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Science and research: Pillars of the development of high Andean livestock farming in a context of climate change

La ciencia y la investigación: Pilares del desarrollo de la ganadería Altoandina en un contexto de cambio climático

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This editorial explores the importance of science and research in the development of livestock farming in the Andes, highlighting the impact of climate change and the fundamental role of universities in publishing and disseminating research results.

Livestock farming in the Andes, a fundamental activity in the economy and subsistence of rural communities living in the vast areas of the high Andes of South America (above 3000 m above sea level), faces a series of challenges arising from its extreme geographic environment and the effects of climate change. Extreme conditions characterized by hypoxia, low temperatures, scarcity of water resources and soils with low fertility, impose significant limitations on livestock farming, not only affecting the availability of pastures for livestock, but also the health and well-being of animals[1].

Among the livestock farming activities developed in the Andes are the breeding of species such as alpacas, llamas, sheep and cattle, which face significant challenges arising from the harsh climatic and geographic conditions of the Andes. However, science and research have proven to be essential tools to improve the production, productivity and sustainability of this sector, promoting advances in areas of knowledge such as molecular genetics, reproductive biotechnologies, nutrition, animal health, among others.

One of the most notable advances was the genetic improvement of the high Andean species. Through research, it has been possible to identify and select traits that optimize the production of meat, wool and milk, improving the resistance of animals to endemic diseases and adverse conditions such as extreme cold and hypoxia. The use of biotechnology and molecular genetics allowed the development of genetic markers that accelerate the selection of individuals with desired characteristics, reducing the time and costs associated with traditional breeding methods[2].

Climate change has altered traditional weather patterns, affecting the availability of water and forage resources essential for livestock. Extreme temperatures, prolonged droughts and irregular rainfall have reduced the productivity of high Andean grasslands, putting the food security of animals at risk and, therefore, the subsistence of livestock communities[3]. Therefore, scientific research is essential to understand these changes and develop mitigation and adaptation strategies.

Science provides the tools necessary to face the challenges of climate change in High-Andean livestock farming. Through research, sustainable management practices must be identified that improve the resilience of livestock systems. Thus, the implementation of silvopastoril systems, which combine trees and shrubs with

grasslands, have proven to be effective in improving forage quality and increasing the water retention capacity of the soil[4]. In addition, the selection and breeding of livestock breeds adapted to the extreme climatic conditions of the Andes were made possible thanks to advanced genetic studies[5].

Universities based in the high Andes have the crucial duty of generating and disseminating scientific knowledge. Through research and extension programs, universities not only contribute to the development of new technologies and practices, but must also train local producers in their implementation. Collaboration between universities and livestock communities is essential to ensure that scientific advances translate into tangible benefits for producers.

The publication and dissemination of research results are essential for the advancement of knowledge and its implementation in innovative practices. Scientific journals and international conferences provide platforms for sharing findings and discussing new ideas[5]. Furthermore, the accessibility of information through digital media has facilitated the transfer of knowledge to a wider audience, including livestock producers who can directly apply research results in their daily practices[6].

Science and research are fundamental pillars for the sustainable development of High-Andean livestock farming in a context of climate change. The role of universities in the generation and dissemination of knowledge are key players in this process. It is imperative to continue investing in research and strengthen alliances between scientific communities, universities and livestock communities to face current and future challenges.

Conflicts of interest

There are no conflicts of interest.

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Ethical considerations

This article was guided by respecting the authors as a source of scientific information.

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Figure 1 Alpaca breeding in the high Andes of the Peruvian Altiplano (Pinaya, Santa Lucía, Puno).

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