

nematodes (GIN) are among the most important, reducing live weight gain, carcass quality, milk yield, and reproductive performance, with particularly severe losses in resource-poor systems where control measures are limited (Rajesh et al., 2017). Meta-analysis indicates that increasing fecal egg counts in infected goats is associated with pronounced declines in average daily gain, dry matter intake, and packed cell volume, reflecting both undernutrition and anemia that undermine growth efficiency (Cei et al., 2018). Internal parasites also lower serum protein and albumin and induce oxidative stress, consistent with chronic malabsorption and inflammation that further compromise productive potential (Sarkar et al., 2024).

High burdens of GIN and other parasites are common in tropical and subtropical regions, where prevalence in goats often exceeds 80%-90% and mixed infections are the rule rather than the exception (Sontigun et al., 2025). On farms in the tropics, higher individual parasite loads correlate with lower body condition scores and hematocrit, demonstrating that even under relatively good nutrition, parasitism still contributes measurably to variation in growth and health (Ortíz-Domínguez et al., 2024). Similar disease-related growth penalties are observed with systemic infections such as trypanosomiasis, contagious caprine pleuropneumonia, and peste des petits ruminants, which cause anemia, respiratory compromise, fetal losses, and increased kid mortality, cumulatively depressing herd productivity and slowing genetic and nutritional gains (Challaton et al., 2023). In intensive settings, poorly managed housing can further predispose goats to parasitic and infectious disease, leading to weight loss accompanied by hematological signs of stress and elevated parasite egg counts.

## **6.2 Disease prevention and immunization programs**

Effective disease prevention programs are essential to protect the benefits of improved feeding strategies on growth. Broad reviews of small-ruminant systems in sub-Saharan Africa conclude that infectious diseases, together with poor nutrition and genetics, are the main causes of low productivity, and emphasize that herd health plans must prioritize control of GIN, major viral diseases, and key bacterial infections (Kimeli et al., 2025). Strategic anthelmintic use, improved grazing management, and nutritional support all help reduce the clinical expression of parasitism and sustain growth, but rising anthelmintic resistance and knowledge gaps about parasite epidemiology often limit control in practice. Meta-analysis shows that better energy and protein supply improves resilience and resistance to GIN infection, mitigating the growth-depressing effects of worm burden and supporting the argument that parasite control and nutrition should be managed together (Cei et al., 2018).

Vaccination against major transboundary and respiratory diseases is a cornerstone of preventive programs and has direct implications for growth. A scoping review of preventive veterinary interventions in sub-Saharan Africa found that vaccination against priority diseases such as PPR, pasteurellosis, and contagious pleuropneumonia was generally both effective and profitable, reducing morbidity and mortality and improving returns on investment in feed and other inputs (Nuvey et al., 2022). At the herd level, implementing vaccination and basic biosecurity was associated with steep declines in respiratory disease incidence in semi-intensively managed goats, illustrating how targeted immunization can translate into healthier animals and better growth performance over time (Atli et al., 2025). Even where some vaccines cause transient reductions in daily gain, as observed after foot-and-mouth disease vaccination in Korean native goats, the long-term protection against outbreaks and trade losses outweighs these short-term setbacks, especially when supportive management is used to buffer temporary performance dips (Jo et al., 2014).

## **6.3 Biosecurity and sanitation management**

Biosecurity and sanitation measures reduce the introduction and spread of pathogens that erode growth performance, and they complement both feeding and vaccination strategies. Good herd health and biosecurity programs aim to maximize production while lowering the incidence of preventable diseases through practices such as pre-purchase testing, quarantine of new arrivals, and strict control of animal movement. Clean housing, appropriate stocking densities, and proper manure handling limit the buildup and transmission of gastrointestinal and ectoparasites, thereby decreasing chronic production losses associated with subclinical infection and improving the response to nutritional improvements (Fthenakis and Papadopoulos, 2017). In extensive and semi-intensive systems, lack of biosecurity, poor hygiene, and inadequate health management have been linked to