

EMERGING TRENDS IN ANIMAL BREEDING: LEVERAGING GENOMICS AND ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE GENETIC IMPROVEMENT

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The field of animal breeding is undergoing a profound transformation driven by the integration of genomics and artificial intelligence (AI) to achieve sustainable genetic improvement. Genomic selection (GS) represents a pivotal advancement that harnesses marker data to predict performance accurately, revolutionizing traditional breeding practices. GS not only expedites the rate of genetic progress but also offers a cost-effective alternative, fundamentally reshaping breeding programs. Its integration into cattle population evaluations exemplifies its transformative impact. The application of breeding technologies, including genomics and genome editing, holds the potential to enhance animal welfare by bolstering resistance to environmental stressors, minimizing invasive procedures like dehorning, and reducing animal suffering. However, the ethical assessment of these technologies' challenges conventional welfare perspectives, necessitating a paradigm shift in the evaluation of breeding practices. The pursuit of sustainable genetic improvement in livestock is attainable through meticulously crafted and precisely targeted breeding programs. These initiatives have yielded remarkable gains in animal productivity, notably in dairy, swine, and poultry systems, while concurrently diminishing resource requirements. Incorporating genomic selection into these programs has the potential to further economize by shortening generation intervals, enhancing selection accuracy at a younger age, and potentially supplanting traditional testing methodologies. Additionally, genomic mating (GM) has emerged as a more precise and reliable alternative to traditional pedigree information, rendering it particularly suitable for contemporary animal breeding and conservation endeavors. The preservation of distinctive genetic reservoirs, such as indigenous chicken populations, stands as a paramount imperative for enduring and sustainable genetic enhancement. In summation, the emerging trends in animal breeding are defined by the synergistic utilization of genomics and AI, aiming for sustainable genetic improvement. Genomic selection, innovative breeding technologies, ethical considerations, community engagement, and conservation efforts converge to shape the future of animal breeding. These advancements hold the promise of enhanced animal welfare, reduced costs, and the preservation of invaluable genetic resources, ultimately contributing to the realization of more sustainable and efficient breeding programs.

Keywords: animal breeding, genomic mating, genomic selection.