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IMPROVING PROLIFICACY IN SHEEP BREEDING

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Abstract: *This paper examines the multifactorial strategies required to improve prolificacy in sheep breeding, defined as increasing the number of lambs born per ewe lambing. Prolificacy is a core reproductive efficiency parameter and strongly influences economic performance in meat oriented systems. The study synthesizes literature from 2013-2026 to identify the most effective genetic, nutritional, and managerial interventions. Crossbreeding emerges as the fastest method of genetic improvement, as heterosis and the introgression of major fecundity genes (BMP15, GDF9, FecB) produce immediate increases in litter size – a point emphasized in the text: "crossbreeding is the fastest way to genetically improve prolificacy". Genetic selection further stabilizes reproductive gains by identifying advantageous mutations through genomic tools such as GWAS, sequencing, and transcriptomics. Management and nutrition complement genetic progress by optimizing ovulation, conception, and embryo survival; as noted, "energy is the limiting nutrient for reproduction." Practices such as flushing, maintaining optimal body condition, mineral supplementation, and reproductive technologies significantly enhance outcomes. Overall, prolificacy improvement is most effective when genetic strategies are integrated with targeted nutrition and reproductive management, ensuring sustainable increases in lamb output and flock productivity.*

• Introduction

Prolificacy improvement in sheep breeding means increasing the number of lambs born per ewe lambing, i.e. raising the average litter size. It is one of the core reproductive efficiency parameters, alongside fertility and fecundity. Prolificacy improvement refers to all genetic, nutritional, and management strategies aimed at increasing how many lambs a ewe produces at each lambing – moving, for example, from 1.0 lamb/ewe to 1.3–1.5 in non prolific breeds or 1.8–2.5 in prolific breeds. From an economic perspective, prolificacy improvement in sheep breeding is relevant in meat systems, where total lamb output drives profitability, but less important in dairy systems, where fertility (ewes lambing) matters more. Higher prolificacy increases efficiency of feed and pasture use, genetic progress in meat traits (more selection candidates), and total kilograms of lamb sold per ewe, but very high prolificacy can increase management complexity, neonatal mortality, and nutritional demands during late gestation. Prolificacy can be improved in three ways: through crossbreeding (because within breed selection is often inefficient, crossbreeding with prolific breeds is a major strategy for raising litter size; through genetic selection (because prolificacy has low heritability, so phenotypic selection alone is slow, and because improvement relies on introgression of prolific genes from prolific breeds into local breeds when mutations are absent, major fecundity genes that increase ovulation rate, and marker assisted selection and genome wide association study to identify beneficial alleles); and management & nutrition (where adequate energy at breeding, correct body condition score, and minimizing embryo loss are essential; and where poor prolificacy often results from age or health issues, early embryo death, low energy intake, and poor AI management. In conclusion, prolificacy improvement is the coordinated effort – genetic, managerial, and nutritional – to increase litter size in sheep. It is central to reproductive efficiency and strongly influences the economic performance of meat oriented flocks.

• Material and method

The material used by the authors in this paper consists in articles published during the period 2013-2026. The research method is the bibliographic one and it aims at identifying the best ways to improve prolificacy in sheep breeding.

• Results and discussion

Management as a method of increasing prolificacy operates through: body management, because optimal body condition score at mating should be 2.5-3: sheep that are too thin → reduced ovulation, sheep that are too fat → hormonal disorders; control of the breeding season, because breeding during periods of good pasture means better ovulation; health and veterinary program, because internal parasitism reduces prolificacy by decreasing nutrient absorption; pasture management, because young pasture, rich in leaves → high protein and energy intake → increased ovulation; and reproductive technologies, because artificial insemination, hormonal management, and oestrus synchronization → increase conception rate and number of lambs. Nutrition as a method for increasing prolificacy operates through: adequate energy and protein, because energy is the limiting nutrient for reproduction; thus, pre-breeding ewes should have a body condition score of 2.5-3/5 for optimal ovulation, and adequate protein (legumes, meal) supports follicular development and egg quality; essential fatty acids (omega-3 and omega-6), because they improve egg quality and embryonic development; nutrition during gestation, because the last 6-8 weeks are critical: intense foetal growth → increased energy and protein requirements, and undernutrition during this period reduces the number of viable lambs; nutritional flushing (increasing energy levels before mating through cereals and quality pastures), because it increases the ovulation rate and the number of embryos: it is applied 2-3 weeks before mating; reproductive minerals (selenium and zinc) and vitamins (A and E, essential for ovarian function and implantation), because they increase fertility and reduce embryonic mortality.

• Conclusions

The analysis of prolificacy improvement in sheep breeding shows that increasing litter size is a multifactorial process requiring coordinated genetic, managerial, and nutritional interventions. Crossbreeding remains the most rapid and efficient genetic pathway, as heterosis and the introgression of major fecundity genes consistently produce immediate gains in ovulation and lambing rates. Genetic selection further consolidates these gains by identifying and multiplying advantageous mutations, offering predictability and long term stability in reproductive performance. Modern genomic tools significantly enhance the precision of selection, overcoming the limitations of low heritability and late trait expression.