

International Journal of Agriculture Extension and Social Development

Volume 9; SP-Issue 1; January 2026; Page No. 183-185

Received: 13-10-2025

Accepted: 17-11-2025

Indexed Journal

Peer Reviewed Journal

Coping strategies for housing dairy animals during the 2018 Floods in Kerala, India

L Arun

Assistant Professor, Department of Veterinary and Animal husbandry Extension Education, Veterinary College and Research Institute, Udumalpet, TANUVAS, Chennai, Tamil Nadu, India

DOI: <https://doi.org/10.33545/26180723.2026.v9.i1Sc.2968>

Corresponding Author: L Arun

Abstract

Livestock farming is a cornerstone of rural livelihoods in India, yet the sector in Kerala faces extreme vulnerability due to seasonal monsoon flooding, as evidenced by the 2018 Kerala Flood disaster that impacted over 200,000 animals. This research examined housing adaptation methods used by dairy farmers in the Thrissur, Idukki, and Ernakulam districts of Kerala, specifically chosen for their significant post-flood declines in milk production. The study revealed that the most favoured coping mechanisms involved constructing shelters on elevated terrain or moving livestock to higher altitudes during emergencies. Conversely, building permanent concrete (pucca) structures was the least utilised approach. Ultimately, the results suggest that successful flood mitigation for livestock depends on prioritising natural elevation and organised relocation strategies, necessitating stronger support from both local communities and formal institutions.

Keywords: Floods, dairy farming, housing coping strategies

1. Introduction

In rural India, livestock is more than just a source of income; it represents a secure investment and a mark of social status. India maintains one of the world's most massive livestock populations, exceeding 535 million animals, with Kerala alone contributing roughly 17.5 million across various species (Mandal *et al.*, 2022) ^[4]. Despite this economic importance, Kerala's geography—with 40% of its land vulnerable to inundation—leaves the sector highly exposed to monsoonal disasters. This was most evident during the 2018 floods, which impacted over 200,000 animals and caused widespread displacement, disease, and feed shortages (Sachin *et al.*, 2019) ^[7]. (Shanthi and Veerakumaran, 2019) ^[9].

The districts of Idukki, Thrissur, and Ernakulam were particularly hard-hit, suffering massive disruptions to milk production and significant fodder scarcity. In Idukki, the Periyar River's overflow submerged 25,000 hectares of land, while the dairy-intensive communities in Thrissur and Ernakulam saw every village designated as flood-affected (United Nations., 2018) ^[10] (SDMA, 2018) ^[6].

Materials and Methods

Based on United Nations data, seven districts in Kerala—including Alappuzha, Ernakulam, Idukki, Kottayam, Pathanamthitta, Thrissur, and Wayanad experienced the most severe impacts during the 2018 floods. For this investigation, Thrissur, Ernakulam, and Idukki were specifically selected due to the dramatic declines in milk procurement they recorded: 33.58%, 29.58%, and 16.92%, respectively. Although Pathanamthitta experienced a higher percentage drop (67.74%), its lower overall baseline milk production made the other three districts more

representative of the sector's broader regional crisis.

Based on the severity of flood four panchayats from each district were selected. From each selected panchayat a sample of 15 affected farmers were randomly selected based on the secondary data available with the Kerala State Animal Husbandry Department and Department of Dairy Development. Thus the final sample size comprised of 180 respondents from 12 panchayats of three districts.

In this context, "coping strategies" refer to the deliberate cognitive and behavioural actions taken by farmers to navigate or reduce the stress caused by flooding. Following the framework established by Lazarus *et al.*, (1984) ^[3], these actions are divided into active problem-solving—aimed at fixing the physical threat—and emotion-focused approaches. This study specifically focused on how these housing-related strategies were implemented by dairy farmers to protect livestock and maintain sustainable livelihoods in the face of disaster.

To assess post-flood coping strategies for dairy animal housing, potential strategies were identified through literature review and expert consultations. Responses were measured on an adoption scale, where farmers indicated if they continuously adopted the strategy, had discontinued it, or never adopted it. This three-point scoring approach was designed to reflect the recurring annual flood risks faced by dairy farmers in Kerala. Scores were recorded on a continuum scale as follows:

Adoption category	Score
Adoption continued	2
Adoption discontinued	1
Never adopted	0

Results

In Thrissur district, the survey results detailed in Table 1 show a unanimous reliance on geographic elevation, with all participants (100%) constructing their livestock shelters on higher ground. This was closely followed by the practice of relocating herds to highland areas during active flooding (93.33%) and the installation of protective dykes around shelters (78.33%). Additionally, a significant number utilised public infrastructure, such as government buildings, for temporary housing (63.33%) or shared space with neighbours on higher ground (61.67%), while the

construction of permanent concrete (pucca) sheds was the least common approach at 23.33%.

Similarly, in Idukki district, the most universal response was the immediate movement of livestock to high-altitude areas during the disaster (100%). Most farmers also prioritised building their primary sheds on elevated terrain (93.33%) and made extensive use of government facilities as emergency shelters (81.67%). While over two-thirds of respondents utilised dykes (68%), there was a lower tendency to share private shelters with others (33.33%) or invest in permanent concrete housing (27%).

Table 1: Housing coping mechanisms followed by respondents (Percentage)

Sl. No.	Housing management	Thrissur				Idukki				Ernakulam			
		AC	AD	NA	Total	AC	AD	NA	Total	AC	AD	NA	Total
1	Construction of animal shed in higher ground	100	0	0	100	93.33	1.67	5	100	100	0	0	100
2	Moving herd onto highlands during flood	93.33	6.67	0	100	100	0	0	100	98.33	0	1.67	100
3	Constructing Pucca / concrete shed for animals	23.33	0	76.67	100	27	0	73.33	100	41.67	0	58.33	100
4	Using government buildings as temporary shed	63.33	20	16.67	100	81.67	1.67	16.67	100	78.33	5	16.67	100
5	Sharing of shed with friends and neighbours living in highlands	61.67	15	23.33	100	33.33	0	66.67	100	46.67	0	53.33	100
6	Constructing dykes around the animal shed	78.33	0	21.67	100	68	1.67	30.43	100	75	1.67	23.33	100

AC: Adoption Continued; AD: Adoption Discontinued; NA: Never Adopted

In Ernakulam district, the data follows a similar trend of prioritising elevation, with every respondent (100%) building animal shelters on high ground. This was followed by the near-universal practice of moving livestock to highlands during flood events (98.33%) and utilizing government buildings for temporary shelter (78.33%). The construction of dykes was also a common measure (75%), while communal sharing of highland sheds (46.67%) and the building of permanent concrete structures (41.67%) were less frequent, though still higher than in the other surveyed districts.

An analysis of the indexing scores across the three districts

confirms a clear hierarchy of adaptation strategies. In Thrissur, building on high ground was the primary mechanism (Score: 1.00), with relocation to highlands closely behind (0.97). In Idukki, the priorities were slightly reversed, with herd relocation ranking first (1.00) and elevated construction second (0.94). Ernakulam mirrored Thrissur's rankings, placing elevated construction at the top (1.00), followed by highland relocation (0.98). (Table 2)

Across all regions, using government infrastructure and building dykes served as consistent mid-tier solutions, while the construction of permanent "pucca" concrete sheds consistently ranked as the least adopted housing strategy.

Table 2: Index score and ranking of housing coping mechanisms followed by respondents

Sl. No.	Housing management	Thrissur	Idukki	Ernakulam
1	Construction of animal shed in higher ground	1.00(i)	0.94(ii)	1.00(i)
2	Moving herd animals onto highland	0.97(ii)	1.00(i)	0.98(ii)
3	Constructing pucca / concrete shed for animals	0.23(vi)	0.27(vi)	0.41(vi)
4	Using Government buildings as temporary shed	0.73(iv)	0.83(iii)	0.81(iii)
5	Sharing of shed with friends and neighbours living in highlands	0.69(v)	0.33(v)	0.47(v)
6	Constructing dykes around the animal shed	0.78(iii)	0.69(iv)	0.76(iv)

Values in parenthesis indicates the order of merit of preferences by the respondents column wise

Discussion

The study's results highlight a strong preference for geographic solutions in housing management, with building shelters on elevated terrain and relocating livestock to highlands emerging as the primary coping strategies. These were followed by the utilisation of government infrastructure as temporary housing and the installation of protective dykes. In contrast, the least common approach was the investment in permanent concrete (pucca) structures.

These findings align with previous research by Paul and Routray (2010)^[5], who observed that farmers initially move animals to higher sections of their own property before relocating to safer roadside elevations as floodwaters rise. The strategy of seeking temporary refuge also mirrors observations by Suriya *et al.* (2012)^[8] during the Chennai

floods and Danso *et al.*, (2017)^[1] in Ghana, where residents relied on the upper floors of buildings or the homes of neighbours.

The necessity of building on high ground is driven by the reality that low-lying farm areas are prone to stagnation even during routine rainfall, making them highly dangerous during extreme flood events. Strategically, using government buildings and veterinary hospitals as makeshift shelters proved effective not only because these structures are typically more resilient and located in safer areas, but also because they centralise the herd. This centralisation allows authorities to streamline the distribution of emergency relief, including fodder, clean water, and medical treatments (Kuriakose., 2019)^[2].

Conclusion

This research underscores the essential role of both structural planning and rapid behavioural responses in protecting Kerala's dairy livestock from flood-related disasters. The most effective strategies identified were proactive, such as building shelters on high ground, and reactive, such as the organised relocation of herds to highland regions. The widespread reliance on public infrastructure and communal shed-sharing highlights the necessity of community-based disaster management and the utility of pre-identified institutional shelters.

However, the minimal adoption of permanent concrete (pucca) sheds points toward significant economic or logistical obstacles that prevent farmers from investing in long-term, flood-proof infrastructure. To bolster the resilience of the dairy industry, future policy interventions should focus on the following pillars:

- **Financial Incentives:** Providing subsidies or low-interest loans for the construction of elevated, flood-resilient animal housing.
- **Logistical Frameworks:** Developing standardised evacuation protocols and "green channels" for moving livestock quickly to highland zones.
- **Infrastructure Accessibility:** Strengthening and designating more sturdy public buildings as emergency shelters to facilitate easier distribution of veterinary aid and fodder.

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