GOAT RESEARCH PRIORITIES

December 2022

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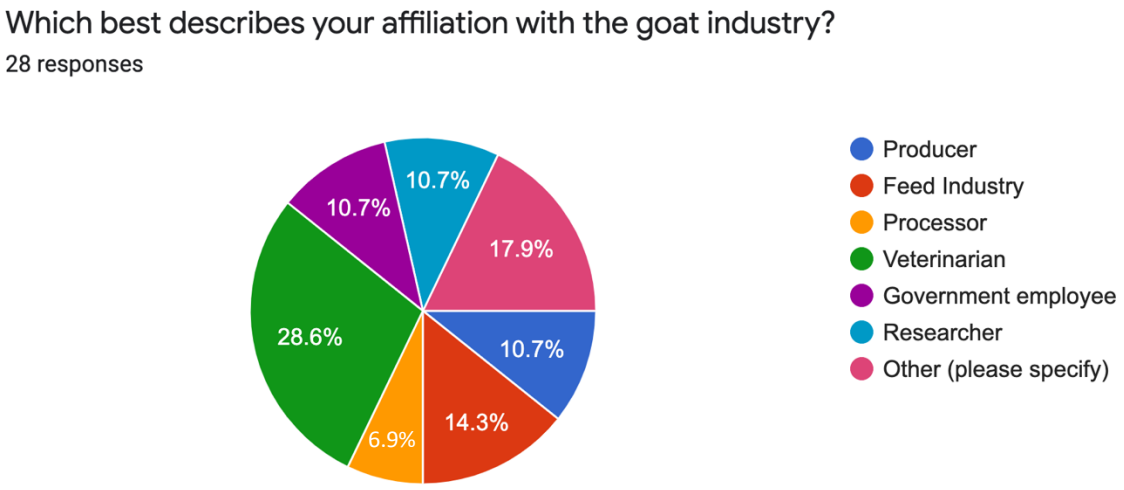
Introduction

In June 2021 a survey on research priorities was conducted. The survey built on:

1. Research priorities that representatives of the goat industry had evaluated and discussed on December 10, 2019 as part of the Goat Value Chain Roundtable. These fell into four areas of focus (health, nutrition, production, and welfare) and were prioritized using a pairwise process.
2. Recommendations from the Goat Code Scientific Committee working on the revised National Code of Practice for the Care and Handling of Goats.
3. Recommendations from Dr. Cathy Bauman's research into Goat Kid Health and Mortality.

The survey was sent to 49 goat industry stakeholders, some of whom forwarded it to others and 28 provided responses. The chart below indicates the affiliation of the respondents to the industry: Those identifying in the other category were representatives of the genetics and service industries.



In December 2022 Sustainability was added as a priority area. Priorities incorporated noted fall under environment and economic, with the social aspects of sustainability incorporated throughout the other priorities. As agreed at the Goat Value Chain Roundtable meeting at which the 2019 priorities were developed, **economics** remains an **overriding consideration** across all streams of research. The industry needs to be productive, and the solutions need to be affordable. The economic impact that a research proposal can offer to both meat and milk production should be considered in funding decisions. A common misconception affecting many issues of goat husbandry is, "goats are like little cows". In fact, goats are their own species and have different requirements in all aspects of husbandry. In additional to the research required, sciened-based disease education programs, and access to pharmaceuticals and vaccines, are needed to advance the industry and are highlighted in notes throughout the document.

Health

The first four topics within health each received votes to be ranked as the top priority.

1. Chronic Wasting Diseases (Caprine Arthritis Encephalitis (CAE), Johnes Disease (JD), Caseous Lymphadenitis (CL))

- What is the efficacy of control programs for CAE to safeguard producers when purchasing from "CAE free" herds? CAE is one of, if not, the biggest health issue for the goat industry.

NOTE: Developing effective science-based industry-wide education is critical. An industry wide certification programs would increase production, improve animal welfare, and protect buyers. To be successful it would require full industry support.

2. Goat Kid Health and Mortality

- What are methods, timing, and pain mitigation options for disbudding in kids that offer good welfare and are practical for producers and veterinarians?
- How much colostrum is required to be fed to kids to ensure passive transfer of immunity and satisfy nutritional requirements for both dairy and meat goats?
- Can antibodies from non-caprine species circulate as long as antibodies from a caprine source?
- What is the effectiveness of different colostrum administration methods (e.g., voluntary suckling versus tube feeding)?
- How do different heat-treatment methods of colostrum affect quality and pathogen load?
- How do colostrum sources for kids impact immunity, disease, growth etc.?
- What are goat-specific (rather than bovine) requirements for formulated milk replacer and colostrum powder?
- What are the impacts of milk/milk replacer hygiene and delivery (i.e., amount, frequency, and delivery method) on kid health?
- What are the GI issues in kids (e.g., enterotoxemia, coccidia)?

3. Milk Quality and Udder Health

- What are the organisms that affect udder health, and milk quality? How can somatic cell counts and bacteria be controlled?
- What are the risk factors for mastitis pathogens at both the individual and herd level?
- What are the risk factors that make animals more susceptible to pathogens and what interventions can be applied?
- What are the frequency and risk factors for zoonotic pathogens in raw milk (e.g., listeria, Coxiella)?
- What interventions can improve udder health and milk quality (e.g., udder preparation, barrier dips, milking time)?
- Does continual milking (no dry period) affect milk quality and animal health?
- What are the actual costs of poor udder health in terms of production losses, food safety and low-quality milk?
- How do different bacteria affect milk quality and cheese production? (e.g., fat/protein inversion issues)

NOTE: The industry will be challenged to do milk quality research due to the difficulty of tracing the animals causing the quality issues as well as the cost of testing given the number of milking goats on farms. There is a need to look for innovations for low-cost testing alternatives.

4. Animal Health Products

- Drug residue and feed additive (e.g., Monensin) depletion studies are required to determine withdrawal time for pharmaceutical products in order to inform their extra-label use by veterinarians.
- Efficacy studies of vaccines for pneumonia, mastitis and clostridial disease.
- Making Coxiella vaccine affordable and accessible (this is both an animal welfare and antimicrobial resistance (AMR) issue).
- Research is required to identify and create tools to assess health and disease status (e.g., rapid test for toxemia).

NOTE: The industry needs registered pharmaceutical options (e.g., vaccine). There is a need to make use of research available from other countries (Europe, Australia).

5. Health and Respiratory Disease

- Identify the main organisms causing respiratory diseases and the risk factors that predispose old and young animals to those organisms.
- Is there an optimum time period to feed high quality colostrum to protect kids from respiratory disease?
- What are the organisms that cause health challenges related to different production systems (e.g., feedlots, pasture)?
- Identify the causes of neurological disease?

6. Infectious Abortion

- What is the prevalence and possible prevention methods for Infectious Abortions? Comprehensive industry benchmarking research is needed.

7. Parasites

- Parasites are an issue for goats on pasture (meat and organic milk). This issue should be addressed through education on the use of various anthelminthics.

NOTE: The Parasite Handbook was updated in the spring of 2019 and is available on the Ontario Sheep Farmers website.

Nutrition

The first three areas all received votes to be ranked as the top priority.

1. Primary Nutrition

There are no recommended ration formulations for different types and life stages of Ontario goats (meat vs. dairy, buck kids, doelings, transition does, etc.). Nutrition research to support recommended nutrient requirements and ration formulations for various types and stages of goat production could have profound effects on animal production, health, welfare, food safety, quality and economics. The 2007 National Research Council (NRC) requirements for meat and dairy goats needs to be updated?

NOTE: Getting Research into Practice (GRIP) and education programs based on research results is critical.

- Conduct a scoping review to identify research needs:
  - What are the nutritional and ration requirements for Ontario meat and dairy goats at different production stages (young animal, stage of pregnancy, transition, stage of milking, dry period, buck kids) and seasons (e.g., do summer and winter requirements differ)?

- What is the selenium requirement for the doe to get adequate transfer to the kid? How is deficiency determined at various ages? Are there cost effective tests? Is it better to feed selenium and vitamin E continually or needle goats at a specific time? Is organic selenium absorbed better and therefore more effectively? Is there economic benefit to using organic selenium?

- What are the risk factors and the impact that result in enterotoxemia?
- What are the water requirements (temperature, purity, mineral content, bacteria count) and impacts during different seasons and at the various stages of development and production?
- What are the differing nutritional requirements for does that are dried off before kidding and those that milk continuously? Are there differences in colostrum quality and quantity?

2. Gut Health

- What is the role of starches and fibre on subacute ruminal acidosis?
- What is the potential impact of probiotics?
- How do specific gut/rumen bacteria affect milk quality and cheese production? (e.g., fat/protein inversion issues)

3. Nutritional and Feed Related Diseases

(There is overlap with research identified within the health area.)

NOTE: Develop control programs and education for: vaccination programs, feed management, Listeriosis and other factors.

- Does heat stress contribute to bringing on pregnancy toxemia? If so, does this change nutrition requirements? What are the factors that cause toxemia?
- What is the recommended ration and treatment for ketonic goats? What are the economic consequences of a ketonic doe on milk production, milk quality and kid health?
- What are recommendations to reduce Sub-acute Ruminal Acidosis (SARA)?
- What is the incidence of adult disease due to Clostridium perfringens? What are the risk factors?

Production

All areas received votes to be ranked as the top priority however by majority vote, Overall Management Practices became the top priority, whereas genetics and lactation data were essentially tied.

1. Overall Management Practices

NOTE: Beyond research, resources need to be allocated toward adoption of best management practices on farms.

- The industry lacks benchmarks for feeding, housing, handling, managing illness and lameness, and reproduction. What are the management practices that provide the most significant benefit to animals and producers?

2. Genetics/Genomics

- There are huge gains to be made in the goat industry through genetic improvement. To take advantage of genetics, the industry needs individual animal identifiers.
- Develop solutions for polled animals without any reproduction impacts.

3. Lactation Data

- What are the tools required for compilation of lactation, production, and genetics data to advance the goat meat and milk industries?
- How is reproduction management affected by continuous lactations vs dry off period?

Welfare

The first three areas received votes to be ranked as the top priority.

1. Pain Management

- What are effective pain control methods for:
  - different methods at differing castration ages?
  - disbudding kids?
- What are the impacts of horn tipping?
- What are effective dosing strategies for pain management?
- Establish drug withdrawal requirements for off label use of drugs.
- What are alternative methods for disbudding of horned goats?

2. Lameness and Hoof Care

- What are the causes, risk factors and prevention strategies for lameness?
  - Considerations need to include the effect of flooring and bedding.
  - Relationship with trimming frequency.

3. Housing and Handling Equipment and Natural Behaviour

- Evaluate space requirements and pen layouts for optimal health considering breed, age, sex, birthing, & multi-level pens.
- Identify equipment:
  - Feeders, ramps, chutes, etc. that improve welfare, including possible modifications needed.
  - Determine space allowance for different breeds and different production stages, comparing horned and hornless goats is required with a specific focus on welfare impacts.
- Goat enrichment needs to be explored.

4. Euthanasia

- Determination of endpoints are needed for lameness.
- Research methods to make Non-Penetrating Captive Bolt devices accessible to producers.

5. Consumer Research

- What consumers expectations can be addressed through on-farm welfare and food safety practices/procedures/methods?
- Are there research and assessment methods of on-farm adoption that address consumer expectations?

6. Non-stun Killing for Halal Food

- What are acceptable methods of slaughter that provide animal welfare while meeting the needs of a religious community?

Industry Sustainability

1. Greenhouse Gas Emissions

- Benchmark the GHG emissions generated in both meat and milk production, per animal and/or litre of milk produced.
- Quantify the benefits of grazing goats on soil health
- Conduct a life cycle analysis of the Ontario Goat industry

2. Economics

(As noted in this document, economics is an overriding consideration across all streams of research)

- Evaluation of industry sustainability recognizes values and costs created via consumer requirements and demands.

Conclusion

This updated set of research priorities reflects changes in the industry since the 2019 set of priorities were established. Industry Sustainability was added in 2022. There is limited benchmarking data which as data capture increase and improves the lack of industry data, including solid benchmarking, sector progress will remain limited. Two overriding concerns surround research: economic impact and getting research into practice (GRIP). Failing these two tests, research will have little meaningful impact on Ontario's goat sector. Beyond research as noted within the document, the industry could benefit from control and education programs.