

Advancing Livestock Welfare through Genetic Improvement: A Path towards Sustainable Production

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Commentary

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ABOUT THE STUDY

The genetic improvement of livestock has long been a backbone of modern agriculture, aimed at enhancing performance, health, and welfare across diverse production systems. Through selective breeding and advanced genomic technologies, livestock producers strive to cultivate animals that are not only productive but also resilient, healthy, and well-adapted to their environments. In this commentary, we explore the multifaceted nature of genetic improvement in livestock and its pivotal role in promoting sustainable production practices while prioritizing animal welfare.

Breeding for performance

The primary focus of livestock breeding programs has been on improving production traits such as growth rate, milk yield, and meat quality. Selective breeding based on phenotypic performance traits has led to significant gains in productivity over generations. However, as consumer preferences evolve and societal concerns about animal welfare intensify, there is a growing recognition of the need to balance performance goals with broader considerations of animal well-being.

Modern breeding strategies leverage both traditional phenotypic selection and cutting-edge genomic technologies to identify and propagate desirable traits. Genomic selection, in particular, has revolutionized the breeding process by allowing for the prediction of genetic merit based on DNA markers associated with key traits. This approach enables faster and more accurate genetic progress, facilitating the development of high-performing livestock with superior production traits.

Breeding for health

In addition to performance traits, genetic improvement programs increasingly prioritize traits related to animal health and disease resistance. Livestock

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diseases pose significant economic and welfare challenges for producers, leading to reduced productivity, increased veterinary costs, and animal suffering. Breeding for disease resistance helps reduce these challenges by enhancing the innate immune response and reducing susceptibility to common pathogens.

Advancements in molecular genetics have enabled the identification of genetic markers associated with disease resistance and resilience in livestock species. By incorporating this information into breeding programs, producers can selectively breed animals with enhanced disease resistance, reducing the need for antibiotic treatments and improving overall herd health. Breeding for health traits not only benefits individual animals but also contributes to broader goals of sustainable agriculture by promoting disease prevention and reducing reliance on pharmaceutical interventions.

Breeding for welfare

Animal welfare considerations are integral to modern livestock production systems, reflecting ethical imperatives as well as consumer expectations. Breeding for welfare traits encompasses a range of characteristics that contribute to the physical and psychological well-being of animals, including temperament, stress resilience, and adaptability to different housing conditions.

Selective breeding for improved welfare traits aims to enhance the overall quality of life for livestock while minimizing negative experiences associated with production practices. For example, selecting for calm temperament and low aggression can reduce the incidence of injurious behavior in group-housed animals, improving social harmony and reducing stress levels. Likewise, breeding for robust skeletal structure and hoof health can mitigate welfare issues related to lameness and musculoskeletal disorders.

Breeding for environmental adaptability plays an important role in ensuring animal welfare in diverse production systems. Livestock breeds adapted to specific climatic conditions or management practices are better equipped to cope with environmental stressors such as heat, cold, or limited forage availability. By preserving and promoting locally adapted breeds, breeders contribute to the resilience and sustainability of livestock production systems while safeguarding genetic diversity.

CONCLUSION

Genetic improvement of livestock for performance, health, and welfare represents a dynamic and multifaceted endeavor with far-reaching implications for sustainable agriculture. By embracing innovative breeding strategies that prioritize animal welfare alongside productivity, producers can enhance the resilience, efficiency, and ethical integrity of their operations. As we navigate the complexities of feeding a growing global population while safeguarding natural resources and animal well-being, genetic improvement emerges as a powerful tool for shaping a more sustainable and compassionate future for livestock production.