

## Coastal Livestock Shelter Management: A Call for Collaborative Sustainability

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### SUMMARY

Coastal regions are highly vulnerable to climate change impacts such as rising temperatures, increased humidity, and extreme weather events. Effective shelter management strategies are essential to protect the health and productivity of domestic livestock. This article examines climate stress on domestic livestock in coastal areas, focusing on the crucial role of shelter management in enhancing the well-being of large ruminants, especially in cattle and buffaloes.

### INTRODUCTION

Coastal regions face unique challenges due to climate change, including rising temperatures and extreme weather. Mitigating the impact of climate stress on domestic cattle and buffaloes in coastal areas necessitates a comprehensive approach, with a particular emphasis on shelter management. To address these challenges, effective shelter management strategies become imperative. This article explores the multifaceted aspects of climate stress faced by livestock in coastal areas, including the pivotal role of shelter design, it investigates key factors like ventilation, insulation, and adaptive infrastructure. Through real-world case studies, the article highlights successful initiatives that have positively influenced animal resilience. Despite the undeniable benefits, the implementation of effective shelter management faces challenges, ranging from economic constraints to knowledge gaps. To overcome these obstacles, collaborative efforts involving farmers, researchers, and policymakers are essential. The article encourages a holistic and sustainable approach to shelter management by advocating for stakeholder engagement. In conclusion, it calls for ongoing research and innovation to adapt to the evolving climate challenges and ensure the well-being of domestic cattle and buffalo livestock animals in coastal regions.

### Climatic Stress in Coastal Areas

Coastal zones, among the world's most densely populated, face escalating climate change threats, including flooding, sea level rise (SLR), and extreme weather events (Harley et al., 2006). In southern India, temperature differences between the east and west coasts add complexity. The impact of climate change on coastal areas involves factors such as flooding, land inundation, and storms. Addressing these challenges is crucial for safeguarding coastal communities and ecosystems.

Farmers in coastal saline regions rely heavily on livestock for their livelihoods. Small-scale traditional livestock systems are central to their economic activities, with dairy farming being vital for income, employment, and nutrition. The vulnerability index (VI) introduced by Maiti et al. (2014) quantifies vulnerability as  $VI = AC - (E + S)$ , where AC represents adaptive capacity, E indicates exposure, and S reflects sensitivity. Higher VI values denote lower vulnerability, while negative values suggest higher vulnerability due to the combined impact of exposure and sensitivity. Understanding and addressing these socio-economic dimensions are essential for enhancing the resilience of coastal livestock communities amid climate change.

### Importance of Shelter Management

Proper housing is vital for animal welfare, farm productivity, and sustainability. It reflects a holistic approach to livestock management, considering health, comfort, productivity, and farming efficiency:

#### Energy Efficiency in Thermoregulation

Adequate housing minimizes energy loss in thermoregulation. By shielding animals from extreme temperatures, less energy is spent on temperature regulation, improving overall efficiency.

#### Maintaining Hygienic Conditions

Proper housing ensures a controlled environment that helps prevent waste accumulation, reducing infection and disease risks.

### **Disease Prevention**

A well-designed housing system reduces disease incidence through proper ventilation, sanitation, and animal separation.

### **Protection from Predators**

Shelter protects animals from predators, ensuring safety and reducing stress, especially in areas with prevalent predatory threats.

### **Improved Working Conditions for Farmers**

Effective housing enhances working conditions for farmers by facilitating easier management and care of the animals, boosting operational efficiency.

### **Comfort and Weather Protection**

Sheltered animals experience greater comfort and protection from adverse weather conditions, contributing to their overall well-being and productivity.

## **Cattle Housing Practices**

In rural India, cattle housing practices reflect practicality and cost-effectiveness. Over 60% of sheds are integrated into residences, with farmers housing about five milch animals in lean-to-type sheds according to a study done in coastal areas of Kerala by George et al. (2021). Whereas, larger herds require more extensive facilities for heat alleviation includes design features and amenities such as automatic drinkers, sprinklers, and fans. A study in Anand district showed 94% of Gir owners used open spaces or tree shade, with 6% using roofing materials (Divekar and Saiyed, 2010). In Gujarat, 7.92% of respondents used weather protection measures, and 86.2% did not provide winter bedding (Patel et al., 2018). Despite challenges, many adopted open-type and Pucca-type houses, ensuring adequate space, lighting, and ventilation. Clean sheds with Pucca floors and drainage facilities indicated a commitment to hygiene and efficiency. Conversely, Ahirwar et al. (2010) found 70.33% of respondents in Madhya Pradesh had inadequate ventilation due to a lack of awareness. In South Gujarat, 60% of farmers implemented weather protection measures (Sabapara et al., 2015; Sabapara, 2017), and 82% regularly cleaned their sheds. Most (89.33%) managed ectoparasites to prevent diseases (Parmar et al., 2021; Kathiriya et al., 2017). In West Bengal, Goswami and Biswas (2021) found that personal localite information sources were preferred over mass media. Despite reliance on local sources, the majority of entrepreneurs had medium knowledge of improved animal husbandry practices (IAHP). This indicates the need for better knowledge dissemination through a combination of local networks and mass media.

## **Buffalo Housing Practices**

Buffalo housing practices vary based on herd size, geographical location, and cultural preferences. Unlike cattle, buffaloes generally thrive in open-air conditions throughout the year. This is particularly evident in Bangladesh, where 99% of buffaloes lack dedicated housing. This trend is common in many parts of South Asia, reflecting the adaptability of buffaloes to such environments. Small herd sizes, typically 2-3 buffaloes, make open-air management feasible (Kabir et al., 2020). A significant aspect highlighted by Kabir et al. (2020) is that 91.25% of farmers rear female buffaloes primarily for milk and calf production, often selling male buffalo calves post-weaning or at an early stage (2-2.5 years). This focus on female buffaloes aligns with economic considerations. Saadullah (2012) notes that approximately 65% of farmers do not maintain proper drainage systems in buffalo sheds. However, about 70% provide cemented mangers, and 90% have manure pits near their dwellings or farms. Around 35% of farmers provide straw bedding during winter, indicating some attention to animal comfort during colder months. Notably, 97.5% of farmers believe they have adequate wallowing facilities, with buffaloes wallowing in rivers, canals, ponds, or designated wallowing areas on farms. In some cases, entire village herds gather for communal mud wallows, highlighting a communal aspect of buffalo care. Dhami et al., (2017) also note regional variations, with higher percentages of crossbred cows and buffaloes kept in close confinement in tribal areas compared to non-tribal areas. Zebu cattle and buffaloes are managed similarly in both close confinement and open areas under tree sheds. These observations emphasize the adaptable nature of buffalo housing practices and the importance of considering factors like herd size, cultural practices, and regional variations.

## **Constraints and Challenges**

In coastal areas of India, livestock housing management faces several significant constraints, as highlighted by Chaudhary et al. (2017) and Rathore et al. (2020). Key challenges include:

**Lack of Personal Capital:** Limited financial resources make it difficult for livestock owners to invest in suitable housing structures and facilities.

**Absence of Credit Facilities:** Lack of accessible credit limits financial resources, while high construction costs deter investment in adequate housing.

**High-Interest Rates:** Even if credit is available, high-interest rates may discourage taking loans.

**Limited Space:** Space constraints impact the construction of proper housing, affecting animal well-being.

**Insufficient Knowledge:** Poor knowledge about cleanliness can lead to inadequate hygiene conditions, increasing disease risk.

**Unqualified Veterinary Services:** The presence of unqualified individuals practicing veterinary services leads to misinformation and inadequate healthcare.

**High Costs of Veterinary Services:** High costs for door-to-door veterinary services pose a financial burden, affecting access to necessary healthcare.

**Adoption Gap:** A gap exists between available knowledge or technology and its actual implementation, hindering the uptake of improved livestock housing practices.

### Collaborative Approaches

Addressing shelter management in coastal areas requires a collaborative, multidisciplinary approach involving farmers, researchers, government agencies, and non-governmental organizations (NGOs):

**Farmers:** Provide practical insights into challenges and opportunities, ensuring solutions are contextually relevant.

**Researchers:** Offer scientific expertise by studying local conditions, animal behaviour, and shelter practices, providing evidence-based solutions.

**Government Agencies:** Shape policies, offer financial assistance, and support infrastructure development, aligning with agricultural and environmental policies.

**NGOs:** Work with local communities to offer support, resources, and expertise through awareness campaigns, training programs, and outreach initiatives.

Engaging diverse stakeholders ensures a comprehensive understanding of challenges, fostering knowledge exchange, capacity building, and a sense of ownership. This approach enhances the likelihood of successful implementation of sustainable shelter management practices, improving livestock welfare, environmental sustainability, and community well-being.

### Future Directions

Farmers in coastal areas rely on small landholdings for agriculture and animal husbandry, yet efforts to enhance cattle and buffalo management are limited. Key future directions include:

**Improving Housing Practices:** Organize awareness camps, exposure visits, and training programs on scientific animal housing management to benefit both animals and farmers.

**Adopting Advanced Healthcare Technology:** Ensure prompt and regular veterinary services for better disease prevention, early detection, and overall animal health.

**Addressing Socio-Economic Dimensions:** Diversify livelihoods to reduce dependence on livestock and strengthen traditional systems with climate-resilient breeds and improved health services.

**Promoting Sustainable Dairy Farming:** Implement climate-smart practices, efficient breeding, and market access.

**Providing Financial Support:** Offer low-interest credit, insurance, and grants to empower farmers to adapt to changing conditions.

**Community Engagement:** Involve communities in designing adaptation programs to ensure relevance and commitment.

**Continuous Research and Technology Transfer:** Facilitate research and technology transfer through extension services to promote resilient practices.

By leveraging the expertise of all stakeholders, sustainable shelter management can be developed and implemented, leading to improved livestock welfare, environmental sustainability, and community well-being.

### CONCLUSION

Addressing socio-economic dimensions in coastal livestock-dependent communities requires a holistic approach. Integrating livelihood diversification, strengthening traditional systems, promoting sustainable dairy

farming, providing financial and institutional support, focusing on education and capacity building, implementing community-based adaptation programs, and facilitating research and technology transfer are essential. A comprehensive approach combining awareness-building, training programs, technology integration, and enhanced veterinary services is crucial for improving livestock management practices in coastal areas. This approach will enhance animal well-being and contribute to the sustainability and prosperity of farming communities.

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