation of other animals. However, one farmer spoke out about needing increased regulations for raw milk and explained:

> Right now, you pay $40, you get a permit, and get your label approved, and you can sell raw milk all day. I totally disagree with this, because, I mean, from day one, we started testing, for all zoonotic diseases, it's for all diseases … What I am lobbying for is a vet inspection of the animals at least twice a year … There's people selling milk that their animals have never been seen by a vet.

Another farm shared about struggling with the Grade A regulations, including regular antibiotic testing despite not using antibiotics. They plan to continue providing goat milk for their community, but the regulatory expenses have made it difficult.

Multiple groups included answers from three farmers. Medication Access was grouped independently from Development from Parasite Management because it is a specific topic that should be discussed separately, and some farmers also specifically mentioned antibiotics which do not pertain to parasite management. Throughout the interviews, discussing the use of on-label versus off-label became

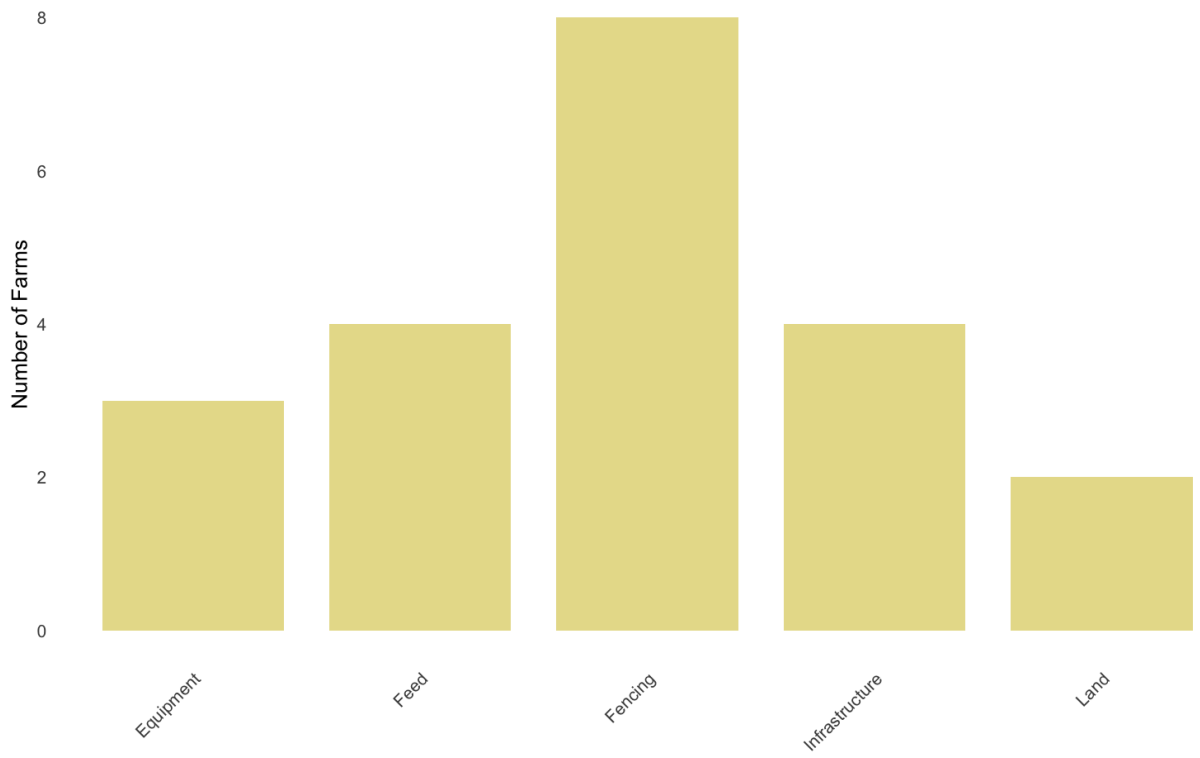
a prominent pattern, and one farmer emphasized the difficulty of this disparity: “We just don't have anything available to us on-label, and it is really challenging because we [have] to make some really hard choices. Nobody wants to over medicate, but at the same time, it is tough.” Another farmer urged the FDA to approve more medications for goats specifically so that farmers in the United States do not have to rely as heavily on foreign countries for goat-related research and basic information. By increasing approved medications, this farmer explains that they will have access to quality medicine as it is needed, which is not currently the case.

Within the Pasture Management group, opinions varied about what was most important. One farmer just wanted to share that goats are a good livestock choice for small farms with proper fencing, while another mentioned the need for more programming through extension offices to teach about pasture management. A third farmer shared:

> Spacing is one of them. Understanding that if you're going to have goats, you need to have the right spacing. There's too many people that put so many goats on such a small amount of land. I don't like the dirt lots. I get the point of them, but I don't, I just don't think it's good for the animal. But I would say spacing is one thing. If you can get, if you're going to have a herd of goats, make sure that they can graze properly.

One farmer expressed frustration and confusion with land zoning, as they are zoned residential and have struggled to be taxed as agricultural land. Another farmer shared that they do not agree with raising dairy goats for show while wasting dairy outputs. While both of these issues were only mentioned once, they still felt significant and tied into broader topics of land management and showing goats. Together with the other categories, these farmer comments highlight a wide range of perspectives that could help guide new farmer development and support the creation of informed management plans.

Figure 30: Grant Priorities



Nineteen farms were asked what they would invest in first if they received a grant tomorrow to improve their grazing system. For many farms, this question was opened to include any part of their operation, since some farmers struggled to think only in terms of grazing. Their responses were grouped into five categories: Equipment, Feed, Fencing, Infrastructure, and Land.

Fencing was the most common response. One farmer said they would invest in Electronet to start rotationally grazing their herd, similar to another farmer who wanted additional fencing to create smaller pastures for more effective rotation. A third farmer mentioned investing in an existing software that uses GPS-controlled boundaries and collars for goats, essentially eliminating the need for physical fencing.

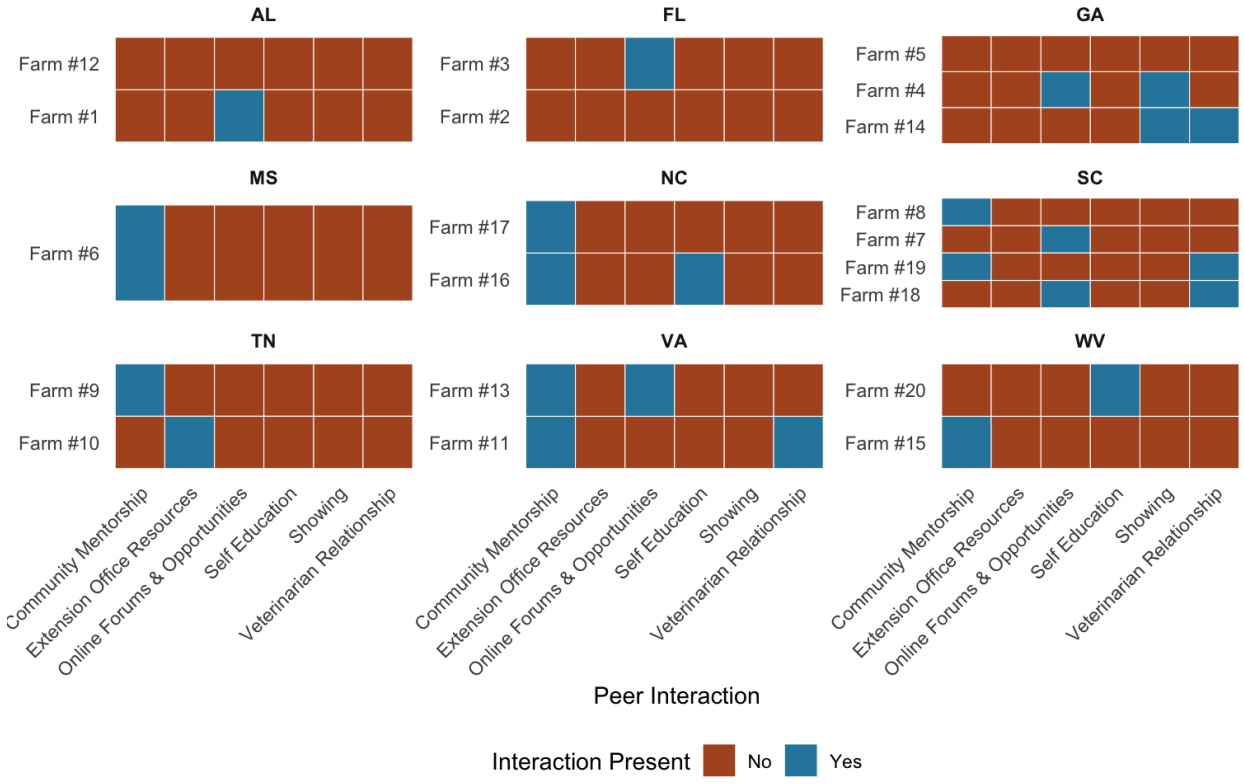
Infrastructure and Feed each had four responses. Within Infrastructure, two farms said they wanted new buildings to be able to separate does from kids, and another farm wanted ventilated hay storage so they could store western alfalfa without worrying about mold. Under Feed, one farmer wanted to seed more Austrian winter pea in their pastures, and another wanted to plant alfalfa or peanut hay. A third farmer added that they would support “researching varieties of alfalfa that would be more hardy to

the climate here in the South" to "help those farmers really reach the pinnacle of alfalfa growing because if you're going to keep dairy animals, I mean, that's your best bet."

Three farmers mentioned Equipment. One wanted an aerator to improve their pasture seeding system, and another wanted a small tractor to help around the property. A third mentioned a tractor attachment to lift fencing back up after trees fall on it. This last farmer technically has the attachment but cannot physically do the labor, so although this appears in the Equipment category, it reflects a human-labor limitation as much as an equipment need.

Finally, two farmers identified Land as their main priority. One hoped to acquire additional acreage to prevent overbrowsing, while the other wanted to clear existing wooded property to make the areas safe for their goats to browse.

Figure 31: Peer Interaction Types by Farm and State



Often the last question asked of the farmers was about peer-to-peer learning, and it quickly became clear that this was a topic of great interest. The plot above breaks down farms by state and

classifies, with a blue box, when the type of peer interaction listed beneath it was mentioned during the conversation. Based on farmers' responses, their answers were grouped into six categories: Community Mentorship, Extension Office Resources, Online Forums and Opportunities, Self Education, Showing, and Veterinarian Relationship. Several farms mentioned more than one type of interaction, as seen above with multiple blue boxes in the rows of those farms

Farm #2 was not directly asked this question, so it is not included in the plot, however, mentorship did come up repeatedly in the interview, particularly around herd health. Farms #12 and #5 were asked this question, but their answers focused solely on nutrition and did not relate to peer interactions; therefore, they are not classified in the plot.

Overall, nine farms mentioned Community Mentorship across Mississippi, Tennessee, North Carolina, Virginia, South Carolina, and West Virginia. In both North Carolina and Virginia, two out of two farms referenced Community Mentorship, and, in South Carolina, two of four farms did as well. This may point to a more interconnected dairy goat community in the Carolinas and Virginia region. One farmer noted simply that learning from people who have been in the industry longer is always the best course of action, and another farmer shared:

> [E]verybody I went to was super helpful, would show me around their facilities and show me around their farms. And one of them actually I became very good friends with, and I bought some of my goats from them. And he … actually comes here three times a week and helps … [W]e do things like stall clean up and stuff like that because I just don't have time.. So he kind of works here three days a week, but when I first started … I met him and his mom. They own a little goat farm like 20 minutes from me.

Furthermore, a pattern emerged in conversations with the farmers in which several of those who are more experienced said that while they did not have many mentors when they were starting out, they have since shifted into that role for newer farmers in their area. One farmer explained, "I stay at the top of that. Like I have a lot of influence over about a half a dozen local breeders. You know what I mean? Like, we all kind of do things the same way. I mean, not all of us, all of us, but, you know, we all have kind of management styles and actually share bucks with some of those people." These farms have become

models for other dairy herds, helping share and spread the knowledge they have accumulated over decades.

Six farmers shared responses that fell into the Online Forums and Opportunities category, represented across Alabama, Florida, Virginia, Georgia, and South Carolina. Two of four South Carolina farmers mentioned using these online resources. One farmer talked about reading through forums on the American Dairy Goat Association (ADGA) website, while another described taking advantage of the surge in webinars during and after the COVID-19 pandemic. A few farmers specifically mentioned Facebook, and one shared:

> I mean, you know, social media helps a lot. I mean, while social media is a pain in the rear for the most part, it is also, I mean, it is the Wiki of every subject in the world, right? I mean, if you read quickly and you can kind of devour information fast, I mean, you can move through [a] tremendous amount of stuff just reading what other people are talking about and watching, you know, for patterns and clues.

Veterinarian relationships came up in conversations with three farmers: one in Georgia and two in South Carolina. This was somewhat unexpected, since many farmers interviewed talked about the challenges of finding goat-specific veterinarians. One farmer credited their veterinarian with helping them design an isolation pen system to reduce parasite transmission. Another farmer described their veterinary relationship in more detail:

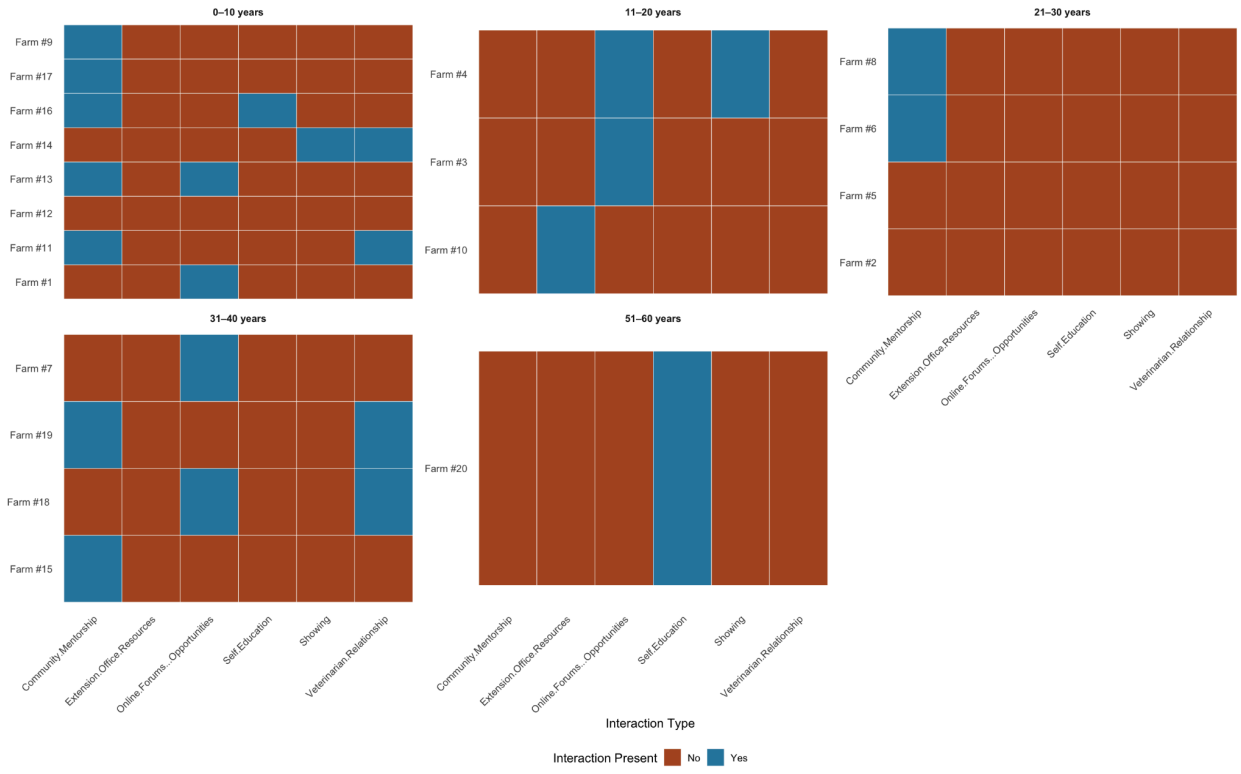
> But my greatest resource has been my vet. So I have found that it's a little different than when you take a dog or a cat to a vet. When you have that client relationship, their goal is to not have to come to your house for very often … Their ultimate goal is to train you, teach you to independently know what you're doing … And so truly my vet has been my number one resource when it comes to learning how to manage the herd properly or how to troubleshoot …

Showing was mentioned as a major source of peer learning by two farmers in Georgia. They described shows as opportunities to meet other dairy goat farmers, see their herds, and talk about different management styles. One farmer referred to it as being “barn blind” at home and then getting “an opportunity to evaluate, you know, how our herd looks and performs compared to other herds.” Shows

provide a place where collective knowledge can be shared, questioned, debated, and absorbed by both new and experienced farmers, without having to go searching for information online or elsewhere.

Two farmers mentioned forms of Self Education rather than peer interactions, which felt equally important to highlight. These included going to the library and reading books, as well as simple trial and error, which is something that is likely part of every farmer's story when starting out. And, finally, one farmer noted that they rely on their extension office's resources.

Figure 32: Peer Interaction Types by Farm, Grouped by Experience



This plot shows the same peer interaction types, but by years of experience instead of by state. One pattern that stood out was that Online Forums and Opportunities were only mentioned by farmers with less than 31 years of experience. Those who started their operations more than 31 years ago responded that they tend to rely on trial and error and their local community instead. It was also only farmers with fewer than 11 years of experience who mentioned Veterinary Relationships as a major peer interaction. Additionally, those with less than 11 years of experience mentioned Community Mentorship more often than farmers who have been in the industry longer.

DISCUSSION

The purpose of this project was to compile information from dairy goat farmers in the Southeast to understand management practices, including the decision-making behind them and how they were either similar or dissimilar across the region. In a time of mass development and growing threats to farmland, a smaller dairy livestock alternative to cows requiring less land and labor is a possible solution for maintaining self-sufficiency and locally-sourced dairy products. In this discussion, the overarching themes and patterns pieced together from the interviews of 20 dairy goat farmers in the Southeast are explained, which will serve as foundational data for an open-source dashboard of community advice and experience, as explained below in the dissemination plan.

Throughout this study, primary themes presented themselves and became evident through real-world management examples and shared experiences from the farmers. These shared perspectives shed light on how dairy goat owners across the region manage their herds despite a lack of United States-based research, and especially a lack of information pertaining to dairy goats in the Southeast. While there were some differences of opinion on various topics, such as hay feeding and copper bolusing, the associated thoughts and beliefs were highlighted to allow other farmers who read this information to make their own informed decisions, as well as to understand how regional practices differ across the United States and even in other countries where dairy goats systems have been around much longer and are more engrained into society.

This study began by examining farmers' backgrounds to understand why they chose to raise dairy goats and what infrastructure made their operations possible. These details provided context for later analyses, helping determine whether experience level or herd size, among other factors, influenced management decisions. Although experience ranged from four to 52 years, it was not a reliable indicator of management styles or financial decisions. Personal dairy use was the most common motivation for owning dairy goats which reflects a trend toward nutritional self-sufficiency and an interest in raw milk.

Accessibility was another recurring theme, as dairy goats were described as a more easily manageable livestock animal that is a practical choice for hobby or small-scale dairy operations. Motivations also shifted over time as several farmers who began with goats for personal dairy use eventually developed small businesses centered on dairy products. Nigerian Dwarfs were a common

breed among the farmers who wanted family dairy animals due to their small stature and quality milk, while others discussed decisions on breed type with reference to milk composition, flavor preferences, production goals, and temperament.

The weak relationship between herd size, which varied greatly, and acreage suggest that land availability does not independently determine stocking decisions. Instead, farmer preference and operation type likely influenced stocking rates more and, thus, nutritional systems were set up to adjust to these preferences.

Through the foundational questions discussed above, the farmers expressed a theme of adaptability. Without specifically identifying that trait, this pattern was seen through the interviews of farmers discussing how they respond to their environment, business opportunities, land growth, and breed needs, constantly learning to be flexible and, in turn, evolving their management systems.

A primary goal of this study was to understand and elucidate how farmers use grazing and browsing systems, especially rotational grazing, to support a natural dairy goat diet while taking milk production into consideration since it is a priority for many farmers who raise these livestock. While those topics were present, it quickly became clear that nutrition is just a single part of a much larger web of management practices that are influenced and defined by health, land, weather, and individual farmer experiences. The inconsistent language around rotational grazing suggests that many farmers use rotations as part of their system, though more through trial and error rather than creating an intentional system. The variation in the discussed rotation systems also suggests that farmers are tailoring rotation schedules to their land's regrowth, but also highlights a broader need for extension resources that help individualize grazing systems for small farms.

In addition to grasses as the most commonly mentioned pasture feed source, many farmers also either mentioned or described in more detail wooded areas and browse. This suggests that goats in pasture-based systems have access to a more diverse and species-rich diet. The ability to browse on such a wide diversity of plants reinforces the role of goats in ecological management, particularly for controlling undergrowth and invasive species, including kudzu in the Southeast. A trend also appeared in which farmers who used rotational grazing systems were more familiar with the plant species on their

land, pointing towards ecological knowledge as a large influence in pasture and land management decisions.

Nearly all farms utilized hay in some capacity, but its role in nutritional systems ranged from a primary feed source to seasonal supplementation depending on pasture growth and quality, climate, and farmer preference. Coastal bermudagrass and orchardgrass were considered the most accessible and affordable options among farmers. At the same time, alfalfa emerged as a clear favorite that many mentioned they would use more often if it grew well in the Southeast. In addition to hay, most farms also supplemented with grain which acts as a consistent protein source to support dairy production. Farmers mentioned adjusting types and amounts based on life stage and animal needs, which, like hay, makes grain a flexible feeding source in periods of seasonal variability and inclement weather.

Farmers' long-term weather perceptions differed greatly: from opinions from some that average temperatures are rising causing warmer summers to others who believed that weather is cyclic with natural changes between colder/dryer and wetter years. These perspectives reflected the very subjective and regionally-specific views of climate. Regardless of perception, nearly all farmers discussed adjusting nutritional systems seasonally or based on short-term weather occurrences, including rain. These adaptations included feeding more hay and grain at certain times of the year, especially in response to a widely reported avoidance of moisture in goat herds. These variations and responses to weather represented nutritional flexibility for farmers, responding to environmental needs of their goats. As the Southeast prevailed as the most climate-vulnerable region in the country in the literature, the lived experiences of farmers detailed throughout this study showcase the need for localized adaptation strategies and continued flexibility.

The uniqueness of the region with sub-tropical characteristics, including high heat and humidity, make herd health especially difficult to manage. Mineral supplementation is foundational for health, ensuring goats receive the micro- and macro-nutrients they would otherwise naturally attain in a wild browsing environment, and a strong preference for loose minerals reflects many farmers' belief that goats can self-assess which minerals they are deficient in and seek them out as part of their diet.

A trend appeared among a few farmers of increasing diagnostic approaches for health and parasite mitigation, including fecal tests and mineral panels. Diagnostic gaps still persist, though, as many

others mentioned a sole reliance on FAMACHA scores which can contribute to under- or over-supplementation without proper diagnosis of a mineral deficiency or overdose. Widespread use of copper boluses as both a copper supplement and a parasite mitigation strategy became a theme among farmers, especially in response to the naturally copper deficient soils in the region, though opinions on use timing differed.

Parasite pressure remains a core health concern among farmers, facing an increased regional pressure due to the hot and wet environmental conditions. The dominance of barber pole worms strongly influences health decisions, including which supplements to use, as well as overall nutritional programs. Two camps emerged in terms of grazing for parasite mitigation: rotational-grazing to allow goats to “eat up” off the ground with varied nutrients and dry-lotting herds to avoid re-ingesting parasite larvae off blades of grass. In response to parasite infestation, farmers agree that de-worming, or treating with anthelmintics, on a schedule will increase resistance within a population, but opinions on when to worm varied between those who offered anthelmintics at vulnerable times of year or life stages versus those who wormed sparingly and only in response to serious health issues.

Overall, a strong theme emerged emphasizing the reliance on farmer observation of their herd to understand individual goat health to identify issues as they arise and knowledge of anthelmintics and other parasite mitigation strategies. Additionally, relationships with veterinarians are necessary for multiple reasons, including that they have been required for writing prescriptions for antibiotics since 2023, and continued community education through resources like extension offices are critical for spreading important and updated parasite management information.

A major factor influencing both herd and individual health in dairy goats is breeding for quality genetics. Around the world, research continues on modifying genes to improve udder morphology, overall health, and other traits important for production (Barillet, 2007). However, within the scope of this study, farmers were less focused on these production-oriented traits. Instead, their primary concerns were breeding for parasite resistance and controlling the number of kids each doe produces.

Across farms, feed consistently emerged as the defining financial burden, with many farmers emphasizing high quality feed as a strategic investment in herd health and dairy production. This was true for farmers who relied heavily on rotational grazing as well as those who used hay as a year-round

primary feed source. Regional limitations further influenced the farmer decisions of feed sources and how to balance purchased feed with pasture-based systems as farmers pointed out that Southeastern-grown hay cannot match the nutrient quality of Western hay. This drove many of them toward prioritizing more expensive options like alfalfa pellets, suggesting feed as a priority expense among the farmers.

Weather conditions also played a notable role in influencing feed reliance. An unusually wet summer, increased snowfall, or extended cold spells often pushed farmers to supplement with additional hay, increasing feed costs. Even farmers who pasture their goats for most of the year described winter as a season of increased dependence on purchased feed, with many keeping their herds in their barns to avoid the snow and cold. The price volatility since 2020 was mentioned by multiple farmers, leading them to budget higher feed costs and cut expenses in other areas, including going so far as to reduce their herd size. This goes to show that feed expenses are not only influenced by farmer preference and management style, but by uncontrollable economic and environmental pressures.

Finally, most farms reported rotational grazing as a method to reduce feed costs, except in the cases of show herds and farms that moved their herds inside during the winter. This suggests that, when it is feasible year-round, rotational grazing is one of the most cost-effective feeding systems for small- to mid-size dairy goat operations.

Each interview was concluded by asking farmers a series of theoretical questions. When the farmers were asked what piece of information that they would most like to share about dairy goats, issues and advice revolving around parasite management was the most common answer. This suggests a persisting problem with herd health in terms of parasites, which is, again, not surprising. Rhetoric around this topic seemed like each farmer had to go through a learning period of parasite management and others would greatly benefit from a centralized source of science-backed information to reduce preventable illnesses and fatalities.

When asked what they would prioritize if they received a grant, the most common answer had to do with fencing. While this initially sounds like a basic infrastructure investment, fencing also opens doors to improved pasture management, and, ultimately, better herd health from proactive parasite management. Fencing, however, is an expensive initial cost that many farmers mentioned as a barrier to improving their nutritional systems.

Lastly, the farmers were asked about their experiences with peer-to-peer learning opportunities, and how those interactions have, if at all, influenced how they manage their herd, especially in terms of nutritional plans. While Community Mentorship was a theme among the farmers, answers varied with experience level. The results showed a shift toward more community engagement, both with other farmers in-person and online, as well as with veterinarians. This trend is in line with the increased interest in dairy goats in the United States in the past 20 years.

Overall, the farmers in this study were generous with their insights and allowed for a better understanding of the regional perspectives relating to nutritional programs and parasite management strategies, the primary topics of interest among the interviewees. These individual thoughts, beliefs, and opinions came together to form patterns that tell a story about what it means to manage dairy goats in the Southeast. From this information, along with parsing through the related scientific literature, some recommendations have been developed for dairy goat farmers in this region below, along with a plan to make these data and recommendations open access for farmers not involved in this study.

Dissemination Plan

Upon completion of this paper, a copy will be sent to each of the interviewees. Beyond this review, the information gathered through the interviews will be compiled into an open-access website for other dairy farmers to be able to obtain region-specific advice, expertise, and knowledge from peers. This website will include a dashboard with a map that allows anyone interested to click on a state and read what farmers who live there are currently implementing on their farms and for what reasons. It will also include a general information section, broken into topics, much like this paper, with visualizations similar to ones presented above. Furthermore, there will be a forum to allow farmers to write extended answers or posts about why they choose certain management decisions to share with others who might benefit from the information. This paper will serve as a strong foundation for future targeted work in the Southeast.

Recommendations

The primary problems for small- to mid-size goat dairies in the Southeast are parasite prevention and mitigation, as well as the creation and implementation of individualized nutritional programs. These

are separate issues, but they are often intertwined depending on management style, as nutrition directly affects a goat's likelihood of ingesting parasites and its immunity to protect against occasional parasite exposure. Two types of recommendations to combat these problems are a) proactive approaches for new farmers and b) action items for current dairy goat owners. This section also includes other management suggestions based on farmer responses from this study. All recommendations are presented in the context of dairy production herds rather than show herds. These recommendations were curated based on the literature review as well as the opinions of the farmers interviewed, combining peer-reviewed science with field experience.

For those who do not currently own dairy goats but are looking to add a personal dairy animal or livestock to a small farm, understanding the differences between breeds before purchasing is vitally important. Some of these breed-specific differences have been discussed throughout this paper, but the key aspects to consider are size (dwarf versus standard), milk composition and flavor, temperament, and climate adaptability. These differences have various impacts, so considering goals and lifestyle preferences will help farmers make the best decision for their operation. Dwarf breeds can be kept more easily on smaller pastures, and Nigerians are known for their high butterfat content, which is appealing for those interested in dairy output. For larger tracts of land, full-size breeds, such as Saanens and Nubians, can perform exceptionally well for dairy purposes. Nubians, however, are a British breed with African origins and may not adapt as well to harsher winters, though they will happily lay in direct sun on hot summery days. Saanens, on the other hand, are a Swiss breed, which makes them hardier in cold weather but more inclined to stay in the shade when the sun is at its peak. Swiss breeds also evolved to climb the rocky terrain of the Alps, meaning their hooves grow quickly and require frequent trimming if they are not kept on land with rocks or other hard surfaces that wear them down. There are plenty of other breeds and differences among them, not to mention crosses. Breeders can also offer detailed descriptions of their herds' behavior and health to help make an informed decision.

When choosing a breeder, it is important to ask about their management preferences to prevent purchasing dairy goats with pre-existing issues. In addition, learning basic health indicators, such as body condition score, is a necessary tool to effectively assess goats at other farms and choose quality animals. Purchasing dairy goats from a breeder who routinely deworms every six months, for example, will likely

result in a herd with minimal parasite resistance due to built-up immunity. Responsible breeding includes a motivation to improve herd health dynamics and sometimes even removing animals with anthelmintic resistance or a heightened predisposition to parasite infection.

After selecting a breed of goat, the next step is to create a land management plan based on farmer preference, lifestyle, and budget. While there are mixed opinions on optimal nutritional programs, the general consensus is to match a natural browsing diet as much as possible, supplementing with minerals and protein based on production needs. This does require wooded and shrubby land, so individuals interested in keeping dairy goats in the future should consider this when looking for property. Depending on herd size and preference, a few pastures or plots can be fenced to combine grass and wooded areas within each space, which allows for shade and a more varied diet for the goats. Most farms in this study had fewer than 50 goats, so, using the rough estimate of 0.2 acres per goat, five goats per acre is the ideal stocking rate. However, if the herds are being moved frequently, slight overstocking for short periods can still be healthy, especially with additional browse in wooded areas.

For a 50-goat herd, splitting them between two five-acre plots works well, with a total of four five-acre plots (20 acres of land) with two acres that are actively grazed while the other two are resting and regrowing for at least three weeks to break the parasite cycle. More plots are even better, or smaller plots moved more often. Ultimately, stocking rate and how long goats stay on a plot will vary by farm and require close observation. If goats are going to stay in one area for a few weeks, they must be eating off the ground so they are not re-ingesting parasites from the grass. One way to do this is with constant, plentiful access to browse from shrubs or trees.

For farmers using rotational grazing, it is recommended to plant winter pasture species and keep goats outside as much as possible. Goats are resilient animals that can handle cold and snow, but offering free choice hay and grain 24/7 will tempt them to stay inside more than go out and forage. Providing only part of their diet as supplemental hay will encourage the herd to eat more naturally, browsing remaining live plants, leaf litter, or winter rye, for as long as possible. If those resources are depleted, then by all means, offer more hay.

Dry-lotting goats is not recommended as they need enrichment, and a diverse diet contributes to more flavorful milk. However, if space is limited on a small pasture, bush-hogging consistently or installing

fencing along tree-lines will help goats eat up and off the ground more than they otherwise could and offers some fresh forage in addition to hay and grain. In this case, supplementing more heavily with hay and avoiding goats from relying on grasses where parasite re-ingestion is more likely would be recommended. If bush-hogging, tree-line access, and browse simply are not options, then dry-lotting with an all-hay and grain feeding system is better than relying on grass grazing.

One final recommendation for new farmers is to establish a relationship with a veterinarian who is willing to work with goats before care is needed, especially with the new regulations on purchasing antibiotics. Maintaining trust with a veterinarian can sometimes allow farmers to call in antibiotic prescriptions without a required farm visit, which could otherwise delay vital medications.

For current dairy goat farmers, the recommendations prioritize adjusting management styles for land availability and quality. For those feeding primarily hay-based systems incorporating enrichment activities, both nutritional and otherwise, such as climbing structures, is advised. If possible, bush-hog and offer browse in the goats' pen or allow fences to extend to tree-lines for overhang browse. In these situations, it is important to consider mineral offerings since the goats are not eating a varied, natural diet. In addition, prioritize loose, free-choice minerals as well as a kelp supplement.

For goats on pasture or rotational grazing, it is recommended to avoid creating or reinforcing systems that discourage goats from browsing, as mentioned previously for new farmers. The goats will browse if that is the only or primary feed option, especially if there is tree cover available. It is not necessary to supplement extra hay on rainy days or during the winter if there is adequate forage available outside. Winter rye or other cold-tolerant ground-cover species will allow them to browse during the day year-round to mimic more natural behaviors. In both hay-based or pasture-based cases, stocking rate will be the greatest factor in herd health management. Staying under-stocked allows for more flexibility when moving goats pasture to pasture and helps reduce purchased feed costs.

Finally, for current dairy goat farmers, using proactive parasite mitigation tools are highly recommended, including investing in a microscope for fecal egg counts at home in addition to FAMACHA scoring. Online webinars or classes through an extension office are resources to learn how to perform these methods. Dewormers should be used one at a time and only when necessary. If resistance to one dewormer develops in the herd, it is advised to switch to another drug family that has not been used

previously with the herd. These recommendations can help improve health management, however every farm, including its land and its goats, is different and will require its own individualized system.

In this section, the term “natural” diets is used several times, however it is important to note that using dairy goats for year-round milk production is not natural. As a result, these goats will likely never be able to fully mirror natural conditions. Allowing for a balance of a mostly natural diet supplemented with protein and minerals helps meet both enrichment needs and production demands. Individualizing systems to build this balance and adjusting other factors is a continual process that requires flexibility and a willingness to evolve through both successes and failures.

Limitations

The first of this study’s limitations is that the proposed title of the project was included in the initial recruitment materials to farmers, including wording related to nutrition and climate. As a result, farmers who were already more knowledgeable about those topics may have been more likely to respond and agree to participate; conversely, individuals newer to dairy goats or agriculture, or those who felt they could not contribute as much valuable information, may have been less likely to express interest. In fact, a few farmers responded to the emails noting this and recommended others in their community who they felt would be more helpful for the purposes of this study.

Another key limitation is that the data presented in the analysis section is based on farmers’ personal perceptions. These data are subject to individuals’ limitations in memory and comfort in sharing certain aspects of their management systems. At times, farmers also interpreted questions differently and responded in ways that could not be categorized alongside other responses.

There were also limitations related to collection and categorization methods. All interviews were conducted over the phone. Some calls experienced more connection issues than others, including a few that dropped mid-conversation. The transcripts were manually edited to account for this and interviewees were asked to repeat answers that were not interpretable. Although all quotes presented are verbatim, it is possible some researcher bias related to dairy goat management affected how interviewee language was categorized.

To achieve thoughtful and in-depth answers, the researcher opted to follow organic paths of conversation, some of which enriched the scope of interviews. Because of this, in some interviews, not all

of the original interview questions were answered. Some of the organic conversations led to interview questions being added to the original list during the process, meaning the farmers interviewed before these additions were not asked these questions. These farmers were contacted for follow-up interviews, however, some did not have time to participate in this second call. Lastly, every interviewee was also allowed to decline any question; this happened in a few interviews for questions in the Miscellaneous section. The variations of the interviews led to some data representing only some of 20 interviewees, however, this is noted in the data sets where this is the case.

Finally, a major limitation of this study was overall population size, as well as the uneven number of interviews from each state. Twenty farmers alone do not represent the full range of perspectives across the region regarding dairy goat management, and it would be preferable to include at least 10 farmers from each state. Ideally, this study will continue in a less formal context online, allowing farmers to input their responses to the same questions included in this and contribute their information to a larger, anonymized database that remains accessible to the public.

REFERENCES

Whitt, C. *About 40 percent of all cow-calf operations reported using rotational grazing in 2018* [Chart]. (2022, December 6). United States Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/data-products/charts-of-note/chart-detail?chartId=105271

About Raw Milk. (n.d.). Raw Milk Institute. Retrieved November 23, 2025, from https://www.rawmilkinstitute.org/about-raw-milk

Abule, E., Smit, G. N., & Snyman, H. A. (2005). The influence of woody plants and livestock grazing on grass species composition, yield and soil nutrients in the Middle Awash Valley of Ethiopia. *Journal of Arid Environments*, *60*(2), 343–358. https://doi.org/10.1016/j.jaridenv.2004.04.006

Alfalfa cost comparison: Hay vs. pellets vs. cubes per pound. (2025, May 20). *SG Wood AB*. https://sgwoodab.com/alfalfa-cost-comparison/

American Veterinary Medical Association. (2025, September 3). *USDA announces plan to address rural, federal veterinary shortages*. https://www.avma.org/news/usda-announces-plan-address-rural-federal-veterinary-shortages

Animal Medicinal Drug Use Clarification Act of 1994. (2024). *FDA*. https://www.fda.gov/animal-veterinary/guidance-regulations/animal-medicinal-drug-use-clarification-act-1994-amduca

Animal and Plant Health Inspection Service. (2020, June). *How is the U.S. goat industry growing?* [Infographic]. United States Department of Agriculture, National Animal Health Monitoring System. https://www.aphis.usda.gov/sites/default/files/goat2019-infographic-overview.pdf

Animal and Plant Health Inspection Service. (2012). *U.S. dairy goat operations*. United States Department of Agriculture, Centers for Epidemiology and Animal Health. https://www.aphis.usda.gov/sites/default/files/goat09_is_dairygoatops_1.pdf

Barger, I. A., Siale, K., Banks, D. J. D., & Le Jambre, L. F. (1994). Rotational grazing for control of gastrointestinal nematodes of goats in a wet tropical environment. *Veterinary Parasitology*, *53*(1), 109–116. https://doi.org/10.1016/0304-4017(94)90023-X

Barillet, F. (2007). Genetic improvement for dairy production in sheep and goats. *Small Ruminant Research*, *70*(1), 60–75. https://doi.org/10.1016/j.smallrumres.2007.01.004

Berman, T. S., Ben-Ari, M., Glasser, T. A., Gish, M., & Inbar, M. (2017). How goats avoid ingesting noxious insects while feeding. *Scientific Reports*, *7*(1), 14835. https://doi.org/10.1038/s41598-017-14940-6

Bernabucci, U. (2019). Climate change: Impact on livestock and how can we adapt. *Animal Frontiers*, *9*(1), 3–5. https://doi.org/10.1093/af/vfy039

Briske, D. D., Sayre, N. F., Huntsinger, L., Fernandez-Gimenez, M., Budd, B., & Derner, J. D. (2011). Origin, Persistence, and Resolution of the Rotational Grazing Debate: Integrating Human Dimensions Into Rangeland Research. *Rangeland Ecology & Management*, *64*(4), 325–334. https://doi.org/10.2111/REM-D-10-00084.1

Burke, J. M., & Miller, J. E. (2006). Control of *Haemonchus contortus* in goats with a sustained-release multi-trace element/vitamin ruminal bolus containing copper. *Veterinary Parasitology*, *141*(1), 132–137. https://doi.org/10.1016/j.vetpar.2006.04.014

Burke, J. M., Wells, A., Casey, P., & Kaplan, R. M. (2009). Herbal dewormer fails to control gastrointestinal nematodes in goats. *Veterinary Parasitology*, *160*(1), 168–170. https://doi.org/10.1016/j.vetpar.2008.10.080

Cellier, M., Nielsen, B. L., Duvaux-Ponter, C., Freeman, H. B. R., Hannaford, R., Murphy, B., O'Connor, E., Cote, K. R. L., Neave, H. W., & Zobel, G. (2022). Browse or browsing: Investigating goat preferences for feeding posture, feeding height and feed type. *Frontiers in Veterinary Science*, *9*. https://doi.org/10.3389/fvets.2022.1032631

Coastal Bermudagrass: USDA ARS. (n.d.). Retrieved November 14, 2025, from https://www.ars.usda.gov/southeast-area/tifton-ga/crop-genetics-and-breeding-research/docs/coastal-bermudagrass/

Coccidiosis of Goats—Digestive System. (2024). Merck Veterinary Manual. https://www.merckvetmanual.com/digestive-system/coccidiosis/coccidiosis-of-goats

Collins, L. A. (2022). *Beef cattle producers face higher input costs, with feed prices up 16 percent since 2021* [Chart]. United States Department of Agriculture, Economic Research Service. https://ers.usda.gov/data-products/charts-of-note/chart-detail?chartId=104424

Conway-Cunningham, T., Ajayi, H. J., Gyawali, B., Gebremedhin, M., Wang, C., & Jiang, Y. (2024). *Effects of continuous and rotational grazing practices on forage production and goat performance*. Biology and Life Sciences. https://doi.org/10.20944/preprints202405.0090.v1

Curtis, P. (2022, September 29). *Is eating goat meat green?* Sierra Club. https://www.sierraclub.org/sierra/eating-goat-meat-green

Economics, Statistics, and Market Information System. (n.d.). *Cattle*. United States Department of Agriculture. Retrieved December 1, 2025, from https://esmis.nal.usda.gov/publication/cattle

El Aich et al. (2006). *Ingestive behavior of goats grazing in the Southwestern Argan (Argania spinosa) forest of Morocco*. https://www.researchgate.net/publication/240416808_Ingestive_behavior_of_goats_grazing_in_the_Southwestern_Argan_Argania_spinosa_forest_of_Morocco

Estill, C. (2023). Over-the-counter sale of livestock antibiotics ended June 11, 2023. *Ag - Range and Livestock*. Oregon State University Extension Service. https://extension.oregonstate.edu/catalog/over-counter-sale-livestock-antibiotics-ended-june-11-2023

Sartell, J. (2018, May 11). *Feeding baking soda to your goats*. MannaPro. https://mannapro.com/blogs/news/feeding-baking-soda-to-your-goats

Perennial Peanut Hay. (n.d). Florida Department of Agriculture and Consumer Services. Retrieved November 14, 2025, from https://www.fdacs.gov/Consumer-Resources/Buy-Fresh-From-Florida/Hay-Suppliers/Perennial-Peanut-Hay

Food and Agriculture Organization of the United States. (n.d.). *Nigerian Dwarf / United States of America (Goat)*. Retrieved November 14, 2025, from https://dadis-breed-datasheet-ws.firebaseapp.com/?country=USA&specie=Goat&breed=Nigerian%20Dwarf&external=1&lang=en

Goetsch, A. L., Gipson, T. A., Askar, A. R., & Puchala, R. (2010). Invited review: Feeding behavior of goats. *Journal of Animal Science*, *88*(1), 361–373. https://doi.org/10.2527/jas.2009-2332

Gosnell, H., Charnley, S., & Stanley, P. (2020). Climate change mitigation as a co-benefit of regenerative ranching: Insights from Australia and the United States. *Interface Focus*, *10*(5), 20200027. https://doi.org/10.1098/rsfs.2020.0027

Grandin, T. (2022). Grazing cattle, sheep, and goats are important parts of a sustainable agricultural future.. *Animals*, *12*(16), 2092. https://doi.org/10.3390/ani12162092

Hale. (2014). *Tools for managing internal parasites in small ruminants: Copper wire particles*. National Center for Appropriate Technology, Appropriate Technology Transfer for Rural Areas. https://attra.ncat.org/publication/tools-for-managing-internal-parasites-in-small-ruminants-copper-wire-particles/

Hanson, S. (2017). Tree leaf fodder for livestock. *Maine Organic Farmers and Gardeners*. https://www.mofga.org/resources/livestock/tree-leaf-fodder-for-livestock/

Hempstead, M. N., Lindquist, T. M., Shearer, J. K., Shearer, L. C., & Plummer, P. J. (2021). health and welfare survey of 30 dairy goat farms in the midwestern United States. *Animals: An Open Access Journal from MDPI*, *11*(7), 2007. https://doi.org/10.3390/ani11072007

Hoiechek, L. (1984). Comparative contribution of grasses, forbs, and shrubs to the nutrition of range ungulates. *Rangelands*.

How does goat milk taste? Factors affecting the flavor of goat milk. (2025, May 30). 99 Oaks Farm. https://www.99oaksfarm.com/blogs/articles/how-does-goat-milk-taste

Howell, S. B., Burke, J. M., Miller, J. E., Terrill, T. H., Valencia, E., Williams, M. J., Williamson, L. H., Zajac, A. M., & Kaplan, R. M. (2008). *Prevalence of anthelmintic resistance on sheep and goat farms in the southeastern United States*. https://doi.org/10.2460/javma.233.12.1913

Human Foods Program. (2024). *Pasteurized Milk Ordinance Centennial.* United States Food and Drug Administartion. https://www.fda.gov/food/milk-guidance-documents-regulatory-information/pasteurized-milk-ordinance-centennial

Hunter, L., & Peng, J. L. (n.d.). Kelp nutrients. *Nutrivore*. Retrieved November 15, 2025, from https://nutrivore.com/foods/kelp-nutrients/

Kronberg, S. L., & Malechek, J. C. (1997). Relationships between nutrition and foraging behavior of free-ranging sheep and goats. *Journal of Animal Science*, *75*(7), 1756–1763. https://doi.org/10.2527/1997.7571756x

Large animal veterinary shortage. (2025, November 6). National Conference of State Legislatures. https://www.ncsl.org/environment-and-natural-resources/large-animal-veterinary-shortage

Lee, J. M., Clark, A. J., & Roche, J. R. (2013). Climate-change effects and adaptation options for temperate pasture-based dairy farming systems: A review. *Grass and Forage Science*, *68*, 485–503. https://doi.org/10.1111/gfs.12039

Lu, C. D. (1988). Grazing behavior and diet selection of goats. *Small Ruminant Research*, *1*(3), 205–216. https://doi.org/10.1016/0921-4488(88)90049-1

Luginbuhl, J.-M., Harvey, T. E., Green, J. T., Poore, M. H., & Mueller, J. P. (1998). Use of goats as biological agents for the renovation of pastures in the Appalachian region of the United States. *Agroforestry Systems*, *44*(2), 241–252. https://doi.org/10.1023/A:1006250728166

Mellado, M., Valdez, R., Lara, L. M., & Lopez, R. (2003). Stocking rate effects on goats: A research observation. *Journal of Range Management, 56*(2), 167–173. https://doi.org/10.2307/4003901

Menne, C. (2012). *Choosing a dairy goat breed. Mother Earth News*. https://www.motherearthnews.com/homesteading-and-livestock/choosing-a-dairy-goat-breed/

Miller, B. A., & Lu, C. D. (2019). Current status of global dairy goat production: An overview. *Asian-Australasian Journal of Animal Sciences*, *32*(8 Suppl), 1219–1232. https://doi.org/10.5713/ajas.19.0253

Mississippi State University Extension Service. (n.d.). *Mineral requirements and impact on dairy and meat goat production*. Retrieved November 15, 2025, from https://extension.msstate.edu/publications/mineral-requirements-and-impact-dairy-and-meat-goat-production

Mississippi State University Extension Service. (n.d.). *Sericea Lespedeza (Lespedeza cuneata)*. Retrieved November 15, 2025, from https://extension.msstate.edu/agriculture/forages/legumes/sericea-lespedeza-lespedeza-cuneata

Nair, M. R. R., Sejian, V., Silpa, M. V., Fonsêca, V. F. C., de Melo Costa, C. C., Devaraj, C., Krishnan, G., Bagath, M., Nameer, P. O., & Bhatta, R. (2021). Goat as the ideal climate-resilient animal model in tropical environment: Revisiting advantages over other livestock species. *International Journal of Biometeorology*, *65*(12), 2229–2240. https://doi.org/10.1007/s00484-021-02179-w

National Agricultural Statistics Service (NASS). (2025). *Sheep and goats* (ISSN: 1949-1611). United States Department of Agriculture, National Agricultural Statistics Service. https://esmis.nal.usda.gov/sites/default/release-files/000000018/zk51xc07n/9593wq66x/shep0125.pdf

Natural goat wormers. (2019, November 7). Lone Feather Farm. https://lonefeatherfarm.com/goat-blog/natural-wormers-for-goats

Naturally deworming goats: a holistic approach to goat health. (n.d.). Retrieved October 13, 2025, from https://bitemegoattreats.com/naturally-deworming-goats-a-holistic-approach-to-goat-health/

Lespedeza cuneata. (n.d.). North CarolinaNC State University Extension. Retrieved November 25, 2025, from https://plants.ces.ncsu.edu/plants/lespedeza-cuneata/

Brady, B. (2019). *Parasite control—dairy goats and sheep*. Alabama Cooperative Extension System. https://www.aces.edu/blog/topics/sheep-goats/parasite-control-dairy-goats-and-sheep/

Penn State Extension. (2021). *Dairy sense: Rising feed costs impact dry cows and heifers*. https://extension.psu.edu/dairy-sense-rising-feed-costs-impact-dry-cows-and-heifers

Orchardgrass. (2025). Pennsylvania State University Extension. https://extension.psu.edu/orchardgrass

Pilarczyk, B., Tomza-Marciniak, A., Pilarczyk, R., Bombik, E., Seremak, B., Udała, J., & Sadowska, N. (2021). A comparison of the prevalence of the parasites of the digestive tract in goats from organic and conventional farms. *Animals, 11*(9), 2581. https://doi.org/10.3390/ani11092581

Rotational grazing for climate resilience. (n.d.). United States Department of Agriculture, Climate Hubs. Retrieved November 29, 2025, from https://www.climatehubs.usda.gov/hubs/international/topic/rotational-grazing-climate-resilience

Sanon, H. O., Kaboré-Zoungrana, C., & Ledin, I. (2007). Behaviour of goats, sheep and cattle and their selection of browse species on natural pasture in a Sahelian area. *Small Ruminant Research*, *67*(1), 64–74. https://doi.org/10.1016/j.smallrumres.2005.09.025

Shaik, S. A., Terrill, T. H., Miller, J. E., Kouakou, B., Kannan, G., Kaplan, R. M., Burke, J. M., & Mosjidis, J. A. (2006). Sericea lespedeza hay as a natural deworming agent against gastrointestinal nematode infection in goats. *Veterinary Parasitology*, *139*(1–3), 150–157. https://doi.org/10.1016/j.vetpar.2006.02.020

Silanikove, N., & Koluman (Darcan), N. (2015). Impact of climate change on the dairy industry in temperate zones: Predications on the overall negative impact and on the positive role of dairy goats in adaptation to earth warming. *Small Ruminant Research*, *123*(1), 27–34. https://doi.org/10.1016/j.smallrumres.2014.11.005

Smith, T. (n.d.). *Rotation vs. continuous grazing*. Hereford. https://hereford.org/static/files/02_07_RotationVsContinuous.pdf

South, D. B., Carey, W. A., & Johnson, D. A. (2004). *Copper Deficiency in Pine Plantations in the Georgia Coastal Plain* (Gen. Tech. Rep. SRS–71). Asheville, NC: United States Department of Agriculture, Forest Service, Southern Research Station. https://research.fs.usda.gov/treesearch/6714

Stachowicz, J., Lanter, A., Gygax, L., Hillmann, E., Wechsler, B., & Keil, N. M. (2019). Under temperate weather conditions, dairy goats use an outdoor run more with increasing warmth and avoid light wind or rain. *Journal of Dairy Science*, *102*(2), 1508–1521. https://doi.org/10.3168/jds.2018-14636

Stadalienė, I., Petkevičius, S., & Šarkūnas, M. (2014). The impact of grazing management on seasonal activity of gastrointestinal parasites in goats. *Helminthologia*, *51*(2), 103–111. https://doi.org/10.2478/s11687-014-0217-8

Tee Lewis, P. G., Chiu, W. A., Nasser, E., Proville, J., Barone, A., Danforth, C., Kim, B., Prozzi, J., & Craft, E. (2023). Characterizing vulnerabilities to climate change across the United States. *Environment International*, *172*, 107772. https://doi.org/10.1016/j.envint.2023.107772

Terrill, T. H., Dykes, G. S., Shaik, S. A., Miller, J. E., Kouakou, B., Kannan, G., Burke, J. M., & Mosjidis, J. A. (2009). Efficacy of sericea lespedeza hay as a natural dewormer in goats: Dose titration study. *Veterinary Parasitology*, *163*(1), 52–56. https://doi.org/10.1016/j.vetpar.2009.04.022

The University of Queensland. (2024). *Parasite treatment for goats*. https://uqvets.com.au/production-animal-service/animal-care-and-advice/parasite-treatment-goats

Tubiello, F. N., Soussana, J.-F., & Howden, S. M. (2007). Crop and pasture response to climate change. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(50), 19686–19690. https://doi.org/10.1073/pnas.0701728104

USDA Sustainable Agriculture Research and Education Program (LNE10-300). (2014). *Why and how to do FAMACHA© scoring*. United States Department of Agriculture, National Institute of Food and Agriculture. https://web.uri.edu/wp-content/uploads/sites/241/FAMACHA-Scoring_Final2.pdf

National Animal Health Monitoring System. (2020). *How is the U.S. goat industry growing?* [Infographic]. United States Department of Agriculture, Animal and Plant Health Inspection Service. https://www.aphis.usda.gov/sites/default/files/goat2019-infographic-overview.pdf

Southeast Climate Hub. (n.d.) *Southeastern climate* [Infographic]. United States Department of Agriculture, Southeast Climate Hub. https://www.climatehubs.usda.gov/sites/default/files/SE%20Climate%20Factsheet.pdf#:~:text=The%20southeastern%20United%20States%20has%20a%20humid%2C,role%20on%20the%20climate%20of%20the%20Southeast.

National Oceanic and Atmospheric Administration. (2024, October 17). *U.S. winter outlook: Warmer and drier South, wetter North.* United States Department of Commerce, National Oceanic and Atmospheric Administration. https://www.noaa.gov/news-release/us-winter-outlook-warmer-and-drier-south-wetter-north

Van Saun, R. J. (2025). *Herbage and browse usage in goats*. Merck Veterinary Manual. https://www.merckvetmanual.com/management-and-nutrition/nutrition-goats/herbage-and-browse-usage-in-goats

Villarroel, A. (2013). *Internal parasites in sheep and goats*. Oregon State University Extension Service. https://www.researchgate.net/publication/263464243_Internal_Parasites_in_Sheep_and_Goats

Wang, T. (2020, November 11). *Barriers to rotational grazing: perceptions from ranchers in the dakotas*. South Dakota State University Extension. https://extension.sdstate.edu/barriers-rotational-grazing-perceptions-ranchers-dakotas

What you should know about common well water contaminants. (2017, March 30). Culligan Nation. https://www.culligannation.com/common-well-water-contaminants

Walker, J.W., Coffey L., Faller T. (2006). Improving grazing lands with multi-species grazing. In K. Launchbaugh & J. alker (Eds.), *Targeted grazing: A natural approach to vegetation management and landscape enhancement* (pp.50–55). ASI, A. Peischel and D.D. Henry, Jr. https://targetedgrazing.wordpress.com/wp-content/uploads/2014/03/chapter_6_targeted_grazing.pdf

Weltzien, L. (2023). *The livestock veterinarian shortage: implications for food safety and security.* Johns Hopkins Center for a Livable Future, P.O.E. Total Worker Health® Center in Mental Health. https://clf.jhsph.edu/sites/default/files/2023-06/the-livestock-veterinarian-shortage.pdf

Wójtowski, J. A., Pikul, J., Mikołajczak, P., Czopowicz, M., Kaba, J., Foksowicz-Flaczyk, J., Antkowiak, I., Pytlewski, J., Markiewicz-Kęszycka, M., & Stanisławski, D. (2025). Effect of herbal feed additives on milk performance and health status of dairy goats. *Journal of Veterinary Research*, *69*(2), 263–272. https://doi.org/10.2478/jvetres-2025-0021

Yeates, J. (2018). Naturalness and Animal Welfare. *Animals*, *8*(4), 53. https://doi.org/10.3390/ani8040053

Zobel, G., Neave, H. W., & Webster, J. (2019). Understanding natural behavior to improve dairy goat (Capra hircus) management systems. *Translational Animal Science*, *3*(1), 212–224. https://doi.org/10.1093/tas/txy145

APPENDICES

Appendix A - Interview Questions

The prepared questions were grouped into categories, including, ‘Foundational’, ‘Grazing System/Nutrition/Forage’, ‘Cost-Benefit Analysis’, ‘Climate’, ‘Health’, and ‘Misc’. Some examples of questions that were in each category are as follows:

1. Foundational
    a. How long have you been working with goats and/or in the dairy industry?
        i. What drew you to this industry?
    b. Have you worked in any other livestock or dairy systems prior to (dairy) goats?
        i. What differences have you noticed?
    c. Why did you choose goats over other (dairy) animals like cows or sheep?
        i. Were there environmental, economic, or practical reasons?
2. Grazing System/Nutrition/Forage
    a. What type of grazing system do you currently use (e.g., continuous, rotational)?
    b. Does your grazing system change with the seasons?
        i. What kinds of adjustments do you make throughout the year?
        ii. Do certain seasons push you toward more browse vs. graze? How does that affect nutrition or parasite risk?
    c. Have you made significant changes to your feeding or grazing system over time?
        i. What prompted these changes—climate, forage availability, cost, or something else?
    d. Which goat breeds are you raising, and do their grazing behaviors or nutritional needs differ in ways that affect pasture planning or milk output?
    e. How do you decide when to move goats to a new paddock—height, residual biomass, calendar days, forage species stage, parasite management, or “eye test”?
        i. What’s your target rest period for pastures, and does it change with rainfall or temperature?
    f. What are your primary forage species?
        i. Have you observed changes in their quality or availability in recent years?
        ii. Are there plants you intentionally encourage or discourage in pastures because of their impact on milk flavor or goat health?
    g. Have you noticed whether different forage species (grasses vs. legumes vs. browse/shrubs) change the flavor, butterfat, protein, or yield of your milk?
        i. Are you concerned about how changes in available forage might affect your dairy products?
        ii. Have customers ever commented on flavor changes tied to seasonal pastures?
        iii. Do lab tests (if any) reflect forage shifts (e.g., butterfat %, somatic cell count)?
    h. Do you adjust grazing access before milk testing, competitions, or when producing specialty cheeses? Why/why not?
3. Cost-Benefit Analysis
    a. What are the most significant costs associated with running your (dairy) goat operation?
    b. If you use rotational grazing:
        i. Do you find it reduces your reliance on purchased feed?
        ii. Have you noticed savings or trade-offs in labor or fencing?

        iii. Do you think the benefits (e.g., forage quality, goat health, milk production) outweigh the management effort?
    c. How do you track or evaluate the financial success of your grazing or feeding strategies?
        i. Are there specific metrics or observations you rely on?
    d. When you think about the “cost” of rotational grazing, what is most significant: fencing, water lines, labor/time moving animals, pasture establishment, or lost flexibility? Rank or describe.
    e. Have you ever compared your feed purchases *before vs. after* adopting (or intensifying) rotational grazing? What changed?
4. Climate
    a. Have you noticed any long-term changes in your pastures, forage, or livestock health that you associate with climate change (e.g., drought, flooding, more pests)?
    b. Have weather events (e.g., extreme heat, frost, unexpected storms) impacted your grazing rotations or milk production?
        i. Have climate-related events increased your costs (e.g., purchased feed during drought, fencing repairs after storms)?
    c. Think back to a specific weather extreme in the past 5–10 years (heat wave, freeze, flood, drought). What did you change in your grazing or feeding plan that season? What worked? What didn’t?
    d. Are you tracking any climate indicators (rainfall totals, soil moisture, heat index days) to guide pasture decisions?
    e. Do you anticipate making any changes to your pasture or herd management due to future climate patterns?
        i. What resources or knowledge would help you prepare?
5. Health
    a. What internal parasite issues are most common in your herd, and how (if at all) does rotational grazing help you manage them?
    b. Have you noticed some breeds handle heat, humidity, or parasites better than others?
    c. Do you see relationships between pasture height/residual, moisture, or plant species and parasite pressure?
    d. What deworming strategies (chemical, FAMACHA scoring, herbal, mixed-species grazing) do you use, and have climate shifts changed their effectiveness?
6. Misc
    a. What are your future goals for your farm, particularly in terms of grazing systems or herd management?
    b. Are there practices you’ve considered (e.g., silvopasture, new forage crops, herbal deworming) but haven’t yet tried? Why or why not?
    c. Is there anything you’d like others (e.g., policymakers, new farmers, researchers) to understand about managing (dairy) goats in your region?
    d. Is there anything else you’d like to share about your experience or lessons learned in managing goats on pasture?
    e. If you received a grant tomorrow to improve your grazing system, what would you invest in first?
    f. Have peer networks or farmer-to-farmer learning opportunities influenced your grazing decisions?

Appendix B - R Code

The R code used during the analysis for this study is available on GitHub: https://github.com/iaroeske22/VT-Masters-Project

Appendix C - Consent Forms

Consent forms are available upon request to permitted parties due to anonymity considerations. Please email iaroeske22@gmail.com.

Appendix D - Transcripts

Transcripts are available upon request and will remain fully anonymous. Please email iaroeske22@gmail.com.