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Challenges in applying genomic selection to ruminants by farmers

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INTRODUCTION

Although there are large disparities in the productivity and available resources of ranchers in developed and Low and Middle Income Countries (LMICs), all farmers, regardless of location, have a few critical needs to seize new opportunities. The world population is projected to increase from 7 billion in 2011 to 9 billion in 2050, with most of this increase occurring in Africa and Asia. Achieving food security by 2050 will require an annual increase in efficiency of 2.0-2.5% for livestock companies and livestock industries, as measured by total factor productivity (Reynolds JD, 1996). This is equivalent to doubling the constant resource input by 2050. Due to pressures on agriculture in developed countries, most of this increased production must occur in areas of Africa and Asia that need it most. This increased demand for food leads to increased competition for resources such as land, water, grain and labour, driving up the cost of animal production (Flint AP, et al. 2008). Climate change adds to this challenge by requiring animals that are productive in hotter, drier climates, and those that can tolerate significantly increased endo parasite loads and vector borne diseases in the tropics and subtropics. Therefore, there is an urgent need to significantly increase livestock herd and herd productivity while reducing grain and water consumption. At the same time, animals must withstand more extreme climate and disease stressors, and farmers must reduce Green House Gas (GHG) emissions from animals. Another positive result from increased production efficiency is that the emission intensity for most livestock species worldwide decreased between 2000 and 2018 due to increased production efficiency. The same authors also argue that improving production efficiency, particularly in countries in Asia and Africa, would have a much greater mitigating effect than removing animal products from the global human diet, thereby preserving human health and We have shown that the nutritional benefits of consuming animal products in these areas remain (Gianola D, et al. 1986).

DESCRIPTION

Opportunities for significantly improving the productivity of livestock systems are greatest in large scale or pastoral production systems in tropical and subtropical environments, including Africa and Asia. These systems utilize land resources that have few alternative uses, including urbanization. In addition, it takes advantage of ruminant animals that use poor pastures unsuitable for humans and mono gastric livestock species. As is the case with factory farming in recent years, pastoral farming is much less likely than factory farming to face unreasonable demands on production systems from urban populations (Gianola D, et al. 2015). To double yields from the same resource base needed for global food security by 2050, tropical and subtropical ranchers need to grow animals that are already well adapted to the production environment. We need to adopt new, low cost, innovative technologies for use in traditional technologies that create incremental change can help improve productivity as they have in the past. For example, one study found that using proven techniques such as animal husbandry and animal nutrition, a U.S. dairy farmer needed 21 cows, 23% feed and 65% to produce his billion cows. With 1 kg less milk than in 1944, he reduced methane emissions by 57% and at the same time significantly reduced waste. But these traditional technologies alone are no longer sufficient to achieve the massive productivity gains needed today (Beuzen ND, et al. 2000). Potentially the greatest opportunity to significantly improve livestock productivity in LMICs in tropical and subtropical environments by 2050 is the exploitation of genomic information through genome selection, using genome wide genetic markers to identify individual animals. Estimate the genetic value of important recent advances in genomic technology that support this recommendation include the very rapid decline in the cost of whole-genome sequencing. This is a significant reduction in the time it takes to sequence the entire genome from the approximately 13 years it currently takes to complete the sequencing of the first human genome sequence. In the near future, it may be possible to achieve same day whole genome sequencing in the field rather than in the lab. The ability to inexpensively identify average genetic value using pooled DNA samples from groups of animals will enable the development of new cost effective management applications based on genomic information.

CONCLUSION

Traditional genetic improvement programs, based on measuring large numbers of pedigreed animals in well-defined cohort groups for the full range of economically important production and fitness traits, are commonly practiced for smallholder farmers in LMICs. Currently, the ability to use genomic data in combination with the use of information and communication technologies is increasing the potential for genetic research by identifying native and hybrid animals for use in intra breed conservation, cross breeding and selection programs.

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