Bio Vet Innovator Magazine

Volume 1 (Issue 1) JULY 2024

OPEN ACCESS
Popular Article

Sustainable Livestock Production

Lokesh Kumar[1], Sachin Chaudhary[2], Ravina[3], Himanshu Saini[1], Shree Ram Karir[4]

[1]Ph.D. scholar, Department of Livestock Production Managaement
[2]M.V.Sc., Department of Animal Nutrition
[3]Ph.D. scholar, Department of Veterinary Microbiology
College of Veterinary and Animal Sciences, Bikaner, RAJUVAS, Rajasthan, India - 334001

***Corresponding Author:** himanshusaini1779@gmil.com

DOI – https://doi.org/10.5281/zenodo.13121235

Received: July 19, 2024
Published: July 29, 2024

Abstract

A rapidly expanding human population has led to an increased demand for animal products, which has caused the livestock business to rise rapidly. In order to meet the increased demand for animal protein from an increasingly urbanized and affluent population, livestock farming worldwide will become more and more complicated. Among various agriculture sectors, livestock sector is growing swiftly and current trends predict its continuous growth in future also. Policies, mitigation strategies, and livestock production adaptation are essential for safeguarding livestock productivity from adverse effects of climate change. There should be a midway approach to balance the potential benefits from livestock with the adverse impacts arising from it. Sustainable livestock practices are advocated to be practiced for the continuance of ecological systems in their elegant manner.

Exploding Human Population:

Livestock revolution is more demand driven as with the continuous increasing human population, intense urbanization, potential growth in net income per head, elevated purchasing power and dietary preferences towards animal products. This in turn leads to generation of more intensified livestock production systems with limited resources like land, water, etc. It has been projected that there would be 70 to 80% increase in meat and milk demands by 2050 in accordance to human population growth. Fulfilling demands of enormously growing population is indeed challenging with maintaining environmental harmony.

Importance of Livestock:

Different heterogeneous livestock production systems fulfill the current demand of animal products with varying intensification levels in diversified agro-ecological zones with differing production goals. Extensive grassland systems, intensified and vertical landless systems and mixed farming systems of livestock raising provides significant services like food security, nutrient availability and ecosystem balance. Livestock plays multiple roles like providing livelihood to low and middle income farmers, being an asset, source of nutrient dense products, contribution to national economy (GDP), as a means of trade between countries and within country, creating job opportunities, providing food security, maintaining ecological balance and many more.

Food security:

According to FAO, food security refers to the condition when all citizens have physical, social and economic reach to the sufficient, safe and nutritionally balanced diet for active and healthy life. To suffice such situation, livestock sector solely plays critical important role by providing direct and indirect animal derived products or services. Various large and small animal rearing systems supports the notion of food security in developing and well-developed countries.

Adverse effects of Livestock:

Global rise in livestock derived products resulted in detrimental environment changes through diversion of available resources (land, water, fossils) towards animal production and creating situation of competition with the human population and also contributing to pollution of ecological systems like water, land, air, etc.

After the publication of Livestock's Long Shadow' by the FAO in 2006, livestock sector has been globally blamed for its greater proportion to GHG emissions, land use change, soil degeneration, water utilization and biodiversity losses. However, such data are mainly rooted on intensified industrialized livestock production chains existing in developed countries.

I. Conversion to arable land:

There is global expansion of pastureland at the cost of natural habitats for grazing livestock and conversion of forests and other natural areas into cropland for the production of feed for intensified rearing of pig and poultry industries to meet animal product demands. In this way the livestock systems are covering major area of earth's surface along with the use of water resources for cleaning, drinking and crop production. There is continuous deterioration of biodiversity mainly attributed to more use of land for farming. Out of total available land surface, 33% area is used for livestock production.

Extensification of livestock production systems is the main driving force for the transformation of forests and native grasslands

into cultivation land which further results in enhanced carbon foot prints and biodiversity losses. On an average, about more than one third of arable land is used for feed production. Land, being the limiting resource, must be used in appropriate manner for the food production systems.

II. Emission of Green House Gases (GHG):

Although GHG emission ranges from 8 to 18%, but on an average livestock sector contributes 18% of global GHG emission. These variations arise due to methodological differences (methane inventories v/s life cycle assessments), CO_2 attributed due to change in land use (livestock raising, feed production), regional differences and emission sources. Enteric methane production, feed processing, manure, slurry and land use for feed cultivation together contributes major sources of methane, CO_2 and N_2O in livestock production system. Among all these sources, feed processing alone accounts for 45% of global livestock emissions.

Media outrage arguing that for saving environment, little or no consumption of animal source food should be adopted as solution is not practical approach as it would result in neglecting the potential of livestock as livelihood and ecological balance. Such gloomy prompt narratives obscure the different complex and many positive impacts of livestock in low and middle income countries. Along with the livestock related environmental issues, crucial role of livestock in livelihood of small farm holders along with nutrition, income, asset provision and nutrient recycling should also be targeted.

Concept of Sustainability:

Precisely, the word sustainability refers to ability to maintain some entity, product or process over the time. Thus, sustainability can be defined as the efficient and full potent use of available ecological resources for the fulfillment of human needs without exhausting resources and compromising the requirements of the up-coming generations and minimizing adverse irreversible effects on the carrying capacity of the environment. Sustainable development approach addresses the judicious use of resources for elevating human living standards without endangering earth's ecosystem and their continuance for further succeeding generations. Further the concept of sustainable development rests on three major conceptual pillars *viz*. economic, social and environmental sustainability.

There should be aim to reduce environmental footprints beyond endangering the livelihood and economic sake that livestock contributes to human life.

Ways to utilize animal products:

There are three pathways to describe current situation of food-feed competition according various authors.

1) **Production pathway:** This pathway suggests that there should be continuous rise in animal source food with minimum livestock-related environmental impacts. There should be greater production of animal derived products per unit of resource used or emissions generated. This can be achieved by improving feed digestibility, feed conversion efficiency, minimizing diseases, improved fertility rates, better feed storage amenities, etc. or overall intensified production per unit of livestock reared. But as the intensification of production increases there is subsequent augmentation in feed-food competition. For instance, beef production potentially rose by feeding more concentrate in place of roughage but at the same time the diversion of more grains towards beef leads to vying for human food supply.
2) **Consumption pathway:** This pathway suggests minimizing or no use of animal derived food or their products to reduce environmental impacts generated by livestock rearing indicating that vegan diet is most environmental friendly. However, turning whole human population into vegan or vegetarian would lead to loss of recycling of inedible by-products back into food chain which are otherwise used by animals efficiently.

   Above mentioned both pathways serves as two extremes of a scale where adoption of one tends to ignore the benefits of the other. So, the midway approach can serve as alternative solution which is discussed below.
3) **Low-cost livestock production**: It can be said as the middle pathway where some animal derived products are consumed from livestock reared on low-opportunity-cost-feedstuff, which otherwise have no nutritional value or importance in food-chain if left unused. By adopting such method, feed-food competition can be potentially minimized.

Sustainable Livestock Practices:

It refers to practices that curtail potential negative effects on natural resources by forbidding the impairment of natural ecosystems, better water and land use, enhanced productivity and input use by accomplishing a multi-level system for feed resources and related management plans. Livestock sustainability requires the treatment of leftover water, the reduction of greenhouse gas emissions and the improvement of the system's ability to act as carbon sinks. Additionally, it entails minimizing food safety risks through hygienic protocols and animal health monitoring, implementing mechanisms for the verification of food safety and ensuring animal welfare, which is defined as ensuring that animals are safe, well-fed, comfortable, able to behave naturally and are not subjected to pain, fear or stress.

Adopting practices to keep optimum animal health, integration of modern advanced technologies for monitoring animal health, data recording and interpretation (Precision Livestock technologies), enhancing feed efficiency, better nutritional management for lower emissions, use of elite genetic breeds are some of the major steps to be taken for sustainable development.

Conclusion:

Achieving the sustainable development goals depends critically on the need for more sustainably produced and consumed animal source food. However, the dominant narrative surrounding livestock ignores the vital roles that animals play in providing a living as well as the abundance of locally adapted livestock options, focusing only on the detrimental environmental effects of the livestock sector. To guarantee that livestock can soon help achieve important sustainable development goals, there will need to be more cooperation between public and private sectors in managing vital resources, educating consumers, and promoting investment and policy. Further experiments are needed to determine the benefits and costs of implementing more ecologically friendly methods, such as changing land use. This would be particularly challenging to do with integration of environmental, social, and economic pillars of sustainability into assessments of livestock production.

References:

Akasha, M. H., Mondalb, S., & Adusumillic, S. (2021). Sustainable livestock production and food security. *Emerging Issues in Climate Smart Livestock Production: Biological Tools*

Techniques, *71*.

Basiago, A. D. (1999). Economic, social, and environmental sustainability in development theory and urban planning practice: The environmentalist. Boston: Kluwer Academic Publishers.

Broom, D.M., Galindo, F.A., Murgueitio, E. (2013). Sustainable, efficient livestock production with high biodiversity and good welfare for animals. Proc R Soc B 280: 20132025. http://dx.doi.org/10.1098/rspb.2013.2025.

CBD, Secretariat of the Convention on Biological Diversity. 2006 Global biodiversity outlook, 2. Montreal, Canada: World Trade Centre.

Delgado C, Rosegrant M, Steinfeld H, Ehui S, Cour C. (1999). Livestock to 2020: The Next Food Revolution. Food Agric. Environ. Discuss. Pap. 28, Intl. Food Policy Res. Inst.

FAO (2017). FAOSTAT: Food balance sheets. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

Giraldo C, Escobar F, Chara´ JA, Calle Z. (2011). The adoption of silvopastoral systems promotes the recovery of ecological processes regulated by dung beetles in the Colombian Andes. *Insect Conserv. Divers*. 4, 115 – 122. (doi:10.1111/j.1752-4598.2010. 00112.x)

Herrero, M., Wirsenius, S., Henderson, B., Rigolot, C., Thornton, P., Havlík, P., De Boer, I. and Gerber, P.J. (2015). Livestock and the environment: what have we learned in the past decade?. *Annual Review of Environment and Resources*, *40*(1), pp.177-202.

Kaufmann, T. (2015). Sustainable livestock production: Low emission farm–The innovative combination of nutrient, emission and waste management with special emphasis on Chinese pig production. *Animal Nutrition*, *1*(3), 104-112.

Leinonen, I. (2019). Achieving environmentally sustainable livestock production. *Sustainability*, *11*(1), 246.

Man, N., & Yee, S. S. (2023, March). Sustainable Livestock Practices. In *3rd International Conference on Environmentally Sustainable Animal Industry 2022 (ICESAI 2022)* (pp. 25-35). Atlantis Press.

Martin, G., Barth, K., Benoit, M., Brock, C., Destruel, M., Dumont, B., Grillot, M., Hübner, S., Magne, M.A., Moerman, M. and Mosnier, C. (2020). Potential of multi-species livestock farming to improve the sustainability of livestock farms: A review. *Agricultural Systems*, *181*, p.102821.

Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent social sciences*, *5*(1), 1653531.

Michalk, D. L., Kemp, D. R., Badgery, W. B., Wu, J., Zhang, Y., & Thomassin, P. J. (2019). Sustainability and future food security—A global perspective for livestock production. *Land Degradation & Development*, *30*(5), 561-573.

Paul, B. K., Butterbach-Bahl, K., Notenbaert, A., Nderi, A. N., & Ericksen, P. (2020). Sustainable livestock development in low-and middle-income countries: shedding light on evidence-based solutions. *Environmental Research Letters*, *16*(1), 011001.

Rojas-Downing, M. M., Nejadhashemi, A. P., Harrigan, T., & Woznicki, S. A. (2017). Climate change and livestock: Impacts, adaptation, and mitigation. *Climate risk management*, *16*, 145-163.

Sakadevan, K., & Nguyen, M. L. (2017). Livestock production and its impact on nutrient pollution and greenhouse gas emissions. *Advances in agronomy*, *141*, 147-184.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., & De Haan, C. (2006). Livestock's long shadow: Environmental issues and options. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

Van Zanten, H.H., Herrero, M., Van Hal, O., Röös, E., Muller, A., Garnett, T., Gerber, P.J., Schader, C. and De Boer, I.J. (2018). Defining a land boundary for sustainable livestock consumption. *Global change biology*, *24*(9), pp.4185-4194.

Citation: Lokesh Kumar1*, Sachin Chaudhary2, Ravina3, Himanshu Saini1, Shree Ram Karir4. (2024). Sustainable Livestock Production. BIO VET INNOVATOR Magazine, (Vol. 1, Issue 1, pp. 28–30). https://doi.org/10.5281/zenodo.13121235