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Buffalo rearing and production system in Bangladesh: Problems and prospects

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ABSTRACT

Buffalo farming in Bangladesh holds significant untapped potential for enhancing rural livelihoods and contributing to national food security. Despite their economic importance, current buffalo production remains low, primarily due to limitations in nutrition, breeding, health management, infrastructure, farmer education, and environmental adaptability. The production system is predominantly extensive and traditional, characterized by low productivity and inefficient resource utilization. Although initiatives to promote semi-intensive and intensive systems are underway, widespread adoption is hindered by poor feeding practices, limited access to artificial insemination (AI), inadequate veterinary services, and lack of organized marketing. Feeding systems largely depend on low-quality roughages, with minimal supplementation, leading to suboptimal milk and meat yields. Improvement in feeding and nutrition management, including the adoption of intensive systems and balanced rations, requires enhanced farmer training and accessible extension services. Similarly, reproductive performance remains poor due to reliance on natural mating, late maturity, and low conception rates. The development of AI infrastructure, estrus detection technologies, and genetic improvement programs is essential for reproductive efficiency. Health and disease management also face serious challenges due to insufficient vaccination coverage, limited veterinary outreach, and dependence on traditional practices. To unlock the full potential of buffalo farming, an integrated strategy involving scientific interventions such as climate-resilient practices, modern breeding, balanced feeding, cooperative marketing, and policy-driven support is imperative. With targeted investment and coordinated efforts from government agencies, research institutions, and farming communities, buffalo production in Bangladesh can be transformed into a commercially viable and sustainable livestock sub-sector.

1. Introduction

Buffalo rearing plays a significant role in the rural economy of Bangladesh, particularly in terms of milk, meat, and draught power production. As a resilient and adaptable animal species, buffaloes are well-suited to the country's hot and humid climate, saline-prone coastal areas, and wetland ecosystems. Despite this suitability, the sector remains underdeveloped compared to other livestock systems, largely due to traditional management practices, poor genetic potential, limited veterinary support, and lack of policy focus.

Bangladesh is home to approximately 1.5 million buffaloes, representing a relatively small portion of the total livestock population which meets up the 2% and 0.94% national milk and meat demand respectively (Hamid et al., 2017). Buffalo, predominantly indigenous and crossbred, are raised in extensive “Bathan” (free-range) systems in coastal regions, household semi-intensive systems, and intensive systems in semi-arid regions like Dinajpur and other areas of Bangladesh (Rahman et al., 2019; Hamid et al., 2017). These animals are primarily reared in rural and coastal regions, such as Noakhali, Bhola, Barisal, Patuakhali, and parts of the Haor areas in Sylhet and Mymensingh. Buffalo milk, though superior in fat content and nutritional value compared to cow milk, constitutes only a minor share of the national milk supply. Similarly, buffalo meat is gaining popularity due to its lean

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quality but remains a niche product in the domestic market.

Several constraints hinder the expansion of buffalo farming in the country. These include lack of improved breeds, poor reproductive efficiency, insufficient quality feed, high calf mortality, limited access to veterinary care, and absence of modern farming technologies. Furthermore, most buffaloes are reared under extensive or semi-intensive systems with minimal input, leading to low productivity.

Despite their importance, buffalo production systems in Bangladesh are still traditional, constrained by low productivity, poor management practices, and limited veterinary services (Rahman et al., 2021). Despite these challenges, there is significant potential to improve buffalo production in Bangladesh. With proper investment in breed improvement, artificial insemination, feed resources, health management, and farmer training, the sector could see substantial growth. Additionally, increased demand for high-fat milk, lean meat, and organic manure presents a unique opportunity for buffalo farming to contribute more meaningfully to food security, rural livelihoods, and economic development.

The transformation of the buffalo sector in Bangladesh requires concerted efforts from government, researchers, NGOs, and the private sector to ensure sustainable development and full utilization of the buffalo's productive potential.

2. Production system of buffalo in Bangladesh

In Bangladesh, buffaloes are reared under three main production systems: extensive, semi-intensive, and intensive, with the extensive system being the most prevalent.

2.1. Extensive system

The extensive system is mainly practiced in coastal and riverine areas, such as Barisal, Bhola, Noakhali, and Cox's Bazar, where buffaloes graze freely on natural pastures and fallow lands. Farmers usually do not provide supplemental feed, and there is minimal health care and housing. This system is labor-saving but results in low productivity due to poor nutrition and disease management (Hasan et al., 2020).

2.2. Semi-intensive system

In this system, buffaloes are allowed to graze during the day and are provided with supplemental feeding in the evening. It is common in areas like Mymensingh and Pabna, where smallholder farmers' rear buffaloes alongside other livestock. The productivity is moderately higher compared to the extensive system due to partial feed and health care provision (Akbar et al., 2017).

2.3. Intensive system

The intensive system is limited but gradually increasing, particularly among commercial dairy and meat buffalo farms near urban and peri-urban areas. These farms offer balanced rations, regular veterinary care, and improved housing, aiming at higher milk yield and meat production. However, high input costs limit the adoption of this system among smallholders (Uddin et al., 2016).

3. Feeding system and nutrition management of buffalo in Bangladesh

Buffaloes in Bangladesh are primarily reared under low-input systems where feeding practices remain traditional and suboptimal, contributing to low productivity in both milk and meat production. Buffaloes in Bangladesh predominantly rely on low-quality roughages, such as straw and natural grasses, with little to no concentrate supplementation. This contributes to low milk yield, generally around 1.5–2.5 liters per day for local breeds (Rahman et al., 2021). Efforts to promote improved fodder cultivation and feed formulation are ongoing, but adoption is still low (Hasan et al., 2020). Proper nutrition management is a critical factor affecting the performance, reproductive efficiency, and overall health of buffaloes, but the adoption of improved feeding strategies remains limited across the country (Akbar et al., 2017; Rahman et al., 2021).

3.1. Feeding systems

The feeding system in Bangladesh varies with production type and geographical location and can generally be categorized into:

3.2. Grazing-based (Extensive) system

In the coastal, haor (floodplain), and char (river island) areas, buffaloes are often reared under an extensive system where they graze on natural pastures, fallow fields, and roadside grasses. This system dominates regions like Barisal, Bhola, Noakhali, and Sunamganj (Hasan et al., 2020). The feed intake is mostly seasonal and of poor nutritional quality, especially during the dry season when green forage is scarce.

3.3. Semi-intensive System

Semi-intensive buffalo rearing is practiced in parts of Mymensingh, Pabna, and Rangpur, where animals graze during the day and are given supplemental feedings such as rice straw, crop residues, and occasionally green fodder in the evening. Although this improves nutrient intake compared to the extensive system, it still lacks balance and consistency (Uddin et al., 2016).

3.4. Intensive feeding system

The intensive system is applied on a limited scale in peri-urban and commercial dairy farms. In these systems, buffaloes are stall-fed with formulated concentrate mixtures, cultivated green fodder, and conserved roughages like silage or hay. Farmers in this system sometimes use feed supplements to enhance milk yield and body growth, but the cost of concentrate feed and lack of technical knowledge remain constraints (Haque et al., 2020).

4. Nutritional challenges

Low Nutrient Density of Feeds: The majority of feeds used, particularly rice straw, are low in protein (2–4%) and digestible energy, resulting in poor productivity (Akbar et al., 2017).

Imbalanced Rations: Most buffalo diets in rural areas are deficient in key nutrients, particularly protein, vitamins, and minerals. Farmers seldom formulate balanced rations due to limited awareness and lack of extension services (Rahman et al., 2021).

Seasonal Feed Scarcity: During the dry season, green fodder becomes scarce, and buffaloes depend heavily on dry roughages, further compromising nutritional adequacy (Hasan et al., 2020).

Lack of Silage/Hay Preservation: While technologies such as silage and hay making are available, their adoption remains low due to lack of infrastructure, training, and investment (Uddin et al., 2016).

5. Recent interventions and improvements

Efforts by government and NGOs have promoted fodder cultivation (e.g., Napier, German grass, maize) and training on balanced feed formulation. Some commercial farms are now adopting total mixed ration (TMR) systems. There is also increasing research into non-conventional feed resources like water hyacinth, urea-molasses-treated straw (UMTS), and oil cakes to improve nutrition economically (Haque et al., 2020).

6. Reproduction and breeding system of buffalo in Bangladesh

Buffaloes in Bangladesh face long calving intervals and late age at first calving, often exceeding 4 years. Natural mating is the dominant breeding method, with limited use of artificial insemination (AI) due to low conception rates and poor AI infrastructure (Akbar et al., 2017). Indigenous buffaloes are generally used, although some crossbreeding efforts with Murrah and Nili-Ravi breeds are being implemented (Uddin et al., 2016).

Buffaloes play a vital role in the livestock sector of Bangladesh, contributing significantly to rural livelihoods through milk, meat, and draft power. However, the reproductive efficiency and breeding management of buffaloes in Bangladesh remain suboptimal, limiting their productivity potential. The reproduction and breeding systems are mostly traditional, with poor heat detection, long calving intervals, and minimal genetic improvement efforts (Akbar et al., 2017; Rahman et al., 2021).

6.1. Reproductive performance of buffaloes in Bangladesh

The reproductive performance of indigenous buffaloes in Bangladesh is generally poor compared to cattle, mainly due to late maturity, silent estrus, seasonal breeding, and long inter-calving intervals (Uddin et al., 2016). The age at first calving typically ranges from 48 to 54 months, and the calving interval is often more than 18 months, resulting in low lifetime productivity (Hasan et al., 2020).

Key Reproductive Traits:
Age at puberty: 36–42 months
Age at first calving: 48–54 months
Estrus cycle: 21–24 days, with silent heat
Gestation period: ~310 days
Calving interval: 18–24 months
Service per conception: 2.0–2.5 (Akbar et al., 2017)

6.2. Breeding systems

Buffalo breeding in Bangladesh is primarily natural, with limited use of artificial insemination (AI).

6.2.1. Natural mating

Natural mating is the dominant breeding practice, especially in extensive and semi-intensive systems. Farmers typically use local bulls in the same community or let buffaloes mate freely during grazing. However, this method does not allow for genetic improvement and often leads to inbreeding (Rahman et al., 2021).

6.2.2. Artificial insemination (AI)

The adoption of AI in buffaloes is very low due to several factors:
Poor heat detection because of silent estrus
Lack of skilled inseminators
Low conception rates compared to cattle
Inadequate supply of frozen semen from improved breeds like Murrah or Nili-Ravi (Haque et al., 2020)
In some selected areas, efforts have been made to introduce crossbreeding with Murrah or Nili-Ravi bulls to improve milk yield and body size. However, the conception rate using AI in buffaloes remains below 30%, limiting its success (Uddin et al., 2016).

6.2.3. Community-based breeding programs

Recent pilot initiatives in the coastal and haor areas have explored community-based breeding programs using selected bulls and record-keeping of reproductive performance. These programs have shown promise but require institutional support, monitoring, and farmer training (Hasan et al., 2020).

6.2.4. Constraints in buffalo reproduction and breeding

Silent and seasonal estrus detection is difficult in rural conditions.
Low fertility and conception rates, especially under poor nutrition and heat stress.
Lack of breeding infrastructure and AI services in remote and flood-prone areas.
Limited genetic improvement programs or breed registries.

6.2.5. Recommendations for improvement

Enhancing AI services with trained personnel and proper semen supply from high-yielding breeds.
Introduction of estrus synchronization techniques using hormonal protocols.
Genetic improvement programs through selective breeding and recording.
Farmer training on reproductive management and early heat detection.
Improving nutrition and healthcare to support better reproductive performance.

7. Health and disease management of buffalo in Bangladesh

Buffaloes in Bangladesh contribute significantly to rural economies by supplying milk, meat, and draft power. However, their health status and disease management practices remain underdeveloped, especially in rural and remote areas. Poor healthcare access, lack of disease surveillance, and limited veterinary extension services have contributed to low productivity, high morbidity, and occasional mortality in buffalo populations (Rahman et al., 2021; Akbar et al., 2017).

7.1. Common health problems in Buffaloes

Buffaloes in Bangladesh are exposed to a variety of infectious, parasitic, and nutritional diseases, many of which go undiagnosed and untreated due to lack of veterinary support and farmer awareness.

7.11. Infectious Diseases

Foot and Mouth Disease (FMD): One of the most prevalent viral diseases, affecting buffalo productivity through fever, lameness, and reduced milk yield. Despite periodic vaccination campaigns, FMD outbreaks remain common due to irregular vaccination coverage and poor cold chain management (Haque et al., 2020).

Hemorrhagic Septicemia (HS): A major cause of sudden death, particularly during the monsoon season. Vaccination is recommended but often not practiced systematically (Uddin et al., 2016).
Anthrax and Black Quarter (BQ): Sporadically occur, especially in flood-prone areas, and pose zoonotic threats.

7.1.2. Parasitic diseases

Ectoparasites (ticks, lice) and endoparasites (liver flukes, gastrointestinal nematodes) are widespread due to poor hygiene, free grazing, and lack of deworming programs. These reduce weight gain, milk yield, and reproductive performance (Hasan et al., 2020).

7.1.3. Metabolic and nutritional disorders

Buffaloes suffer from minerals and vitamin deficiencies, especially calcium and phosphorus, leading to reproductive problems like retained placenta, low conception rates, and poor calf health (Akbar et al., 2017).

Inadequate nutrition also contributes to conditions like ketosis, bloat, and ruminal acidosis, particularly in semi-intensive and intensive farms without balanced diets.

7.1.4. Current disease management practices

In most parts of rural Bangladesh, disease management is reactive rather than preventive. Farmers often rely on traditional medicine or unqualified practitioners, and seek veterinary help only during serious outbreaks (Rahman et al., 2021).

Vaccination: Irregular and often limited to FMD and HS; national campaigns exist but coverage is insufficient.
Deworming: Occurs infrequently; few farmers follow scheduled deworming.
Veterinary Services: Available in urban centers but largely absent in coastal and remote areas like Bhola, Patuakhali, and Sunamganj.
Quarantine and Biosecurity: Largely absent; buffaloes often mix freely, increasing the risk of disease transmission (Hasan et al., 2020).

7.1.5. Constraints in health management

Lack of awareness among farmers about disease symptoms and prevention.
Insufficient veterinary personnel and infrastructure in rural areas.
Poor cold chain and vaccine distribution, especially during monsoon and floods.
Limited government monitoring of buffalo-specific diseases compared to cattle and poultry.

7.1.6. Recommendations for improvement

Strengthening Veterinary Infrastructure in buffalo-dense regions.
Community-based health programs, including scheduled deworming and vaccination.
Capacity building through farmer training on early disease detection and first aid.
Research and surveillance on buffalo-specific diseases and health economics.
Use of mobile veterinary clinics in remote and flood-prone areas.

8. Prospects of buffalo in Bangladesh

Buffaloes hold great potential in the transformation of Bangladesh's livestock sector. Despite their historically low productivity due to traditional rearing systems and poor management, buffaloes are increasingly recognized for their adaptability, high-quality milk and meat production, and ability to thrive on low-input systems, especially in coastal, flood-prone, and haor regions (Akbar et al., 2017; Rahman et al., 2021). With increasing domestic demand for

animal protein and the growing interest in commercial livestock farming, buffaloes are emerging as a viable option for sustainable rural development and food security.

8.1. Potential for milk production

Buffaloes contribute around 3–5% of the total milk production in Bangladesh but produce milk with higher fat content (6–8%) than cattle, making it more suitable for dairy processing industries such as yogurt, butter, ghee, and sweets (Uddin et al., 2016). Commercial farms using improved breeds (e.g., Murrah or Nili-Ravi crosses) have demonstrated milk yields of 6–10 liters/day, significantly higher than the national average of 1.5–2.5 liters/day from indigenous buffaloes (Hasan et al., 2020).

With increased access to artificial insemination, improved fodder, and veterinary support, milk production from buffaloes can help reduce the country's dependency on imported milk powder and meet rising demand in urban areas (Haque et al., 2020).

8.2. Contribution to meat sector

Buffaloes, especially culled females and surplus males, are increasingly marketed for meat. Buffalo meat (buffen) is leaner and more affordable than beef and has significant demand in both domestic and international markets (Rahman et al., 2021). Coastal and char regions are already supplying buffalo meat to urban centers like Dhaka and Chattogram.

With proper fattening, improved nutrition, and health care, meat production can be greatly enhanced, opening avenues for export potential, especially to Middle Eastern countries where buffalo meat is in demand.

8.3. Draft power and manure use

In areas where mechanized farming is still limited, especially in remote or waterlogged regions, buffaloes remain vital for plowing, cart pulling, and transportation (Akbar et al., 2017). Their ability to work under extreme heat and wet conditions makes them irreplaceable in some areas. Additionally, buffalo dung is widely used as organic manure and biofuel, contributing to climate-smart agriculture and reducing chemical fertilizer dependency.

8.4. Adaptability to harsh environments

Buffaloes are highly adaptive to adverse climatic conditions, particularly waterlogged areas, saline coastal belts, and lowland flood zones, where cattle often fail to thrive (Hasan et al., 2020). This makes buffalo an ideal livestock for climate-resilient farming systems in Bangladesh, where large portions of land are affected by salinity, flooding, and erosion.

8.5. Employment and livelihood opportunities

Buffalo farming offers income-generating opportunities for rural women, landless farmers, and youth, especially through milk collection, calf rearing, meat marketing, and value-added dairy processing. The formation of buffalo producer groups and milk cooperatives can enhance collective bargaining and improve market access (Uddin et al., 2016).

8.6. Government and institutional support

The Bangladesh government has identified buffalo as a priority species under the Livestock Development Policy and has initiated projects for: Establishing buffalo development farms (e.g., in Noakhali and Subarnachar), Enhancing AI services, Promoting fodder cultivation in saline lands, Supporting research through institutions like BLRI and DLS (Rahman et al., 2021).

8.7. Challenges to realizing the prospects

Despite these prospects, several constraints must be addressed: limited availability of improved genetic stock, inadequate veterinary services in remote areas, poor access to credit and feed, and Lack of organized buffalo markets and processing infrastructure (Haque et al., 2020).

9. Conclusion

Buffalo farming in Bangladesh holds significant untapped potential. While current production

remains low due to nutritional, infrastructural, breeding, health, educational, and environmental limitations, scientific interventions including balanced feeding, AI, intensive systems, cooperative marketing, and climate resilience can transform the sector into a profitable, sustainable contributor to rural livelihoods and national food security. Buffalo production in Bangladesh is largely traditional and low-yielding, dominated by the extensive system. While there are efforts to introduce semi-intensive and intensive systems, challenges like poor feeding, limited breeding services, and inadequate veterinary support hinder progress. Government initiatives, research support, and awareness programs are needed to transform the buffalo production system toward commercialization. The feeding and nutrition management of buffaloes in Bangladesh is still far from ideal. Most buffaloes are raised under extensive or semi-intensive systems relying on poor-quality roughages. Although there is growing interest in intensive feeding practices and balanced nutrition, widespread adoption requires increased extension services, farmer training, and access to affordable feed resources. Addressing these challenges will be crucial to improve productivity and profitability in buffalo farming. The reproduction and breeding system of buffaloes in Bangladesh is still largely traditional and inefficient. While natural mating prevails, artificial insemination and crossbreeding are not yet widely practiced. To enhance buffalo productivity, systematic breeding programs, AI infrastructure, estrus detection technologies, and improved herd management are necessary. With proper policy support and technical intervention, buffalo breeding in Bangladesh holds potential for significant improvement. Health and disease management in buffaloes in Bangladesh remains a major bottleneck to productivity improvement. The dominance of traditional practices, inadequate vaccination, and insufficient veterinary outreach result in high disease prevalence. An integrated approach involving government support, veterinary services, farmer education, and community involvement is essential for improving buffalo health and welfare across the country.

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