

The Role of Livestock Resources in Sustainable Food Security and Livelihoods in Afghanistan

Ahmadullah Zahir¹, Maazullah Nasim², Safiullah Jauhar³, Emal Naseri⁴, Abdulfahim Sarwary⁵, Aminullah Noor⁶, Rahimullah Amarkhil⁷, Enayatullah Hamdard⁸

¹Afghanistan National Agricultural Sciences and Technology University (ANASTU), Afghanistan

²Faculty of Agriculture, Department of Horticulture, Kabul University, Kabul, Afghanistan

³Faculty of Agriculture, Department of Animal Science, Kabul University, Kabul, Afghanistan

⁴Department of Horticulture, Faculty of Agriculture, Wardak Institute of Higher Education

⁵Faculty of Veterinary Sciences, Department of Para-Clinic, (ANASTU)

⁶Faculty of Veterinary Sciences, Department of Pre-Clinic, (ANASTU)

⁷Faculty of Veterinary Sciences, Department of Para-Clinic, (ANASTU)

⁸Department of Animal Genetics Breeding and Reproduction, Nanjing Agricultural University

✉ Email: ahzahir.af@gmail.com (corresponding author)

ABSTRACT

The agri-food sector is pressured to produce more livestock products with fewer resources due to global drivers like rapid population growth and challenging climate changes. Food insecurity can lead to hunger, malnutrition, and famine over time. Recently, half of Afghanistan's population has been food insecure due to COVID-19 and climate change, as highlighted by current food price shocks. One of the factors contributing to food insecurity is the decline of livestock production for many reasons. Meanwhile, by 2050, we will need to produce 50-70% more food to feed an additional 2 billion people, and the demand for animal-source foods (ASFs) will double. Ruminant livestock are crucial for food security by converting non-edible products into nutritious food. Still, they pose a challenge to sustainability due to resource-intensive practices and greenhouse gas emissions. In Afghanistan, empowering livestock farmers to build capacity for sustainable food security and implementing region-specific strategies for sustainable livestock production and consumption is crucial. However, creating and developing an efficient whole value chain system can help maximize dairy production and improve nutritional security in Afghanistan. Nonetheless, a single player cannot achieve livestock-based food security in Afghanistan. All stakeholders need to collaborate and recognize the significance of livestock in ensuring food security. This paper reviewed the role of livestock resources and the required percentage of ASF in human diets for sustainable nutritional security and resulting productive livelihoods in Afghanistan.

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Introduction

The world population is projected to be 9.7 billion by 2050, almost one-third more than the residents in 2015. This increase poses a challenge due to the increasing food production of

the increasing population and public health issues such as obesity and malnutrition. This challenge is highlighted by the recent global evidence that there are almost 2 billion overweights with 1 billion starving individuals in numerous countries. The food system faces ongoing challenges due to elevating greenhouse emissions, natural ecosystem loss, and deteriorating bio-diversity. These challenges indicate that the up-to-date food manufacturing and consumption policies were inappropriate and did not respond to current demand.

Moreover, the COVID-19 pandemic has brought concerns linked to food security on the frontline, which further highlights the prerequisite to change the food system (Babu, Looden, Ajmal, Rana, & Srivastava, 2021; M Henchion, Moloney, Hyland, Zimmermann, & McCarthy, 2021). In recent decades, considerable progress has been made to alleviate extreme hunger. On this occasion, the United Nations (UN) reported that in 2020, over 30% of the world's inhabitants severely or moderately experienced food insecurity, and entitlements to end starvation by 2030 in terms of the Sustainable Development Goals 2 (SDG2) (Nigel Poole, Amira, Amiri, & Farhank, 2019).

The Integrated Food Security Phase Classification (IPC) provides a comprehensive and standardized framework for assessing food security situations in countries worldwide. The most recent IPC data on food security in Afghanistan sheds light on the current situation. According to the latest IPC analysis conducted in Afghanistan, the country is experiencing a severe food security crisis. In particular, Afghanistan's southern and western regions, including provinces such as Helmand, Kandahar, Nimroz, and Herat, have been classified as being in the "Emergency" phase. This means that households in these areas are facing high levels of acute food insecurity, with limited access to food and serious malnutrition concerns.

Additionally, several provinces in the east and northeast regions, such as Kunar, Nuristan, and parts of Laghman, have also been classified in the "Emergency" phase, indicating a significant deterioration in food security. Moreover, several areas in the northern and central regions, including Balkh, Baghlan, Samangan, and parts of Parwan, are classified as being in the "Crisis" phase. This implies that households in these areas face heightened levels of acute food insecurity and risk falling into the "Emergency" phase if appropriate actions are not taken. The ongoing conflict, displacement, drought, and economic challenges are major contributing factors to the current food security crisis in the country. The COVID-19 pandemic further exacerbates the situation, disrupting livelihoods and hindering access to food for many vulnerable households. Immediate and sustained humanitarian assistance and long-term solutions must be implemented in Afghanistan. This includes providing food aid, improving access to livelihood opportunities, supporting agricultural production, and enhancing resilience to future shocks. The IPC data highlights the urgent need for comprehensive and coordinated efforts by national and international stakeholders to address the food security crisis in Afghanistan and ensure that vulnerable populations have access to sufficient, safe, and nutritious food (Cook-Pellegrin, 2022; Islam et al., 2022).

The ongoing drought effect, climate change, and food insecurity in Afghanistan have made the country prominent within the region (Iqbal, Donjadee, Kwanyuen, & Liu, 2018). Over 54.5% of Afghans are in poverty, and more than 80% of the country's people live in countryside areas. Rural inhabitants' main activity is agriculture, contributing to around 26% of the country's gross domestic product (GDP) (Ahmadzai, 2014; Samim & Zhiquan, 2020). However, more than 30% of Afghan people do not have access to food to fulfill their daily needs (D'Souza & Jolliffe, 2013). According to the World Bank assessment (2020), owing to the COVID-19 pandemic, long-term conflict, low agriculture production, climate change, agricultural land destruction, lack of appropriate infrastructure, and increasing food prices, among others, reduced the country's economic growth up to 1.75 %, following high rates of poverty in Afghanistan (Oskorouchi & Sousa-Poza, 2021; S. A. Samim et al., 2021). The foremost contributor that decreased food production and ultimately affected livelihood was the past ten-year drought, particularly in 2018, which destroyed over two-thirds of the country and wrecked farming production (Akbar & Ahmadzai, 2020). The production has declined, and farmers and herders have lost their homes, properties, and livestock. As a result, people's income has been cut in half, and their health condition has deteriorated. To cope with this situation, many Afghans have resorted to negative strategies such as begging, debt, asset sales, and the sale of livestock (Miani, Hamayoun, Hemat, & Economics, 2022).

Afghanistan is known for its agricultural sector, particularly livestock rearing and poultry keeping, which provides livelihoods to over 80% of its population (RAHIMI & ARTUKOĞLU, 2021). The main contributors to food production and livelihood of the rural populace are livestock rearing and poultry keeping. Most Afghans' income generation and diurnal food security have relied on manufacturing eggs, milk, and dairy. Moreover, the governmental and private livestock sector provides employment opportunities, supports food security and livelihood, and increases the national GDP (Nigel Poole, Echavez, & Rowland, 2018). In this country, nomadic and sedentary are the two livestock-rearing systems. Most farmers practice sedentary farming, keeping small livestock such as goats and sheep, camels, and mostly milking cattle. In contrast, nomadic farmers rely on livestock for their livelihoods (Hasani & Shrestha, 2023).

However, as the demand for livestock-derived foods (LDFs) is increasing, there is a necessity to manage their production (projected that the demand for milk and meat will increase by 48% and 57% between 2005 and 2050 globally) (Mottet et al., 2017). Globally, strategic investment in the livestock sector is crucial, as it ensures sustainable development, enhances resource productivity, and supports the resilience of the manufacturing systems. Nevertheless, since the production and consumption of animal-source foods (ASFs) vary across developing regions, there are various occasions and drawbacks to expanding the sector. Therefore, policies and investments are needed to address this variation. Furthermore, to evaluate the possible influences of new programs, technology, policies, or investments that support the development of the livestock sector in developing countries,

the understanding of main interactions and trade-offs within and beyond the livestock sector is indispensable (Enahoro et al., 2019; Turk, 2016).

Livestock, in particular its production, is an important element of the livelihood strategies of poor people. This sector provides opportunities for emergencies and reduces weakness to economic shocks from planting failures, public health, and other hazards. Their products directly benefit farmers through livestock products (Nigel Poole et al., 2018). Despite the challenges, the agricultural sector still produces food for nearly 13% million people in Afghanistan, while 14.3 million of them are living in severe poverty. To overcome this challenge, the National Livestock Development Program (NLDP) is designed nationally to enhance livestock food, subsequently, livestock products and linkage with better market access (Shrestha, Bokhtiar, Khetarpal, Thapa, & Asia-Pacific Association of Agricultural Research Institutions 2019). According to the literature, keeping local poultry in rural areas, especially by women, increases household incomes, food accessibility, and security (Miani et al., 2022). A work conducted by Najam et al. (2023) revealed that participating in livestock activity can increase household income and food security and decrease poverty. The author also added that livestock production is crucial in hardships like climatic and economic unpredictability (Najam et al., 2023).

Hence, participating in any agricultural activity, particularly in livestock resources, could secure food security in Afghanistan compared to related activities. Moreover, explicit leadership from the center is necessary to integrate agriculture and nutrition policies. However, to reduce food and nutrition insecurity, it is vital to focus on decentralizing policy on a regional and provincial basis. This review aimed to summarize the role of livestock resources and the required percentage of ASF in human diets for sustainable food security and associated livelihoods in Afghanistan. Figure 1 illustrates the food and non-food roles of livestock resources.

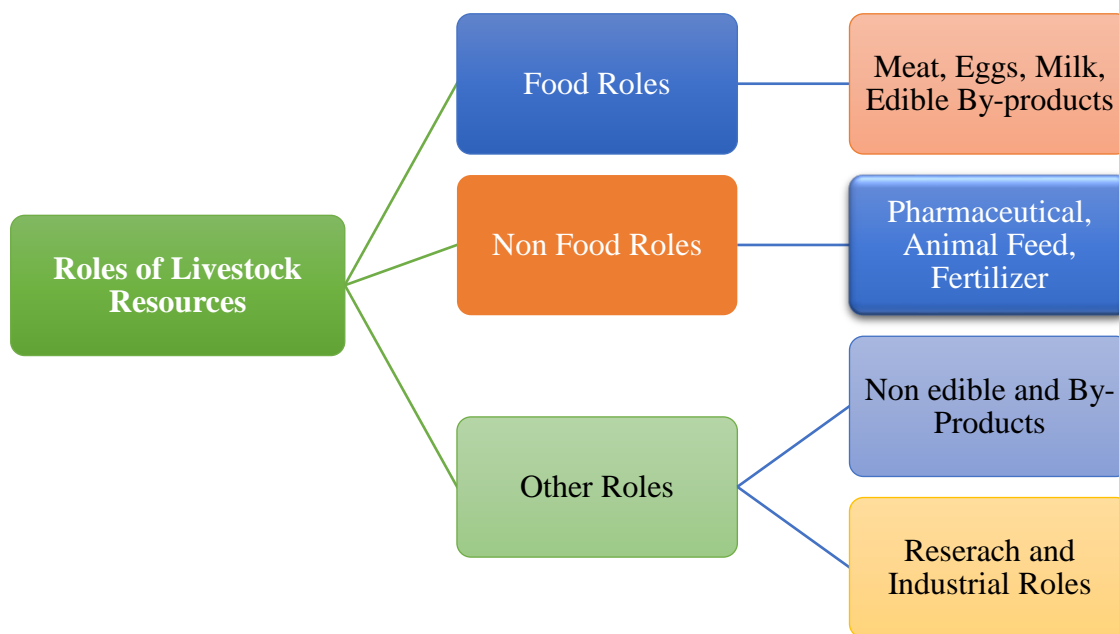


Figure 1. Diagram of livestock resources as food and non-food roles, adapted from (Banda & Tanganyika, 2021).

Food Security and ASFs

The primary objective is to advance nutritional and food security for individuals at risk of malnutrition. These individuals need higher levels of nutrients than the common people, and shortages during this phase of life can have life-threatening consequences, leading to physical, emotional, and cognitive stunting, significantly decreasing the potential for an energetic and healthy lifetime. Even when caloric requirements are met, shortage and inadequate consumption of ASFs for PLW and IYC can have severe consequences (Adesogan, Havelaar, McKune, Eilittä, & Dahl, 2020).

Temperature and precipitation patterns will affect cultivation, growing periods, and production volume, eventually leading to a decline in food quality as hotter and drier climates reduce yields. Surge pollutants such as aflatoxins and bacterial pathogens (Figure 2). Diseases, drought, and other unfavorable climactic events will likely lead to the depletion of feed resources for animals, resulting in periods of increased market pressure. Access to these items will be restricted due to the lack of potent and responsible trade affairs (Enahoro, Lannerstad, Pfeifer, & Dominguez-Salas, 2018).

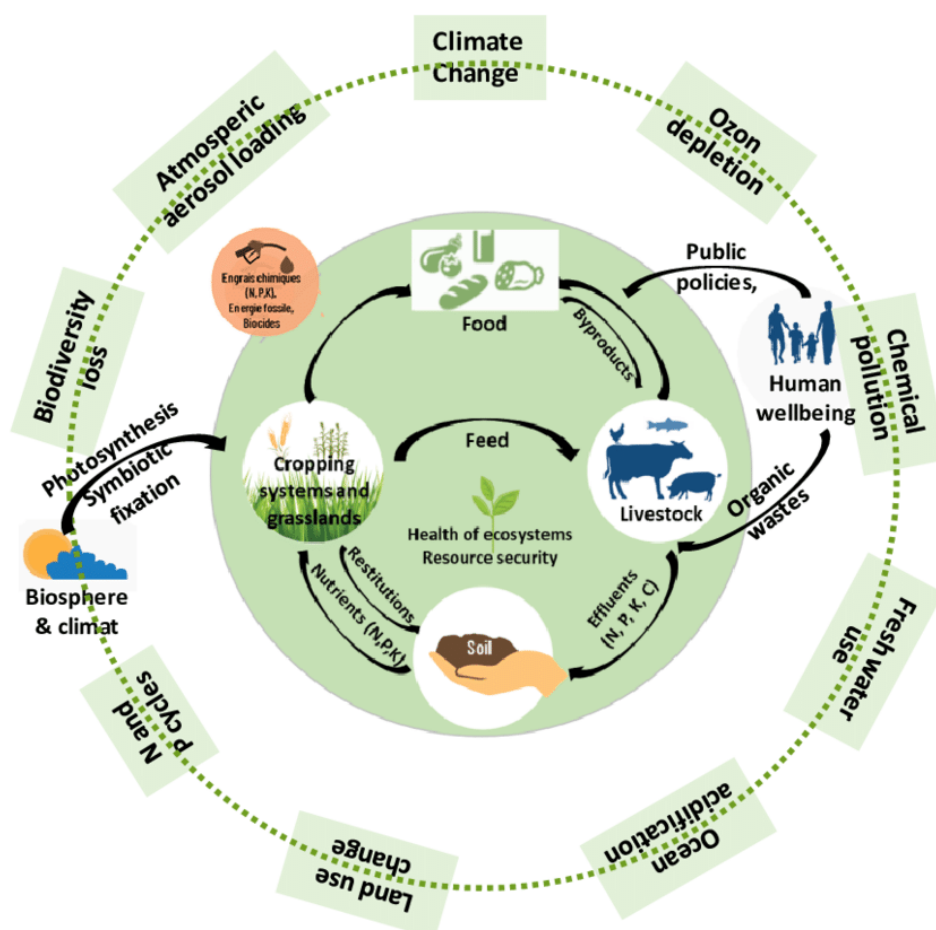


Figure 2. This illustration displays within the global borders the role and place of livestock in balanced circular food production (Peyraud, MacLeod, & Rural Development: Brussels, 2020).

There will be a significant increase in global meat production, with a growth of nearly 40 megatons (Mt) expected by 2029. Among these, developing regions are likely to experience

most of this growth. Among smallholders, poultry is the key driver of growth in overall meat production owing to its low expenses, rapid production period, and high feed conversion percentages. The report also estimates that by 2029, worldwide poultry meat consumption will reach up to 145 million tons (Mt), constituting 50% of the remaining meat consumption. Although mutton consumption is expected to increase by 2 Mt, the per capita sheep consumption is likely to decline in favor of poultry meat in several Middle Eastern and North African republics. However, world milk production increased by 1.3% in 2019, reaching approximately 852 metric tons; these include cow's milk (81%), buffalo's milk (15%), and goat, ewe and camel milk (4%). Growth is expected to be 1.6% over the next decade, with India and Pakistan anticipated to contribute more than half of the growth. The report forecasts robust growth production in Africa due to larger herds, more goat and sheep milk, and lower profits due to lower inputs (OECD, Food, & Nations, 2020).

Projected that the demand for fresh dairy foodstuffs will upsurge by 1% in the next decade, primarily due to the daily income and population growth in India, Pakistan, and most African countries. Egg production has increased by 24% in the past 10 years, led by China, the European Union (EU), the United States, and India. Due to emerging food safety and quality standards, small-scale farmers face drawbacks, as they have partial access to facilities, product inputs, and information. This might be restricting their ability to engage in international and national markets. To meet the growing demand, nationwide manufacturing systems are required to provide small-scale farmers with appropriate policies and encouragement. Meat consumption in developing regions is also projected to increase significantly compared to developed countries (Oecd, 2020). Here, we discussed the annual livestock production and value in Afghanistan in Table 1 and the RDA of protein per capita in Table 2.

Table 1. Annual livestock production and value in Afghanistan* (Livestock Production Department MAIL, 2019)

The magnitude of the Livestock Sector Annual Production and its Value in US\$					
No.	Items	Unit	Quantity	Unit Cost	Total Value In USD
1	Red meat	MT	240,039	3,567	856,219,113
2	Poultry meat	MT	156,680	2,564	401,727,520
3	Fish meat	MT	10,000	2,547	25,470,000
4	Milk	MT	1,930,000	448	864,640,000
5	Honey	MT	2,319	4,458	10,338,102
6	Eggs	No	600,000,000	0.06	36,000,000
7	Wool	MT	13,315	337	4,487,155
8	Cashmere	MT	867	10,000	8,670,000
9	Skin	Hides	1,488,440	15	22,326,600
10	Animal Intestines	No	1,234,773	3	3,704,320
11	Carpets	M ²	418,519	150	62,777,800
12	Fur				415,500

13	Animal bones	MT	82	640	52,480
Total Cost USD					2,296,828,590

*Recommended Dietary Allowance (RDA) for a human average of 65 gm of protein and 2256 Kcal enrage per day is recommended in developing countries, and at least 40 % should be a source of animal protein. Based on the 40% recommendation, the requirement of animal protein per capita is 26 grams, and as per existing sources, it is estimated annually in Table 1 above per person in Afghanistan. MT: metric tons; M²: Meter Square.

In Afghanistan, 25.8% of the total meat production comes from poultry, and the annual demand for poultry meat is 270 thousand tons. This production cannot meet the current market demand; thus, more work is required to fulfill the current demand of the market (Zrawar, Rasikh, Danishyar, Motmain, & Biotechnology, 2023).

Table 2. RDA of protein per capita (The food item has been calculated based on the 40 million population) (Livestock Production Department MAIL, 2019)

Food Items	Protein Grams	Daily Requirement	Annually Requirement	Annual Current consumption	Shortage
Meat	9	50gm	18.3 Kg	7.8 Kg	10.5 Kg
Milk	7	250ml	91.25 Liter	48.4 Liter	42.85 Liter
Egg	10	1 egg	365 eggs	20 eggs	345 eggs

ASFs and Nutrition Security

ASFs are a good source of high-quality and essential amino acids, bioavailable minerals, and vitamins. However, the intake proportion of these products varies extensively between different countries and communities. Some people consume over 100 kg of meat yearly, while others consume less than 4 kg. This can be because of various reasons, such as poor availability, lack of accessibility, or cultural and religious dietary restrictions (Enahoro et al., 2018). Highly nutritious products such as eggs and milk, meat, and meat byproducts comprise all the essential nutrients, such as high-quality proteins and important fatty acids that complete the human body's requirements (Nutrition, 2020). The one expected source of vitamin B₁₂ is ASFs, which are indispensable for human nutritional requirements throughout life, particularly for development and healthy growth. For instance, young children's bodies require foods that absorb nutrients efficiently due to fast growth (Lonnie et al., 2018; Schönfeldt, Pretorius, & Hall, 2013). ASFs have positive effects on children's nutrition, development, and education. They also help preserve aging adults' memory, bone health, and muscle mass (Goyal et al., 2018). Micronutrient malnutrition is a major problem in Afghanistan, and iron and vitamin A deficiency are of particular being exist (Flores-Martinez, Zanello, Shankar, & Poole, 2016). Communal strategies to point out malnutrition appear to be more about "remedial measures" than improving food systems, which mimic agricultural and general policies for food consumption (N Poole, Echavez, & Rowland, 2016).

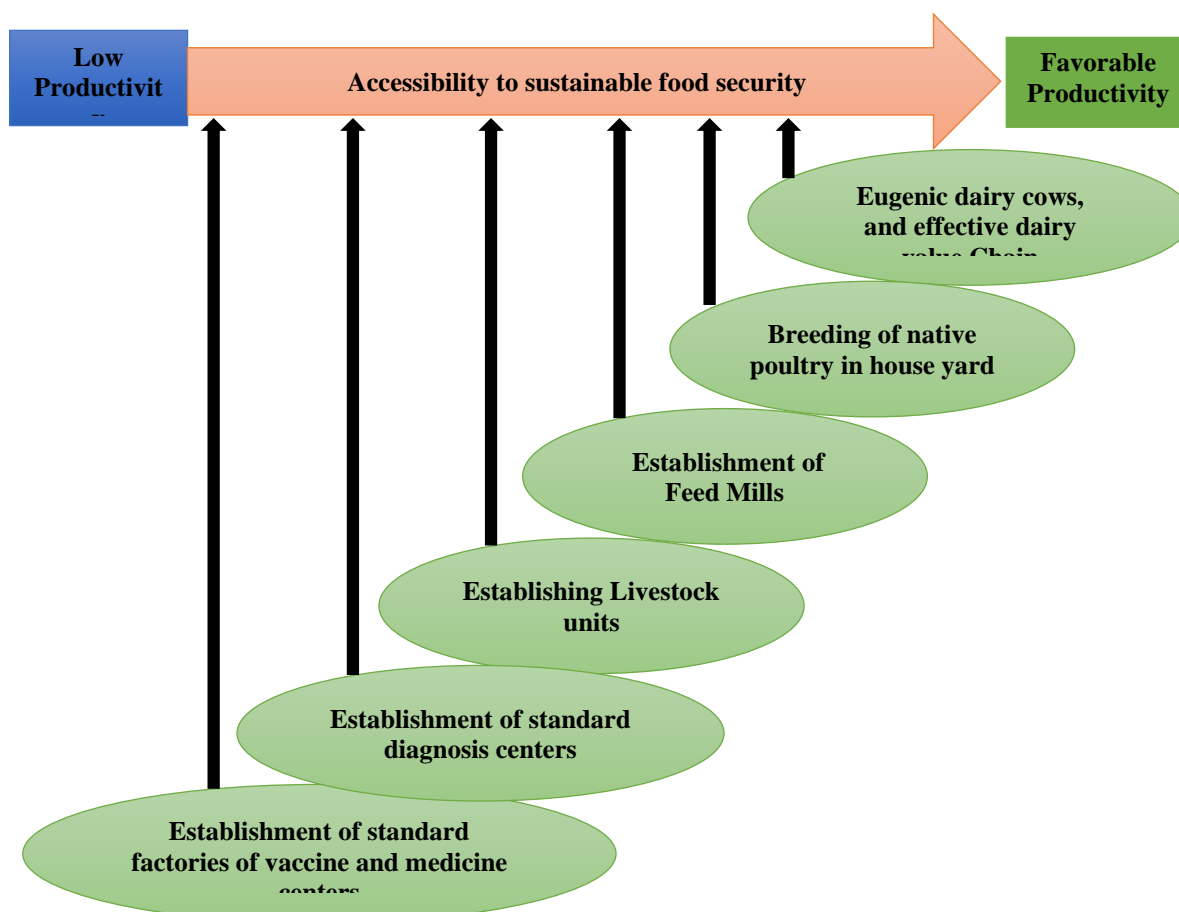


Figure 3. Theory of sustainable food security in rural areas, adapted from (Miani et al., 2023).

Challenges to Livestock for Food and Nutrition Security

Agriculture, especially livestock in low- and middle-income countries, is growing rapidly due to increasing incomes, changing food supplies, and growing populations. The world population, which was 7 billion in 2010, is expected to increase to 9.7 billion in 2050, and as income increases in developing countries, total food demand is expected to increase further by 50%. Furthermore, there will be a rise of nearly 70 percent in the demand for animal-based foods (Lokuruka, 2020). There are several challenges to livestock for food and nutrition security in Afghanistan. These challenges include inadequate infrastructure, limited access to markets, insecurity and conflict, Climate change and natural disasters, limited technical knowledge and skills, and access to credit and financial services. Addressing these challenges is crucial for improving livestock production in Afghanistan and achieving food and nutrition security for its population (Samim et al., 2021).

Animal production solves the growing global demand for protein and calories. However, many challenges will limit its capability to accomplish this role. ASFs account for 25% of global protein and 18% of calorie consumption. However, meeting the rising demand, particularly from developed and developing countries, remains a challenge (Table 3). The world population is projected to grow by 2050, and most of this growth is expected to occur in developed and developing countries. As people's profits increase, the demand for ASFs also increases. This situation is further exacerbated by the fact that the incomes of

households that do not rely on agriculture for their livelihoods grow quicker and are, therefore, stronger in terms of ASFs than households whose livelihoods depend on agriculture.

Nevertheless, the demand for ASF provides economic development and higher returns opportunities for livestock farmers, which often improves the quality of food for people experiencing poverty (Maeve Henchion, Hayes, Mullen, Fenelon, & Tiwari, 2017; Neopane, Shrestha, & Gauchan, 2022). The growing demand for ASFs in low-income countries such as Afghanistan poses a major challenge due to the growing population and rising per capita income. However, agricultural development in rural areas still has great economic growth and poverty reduction potential. Key barriers that prevent livestock from benefiting from economic growth include lack of feed and forage, limited access to land and water, poor infrastructure, and environmental deprivation. To improve rural livelihood and food security in small livestock farming, we must address production, risk, and sustainable development across the entire value chain (Ates et al., 2018).

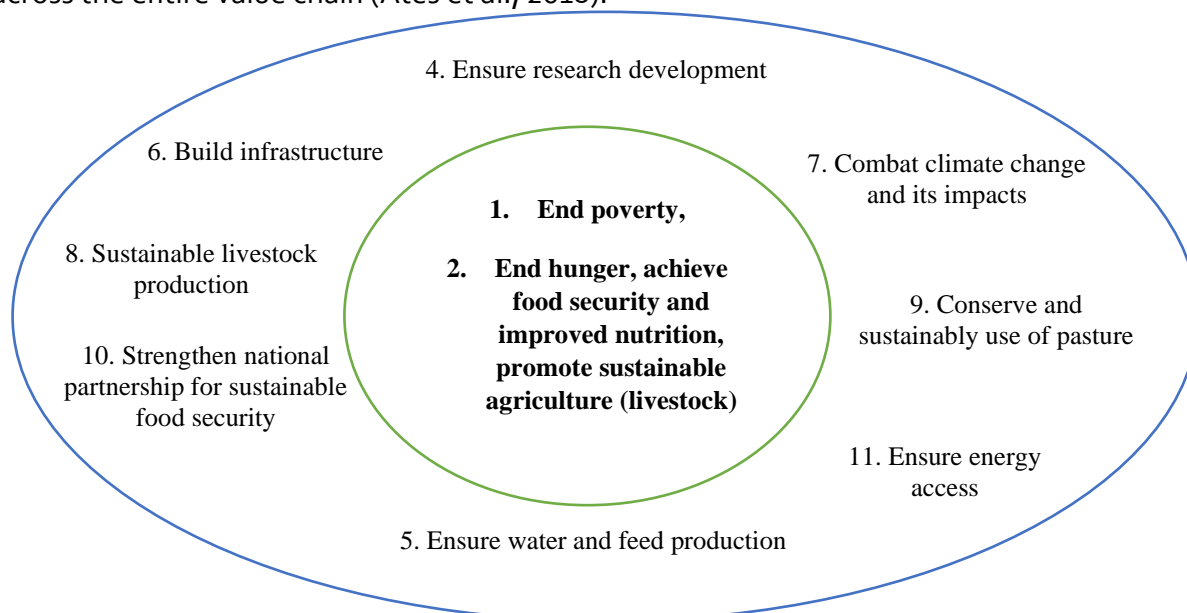


Figure 4. Livestock, nutrition, and the Sustainable Food Security (SFS), adapted from (Nigel Poole et al., 2018).

The Sustainable Development Challenges

Afghanistan is one of the poorest countries in the world, ranking 181st out of 182 countries according to the Human Development Index. The Rural and Livestock Microfinance Program (RMLSP) was conducted by the International Fund for Agricultural Development (IFAD) to find solutions to these problems. Due to the conflict, the country faces numerous challenges and kinds of insecurities. Afghans are faced with difficulties due to a lack of financial aid, a lack of assets, and an impaired agricultural system. However, over 75% of the Afghans live in rural areas and make a living from agriculture. IFAD involvement estimation showed that up to 70% of the people face malnutrition, and 38% face food insufficiency (Banda & Tanganyika, 2021). Livestock farming is an important source of income for Afghans. However, insecurity and drought reduced livestock production by 40-70 percent. Small-scale farming faces

problems such as standard animal shelters, scarce access to animal vaccines and drugs, and pasture overgrazing (Rota & Urbani, 2021). Figure 4 illustrates the livestock, nutrition, and Sustainable Food Security (SFS).

Animals' Diseases

Animal illnesses decrease the quality and quantity of livestock production; losses could be long-term or catastrophic, reducing farmers' food supply. The Global Food Security Report shows that animal diseases are the main cause of food insecurity in Afghanistan (Crises, 2021). Therefore, this study encourages the administration to implement policies to combat animal diseases, which could improve food security.

Insufficient Feed Availability

Around 75% of Afghans reside in the countryside, and about 85% are rearing their livestock. Unfortunately, most of the forage seed and relevant planting resources in Afghanistan were misplaced amid the long conflict, which implies that ranchers either have to deliver their forage seed or depend on bargaining with other agriculturists. The livestock sector faces a noteworthy challenge of deficiently nourishing accessibility and production for ruminants. The need for scrounge of great quality prevents efficiency, and this issue heightens in a long time of dry spells or in locales where feed imports from neighboring nations are limited. The deficiency of forage and feed, particularly during winter, is one of the essential confinements for ruminants in Afghanistan and subsequent food insecurity (Louhaichi et al., 2019).

Opportunities

The development of the livestock sector is supported in Afghanistan; there are various opportunities to enhance it, and the livestock sector can directly and indirectly contribute to the national economy and GDP. The following are some major opportunities for the livestock sector to intervene (Table 3) effectively.

- Establishment of standard quality control centers/laboratories on a national level (quarantine system on borders entry points).
- Establishment of standard diagnostic centers/laboratories on a national level
- Establishment of standard medicine/vaccine production factories on a national level
- Establish feed production mills to produce various types of feed, depending on animal requirements, such as animal feed, poultry feed, fish feed, etc. (O. F. J. Oecd, 2020).

Interventions

Eugenic dairy cows. Fruitful ethnic change measures depend on this to recognize animals with superior genetic competence and make offspring that will accomplish better than their competitors in various rearing situations (Doeschl-Wilson, Knap, Kinghorn, & Van der Steen, 2007). This was the view of Afghan participants within the interviews, which was detailed by

the creator as follows: "Keeping milking cows in the countryside has very low productivity, regenerative capacity, and keeping these dairy animals has no advantage for a family's economy"(Miani et al., 2023).

Breeding of local poultry in house-yard. One of the foremost income sources in Afghanistan is the poultry industry, where around 1.5 million individuals are busy, which donates 11.5% for livestock development (Zrawar et al., 2023). Local poultry breeding has been reported to substantially contribute to the sustainable development and engagement of rural societies (Sanusi, 2018). In addition, the role of poultry in the food security of impoverished villagers is more noteworthy than that of middle and rich family units (Wong et al., 2017). The author added that the development program application is essential since all required situations were suitable for rural poultry rearing (Miani et al., 2023).

Effective Dairy Value Chains

In Afghanistan, women have the opportunity to work in the agricultural sector, particularly in areas like farming and livestock rearing. One area where many women work is in producing dairy products, which is beneficial as it can help them earn money and feel more empowered (Ganesh & Evaluation Unit, 2017). Moreover, having access to dairy products can improve the health of children, teenage girls, and women in rural areas (Boros & McLeod, 2015). However, there are some challenges in producing and selling dairy products in Afghanistan, such as insufficient production, ineffective processing, and inadequate marketing. As a result, people sometimes have to import dairy products from other countries (N Poole et al., 2016). Building effective value chains can improve human nutrition by leveraging dairy production. However, value chain development must be contextualized to maximize potential, and further research is needed. Poole (2018) studied the building of dairy value chains in Badakhshan province, Afghanistan, and added that the dairy interventions to add value through improving production, milk collection, processing, and distribution are effective. Additional study and value chain development are essential to realizing projects' potential (Nigel Poole, 2018).

Livestock sector. Globally, small-scale agriculture plays a significant role in solving many difficulties. These include extreme levels of poverty; 689 million people live on less than \$1.90 a daily income, and 690 million people suffer from starvation. The sector can also prevent the rapid destruction of arid lands, fresh water, forest, and ocean environments. However, there are challenges such as zoonotic diseases, emerging epidemics (such as COVID-19), and the adverse effects of climate change. It can provide healthy and nutritious food, create employment, empower rural women and youth, and support families financially, physically, and socially assistant (Zanello, Shankar, & Poole, 2019). Livestock farming is imperative in Afghanistan, where numerous families reared cows, sheep, goats, and chickens. Indeed, 60% of all households are keeping livestock. This rate is more than 55% among people who have their land. Additionally, 12% of households have a garden, the main source of fruits, nuts, and vegetables (Trani, Kuhlberg, Cannings, & Chakkal, 2016).

Zanello et al. (2019) studied Afghanistan's agricultural production, marketing, and food diversity. They noticed that overall production diversity is important, but livestock diversity

is especially important regarding the different diets of Afghan farmers. Animal species diversity is important for diet yearly but is predominantly important during the lean season when crop diversity becomes less relevant. One of the main ways to move from livestock diversity to seasonal diets in Afghanistan is through livestock diversification, which provides an additional source of income from the sale of livestock or their products. Unlike crop production, animal husbandry can provide income for marketing off-season crops and animal feed. Among them, sales of eggs and mutton are noteworthy. In addition, the diversity of livestock species helps maintain a diverse diet through off-season production and consumption. Cows and goats are used mainly for milk production. This is especially vital to maintaining milk supply during the lean season, particularly when the milk market drops (Zanello et al., 2019).

Household food and nutrition security. Small animals support small farmers by producing eggs, meat, milk, wool, and fertilizer. This increases household food security and financial stability. Small animals also benefit indirectly by increasing crop and vegetable yields through fertilizer and pest control services. In addition, small livestock have a short reproductive cycle and good growth, ensuring the family's food and income security. They can also withstand extreme weather conditions, making food more accessible for households. Women prefer small animals because they play a direct role in food security, providing good food for domestic consumption, but they can also be sold or bartered to meet urgent cash needs. In some countries, women prefer small animals due to health problems. In contrast, men prefer larger animals because they are more valuable, and women have limited opportunities to obtain or control them. A recent study on the contribution of small ruminants to food security shows that small ruminants play an imperative role in improving food security because increased income allows families to purchase other foods, such as fruits and vegetables, that are not grown on their farms (Wodajo et al., 2020).

Household economic security. Small livestock, such as poultry and small animals, are valuable assets for poor farmers as they can be sold for cash and used to meet basic household needs. These animals require fewer resources and offer a faster return on investment than larger animals. Farmers can use them to accumulate assets and sell processed products for additional income. In developing countries, 68% of households earn daily from livestock (Banda & Tanganyika, 2021).

Small livestock strengthens rural people's resilience to climate change

Livestock production is one of the causes of climate change and faces growing challenges due to its effects. Climate change directly and indirectly affects livestock performance, ecological systems, feed production, and agricultural profitability. These impacts could change local and nationwide food manufacturing and income rates. Climate change also affects the quality and quantity of plants, reduces food and water supply, and increases the incidence of climate change-induced illnesses. Small-scale farming has great adaptive potential. For example, sheep and goats can transform useless plants to other animals and humans into human food and the food of people living in barren or barren lands. Pastoralists provide valuable

ecosystem services in many areas, including sustaining high levels of biodiversity, increasing soil cover, reducing erosion, preventing forest fires, upholding infrastructure, seed distribution, nutrient distribution, and improving soils. Livestock feeds hundreds of millions of poor and landless families, allowing people to produce food when farmers cannot. Through breeding, better feed and nutrition, as well as animal health and husbandry, production can be increased, emissions reduced, and energy restored (Paul et al., 2020).

Establishing livestock units

In Afghanistan, animals provide meat, milk, and dairy products and keep families healthy. Additionally, the sale of livestock (often including live animals) can increase a family's income, increase the family's purchasing power, and support the importance of animal ownership. Nevertheless, still, farmers do not have access to enough food in some countries. Therefore, as livestock farming is a major source of malnutrition, the government needs to develop strategies focusing on animal production in the study area (Samim et al., 2021).

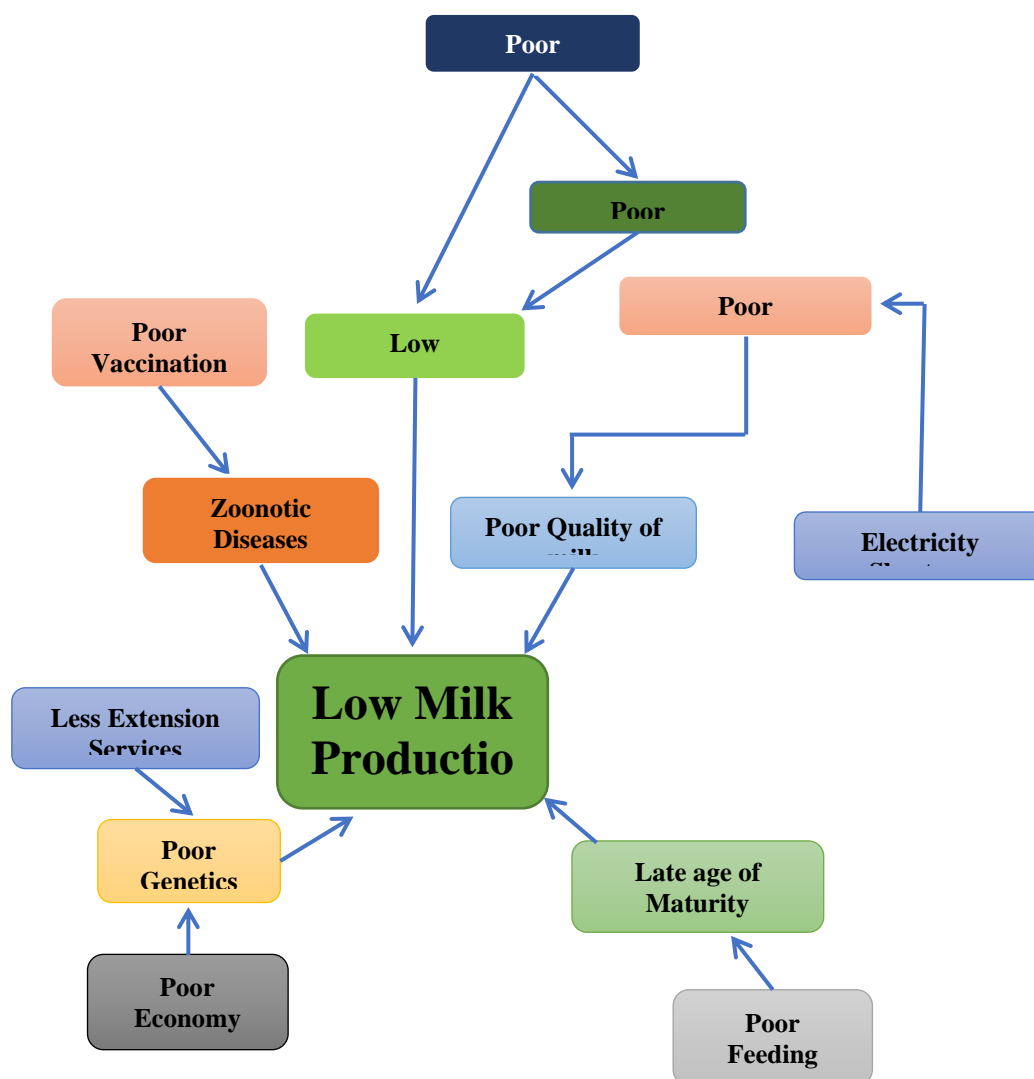


Figure 5. The causal diagram represents the low milk production in Afghanistan (FAO, 2023)

High Demand for Livestock Products

As the population and income of Afghanistan and bordering republics continue to grow, demand for animal products is projected to increase. This offers Afghan farmers a substantial opportunity to improve family income and food security. Livestock production has played an important role in Afghanistan's economic development and is important for farmers. Livestock farming contributes to rural development by providing income, food, employment, and other basic services (Ates et al., 2018; Louhaichi et al., 2019).

Table 3: Opportunities and drawbacks, and proposed programs in the livestock sector, adapted from (Shrestha et al., 2019)

Drawbacks	Opportunities	Program actions
Genetic improvement of native poultry and livestock	Afghanistan has a high genetic variability and diversity.	<ul style="list-style-type: none"> Improved breeding using both conventional and molecular methods. Creation of a national gene bank for strains and breeds significant to a particular area. Genetic resource sharing across provinces. The avoidance, management, and complete elimination of zoonotic and transboundary illnesses.
Livestock and poultry health.	Create technology that will improve health management.	<ul style="list-style-type: none"> Creation of a bank with vaccinations and diagnostics for transboundary animal diseases in order of priority. The creation of a national referral laboratory for illnesses with significant regional impact. Supporting the use of Insight Segmentation and Registration Toolkits (ITKs) and herbal remedies to safeguard the health of animals. Creating a balanced diet by utilizing agricultural waste, crop dregs, and local grasses.
Inadequate supplies of grain and fodder.	Feed items that are readily available locally, as well as industrial, agricultural, and unusual feed ingredients.	<ul style="list-style-type: none"> Formulation of feed for poultry and livestock that is economical. Encouraging the production of high-yield fodder with cutting-edge technologies. Encourage hay and silage during lean times. Distribute fodder seeds through the national initiative. Adaptive trials for fodder varieties with high yields. Management of pasture land in communities.
Biosafety and biosecurity in the raising of animals and poultry.	Safe and healthful products for poultry and livestock.	<ul style="list-style-type: none"> Good management practices (GMPs) about poultry and animals.
Applications of antibiotics and antibiotic resistance.	Public health concerns.	<ul style="list-style-type: none"> Raising awareness about antibiotics and antibiotic resistance. Alternative feed additives, such as probiotics, prebiotics, herbal residues, functional foods, and nutraceuticals.

Natural calamities.	Safety netting for poultry and cattle.	<ul style="list-style-type: none"> • The National Feed Bank (NFB) was established. • Creation of an affordable shelter. • Managing the spread of disease. • The avoidance of foreign infections and the promotion of climate-resilient breeds.
Climate change.	Green livestock production.	<ul style="list-style-type: none"> • Meal plans that cut greenhouse gas emissions. • A database of greenhouse gas emissions from cattle in Afghanistan. • Reproductive and genetic enhancement program. • Developments in vaccinations, biologicals, and veterinary diagnostics. • Disease surveillance and monitoring to improve the health of animals.
Enhancing the ability of qualified human resources.	Proficiency in the field of poultry and cattle.	<ul style="list-style-type: none"> • Characterization and preservation of previously undiscovered poultry and cattle. • Creating a balanced ration model to reduce greenhouse gas emissions. • Clean milk and meat production to guarantee food safety. • Add value to cattle and their byproducts to increase financial returns. • Create small ruminant farms, medium-to large-scale dairy farms, and poultry farms. • Create a local database for risk evaluation.
Policy formulations.	Policy harmonization for improved regional collaboration.	<ul style="list-style-type: none"> • Examining current regulations pertaining to the transfer and exchange of animals as well as their products. • Encourage and provide incentives for importing and exporting goods related to cattle, livestock, and life.

Conclusion

There is a gap in the existing discussion about nutritional security and the production and use of ASFs. However, the absence of ASFs in many developing and emerging countries may negatively impact the health and well-being of expecting mothers and their unborn children, which might hinder the growth of these individuals. However, raising animals in these countries can be costly and detrimental to the ecosystem. However, industrialized markets usually consume more ASFs than is recommended, which can have detrimental impacts on health. The production of ASFs is cost-effective in developing countries due to its lower resource consumption and environmental impact than other industries, such as transportation. Policy creation requires an understanding of the diverse debates surrounding ASFs. Even though ASFs are a major global source of food security, certain production methods may be detrimental to the environment and public health. As such, policymakers should promote consideration of how ASF manufacturing methods impact many aspects of

sustainability. It is imperative to acknowledge that there is likely to be a growing market for ASFs, highlighting the significance of manufacturing growth. Meeting all needs rather than just consumption should be the main message that addresses farmers' concerns about risks to their livelihoods. Raising cattle should be seen as a crucial step in improving the food security of rural people. The livestock sector needs to increase productivity and the number of animals it raises to meet the world's growing food needs. To ensure food security and safety in rural regions, more consideration should be given to developing production facilities, building cattle housing structures, breeding domestic poultry, and research. Since animal diseases are the main source of food insecurity, the government can pass legislation that prevents them, improving food security, boosting domestic production, and providing financial support.

Recommendations

Below are some recommendations that would be helpful for livestock farmers and governmental sectors.

- Establishment of standards for Afghanistan's livestock industry in several areas, including infrastructure for livestock, market connections, public health prevalence, the introduction of enhanced high-yield and resistance breeds, and a single health program.
- Action is advised to address various concerns about system hazards, value chain development, and production efficiency.
- It is necessary to provide cash, concentrated animal feed, emergency relief assistance, animal shelters, and animal health services.
- Technical workers and farmers in animal and poultry production should receive specialized training and extension programs in animal nutrition and range management, fodder production, and feed crops.
- Several organizations representing livestock stakeholders also emphasized the need to plant suitable leguminous crops on rain-fed agricultural land to boost fodder production and the availability of high-protein feed for livestock.
- To safeguard the assets of sedentary and Kuchi livestock and provide veterinary care, immunizations, and medication.
- Constructing water stations at pasture level will increase the accessibility of drinking water for cattle.
- Depending on farmers' choices, resources, and livelihoods, good livestock management is necessary within farming systems. International organizations should prioritize income-generating opportunities and skills for livestock holders to alleviate severe food insecurity.

- Poultry is advised for smallholders producing meat because of its short production cycle, low costs, and high feed conversion ratios.
- The province and the country should set up a cold chain system for active immunization surveillance.
- In emergencies and disaster management, innovative technology for cattle husbandry techniques, such as fodder production, should be implemented.
- Investments in livestock businesses and bettering market facilities in Afghanistan may be especially beneficial to diets during the lean season, when families may find it difficult to get a variety of foods.

Future Prospects of Livestock Resource in Food Security

The world's livestock industry currently uses most agricultural land directly through pasture use and indirectly through crop use. Compared to other foods, foods derived from animals require more land, energy, and water during manufacturing. Only when rising demand is matched by available supply worldwide can dairy, meat, and eggs contribute to global food security. All parties must work together to make livestock farming sustainable in terms of food security. There are roles to be played by the public and commercial sectors, food producers and consumers, research, and technology advancements. Large-scale private sector initiatives will account for a significant portion of the increase in animal production. The majority of the expenses are associated with managing adjustments to lower environmental.

Long-term research, governmental financing, and support for animal health care in rural places are all necessary for infrastructure. Public funding on a national and international level is also required to create temporary buffers during food crises. In order to help animal-dependent social farmers and smallholders access the service base, private organizations and non-governmental organizations (NGOs) can invest in public and private finances. There is a need for joint ventures of private and public funds to support farmers who create specialized livestock enterprises, use water management, pilot projects in environmental services, or create new health outside of agriculture, as some farmers farm differently or fail when they cannot deliver products of sufficient value or quality.

Public management can foster innovation and efficiency in the private sector by identifying methods to enhance livestock farming's productivity and its contribution to waste management. A brand-new, unique system has been developed that can both feed cities and reduce pollution. It's crucial to ensure that big manufacturers and small company owners are included while assisting the private sector with policies. To increase comprehension and produce knowledge that will inform the creation of policies for both corporate and domestic use, we must integrate research into institutions and technology. For instance, creating better animals for particular production locations will increase the efficiency of livestock

farming, but managing an innovative health system will be necessary to tackle climate change and water tension.

Consumer decisions will influence animal behavior in product selection and animal management. Governments can impact elections by controlling food advertising, school lunch programs, and nutrition instruction. However, a more creative and varied nutrition communication strategy is needed, founded on solid information and disseminated by credible people, peer groups, and the media. Conclusively, the future of livestock in ensuring global food security hinges on forming a coalition comprising diverse stakeholders with varying objectives, roles, and histories, yet a shared understanding of the potential benefits livestock can bring to food security and the consequences of inaction.

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