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Assessment of Adoption Level of Health Practices by Livestock Farmers in the Flood-Prone Areas of Cuddalore District of Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A study was conducted to assess the occurrence of flood and its impact on livestock and poultry in 20 flood prone villages in ten blocks of Cuddalore district of Tamil Nadu with aim to develop livestock information system and mitigation strategies during flood disaster. Datafrom 600 farmers, geographical data, rainfall, incidences of flood and its impact during the period from 2018 to 2021 were collected. The flood hazard map was prepared and falls on latitude ranges between 11˚ 30'N and 11˚ 75'N, longitude ranges between 79˚ 40'E and 79˚ 74'E and altitude ranges between 6 and 69.5 m MSL. Flood disasters pose significant challenges to livestock farming, particularly in low-lying and flood-prone regions. In the present study the adoption of disaster mitigation strategies by livestock and poultry farmers in the flood-prone Cuddalore district of Tamil Nadu, India were assessed, using a three-stage random sampling design Such as Block level, Village level and farmer level. Data were collected from 600 livestock-rearing households across 20 villages scattered in 10 flood prone blocks of Cuddalore Dt. through structured interviews schedule. The study focused on short-term and long-term management practices across three key domains: water, breeding and health management. The results revealed, low adoption rates of safe water practices such as boiling (10.0%), use of water sanitizer (10.83%) and filtration (12.33%), while the majority (66.84%) relied on untreated surface water sources during floods. Breeding was postponed by 65.33% of respondents, and among those continuing, 89.42% preferred artificial insemination over natural service. Health management practices were inadequately followed, with only 13.16% availing immediate veterinary care and 28.0% adhering to regular vaccination schedules. The Chi-square analysis confirmed significant differences ($P<0.01$) in adoption levels across all practices. Barriers to adoption included lack of awareness, limited access to veterinary services, poor infrastructure and economic constraints. This study highlights the urgent need for improved veterinary outreach, farmer training, mobile breeding services and community-based water resource management. Strengthening institutional support systems can enhance disaster resilience in vulnerable livestock farming communities.

Keywords: Flood disaster; water management; animal breeding; health management; Cuddalore district; Tamil Nadu.

1. INTRODUCTION

Disasters are sudden, calamitous events that cause extensive damage to life, property and the environment. The severity and impact of disasters vary depending on geographical location, climate, and the vulnerability of the affected area (Shankar, 2012). Cuddalore district in Tamil Nadu is categorically classified as a disaster-prone area due to its low-lying coastal terrain and the confluence of several major rivers draining into the Bay of Bengal. With an average elevation of just 1.5 meters above mean sea level, floodwaters often accumulate and drain slowly, making the region highly susceptible to frequent and severe flood events. Out of the 13 blocks in the district, 10 are consistently affected by flooding, with seven listed as the most severely impacted. In 2015, the district experienced a catastrophic flood event caused by a cyclone, resulting in the loss of 54 human lives, the death of thousands of livestock, damage to nearly 50,000 homes, and the submergence of over 24,000 hectares of agricultural land across 53 villages (Nithya & Priyanka, 2019).

Among the most vulnerable during flood disasters are livestock and poultry, primarily due to inadequate shelter, lack of feed, clean drinking water and poor management practices. Although several mitigation strategies have been recommended by Heath et al. (1999), Sen and Chander (2003) and Mishra et al. (2017) to reduce livestock losses during disasters, the extent of their adoption by farmers remains unclear. Assessing the level of adoption of these practices is essential for designing targeted interventions, improving disaster preparedness, and enhancing the resilience of livestock farming systems in vulnerable regions. Therefore, this study aims to evaluate the adoption of water, breeding, and health management strategies by livestock farmers in the flood-prone areas of Cuddalore district, Tamil Nadu.

2. MATERIALS AND METHODS

A three-stage sampling design was employed in this study to evaluate the adoption of short-term and long-term mitigation strategies; particularly those related to water, breeding, and disease management during flood disasters. The sampling framework consisted of selection at the block level, followed by village-level, and finally individual livestock farmer-level sampling. Initially, ten flood-prone blocks were identified in the Cuddalore district (Fig. 1). From each block, two villages were randomly selected, resulting in a total of 20 villages for survey study (Table 1). Within each village, 30 households were randomly chosen for participation. The survey targeted individuals directly involved in the management of livestock and poultry in each household, yielding a total of 600 respondents.

Recognizing that building rapport with respondents is crucial for eliciting accurate information, efforts were made to establish trust and familiarity prior to conducting interviews. Data were collected using a structured interview schedule. Respondents were interviewed systematically and adequate probing and clarification were employed to ensure their full understanding of each question, thereby facilitating accurate and reliable responses. Information was collected on the types and numbers of livestock and poultry owned, losses incurred during flood events, and the specific mitigation strategies adopted to minimize such losses.

Water management strategies were assessed under five main categories: boiling water prior to feeding, addition of water sanitizer chlorine, mixing turmeric with water, filtering and sieving, and direct access to community water sources. In addition, efforts to safeguard community water resources such as ponds and lakes, as well as rainwater harvesting practices, were also evaluated.

The adoption of breeding management strategies during flood disasters included postponement of breeding activities, use of artificial insemination and reliance on natural mating practices were also evaluated.

Health management measures assessed during the study included observation of abnormal signs in animals, safeguarding young stock, isolation of sick animals, prompt Veterinary consultation, sharing of first-aid medicines among neighboring farmers, regular deworming, vaccination practices, quarantine procedures for newly acquired animal, and restrictions on community grazing.

The survey data were subjected to Chi-square analysis using SPSSversion-20 software package to assess the statistical significance of variations in the levels of adoption of each flood mitigation strategy.

Table 1. Study area comprising the villages of Cuddalore District with respective blocks

Sl. No.	Block	Villages
1.	Cuddalore	Alapakkam and Otteri
2.	Keerapalayam	Kezhakondalapadi and Jayankondapattinam
3.	Kattumannarkoil	Sarvarajanpettai and Thirunaraiyur
4.	Panruti	Visoor and Keeliruppu
5.	Kumaratchi	Nandhimangalam and Karuppur
6.	Vriddhachalam	Mudhani and Kolliruppu
7.	Parangipettai	Silambimangalam and Velangipattu
8.	Kurinjipadi	AdoorAgarm and Kolakudi
9.	Kammapuram	Devangudi and Po. Keeranur
10.	Bhuvanagiri	Poovalai and Ellaikudi

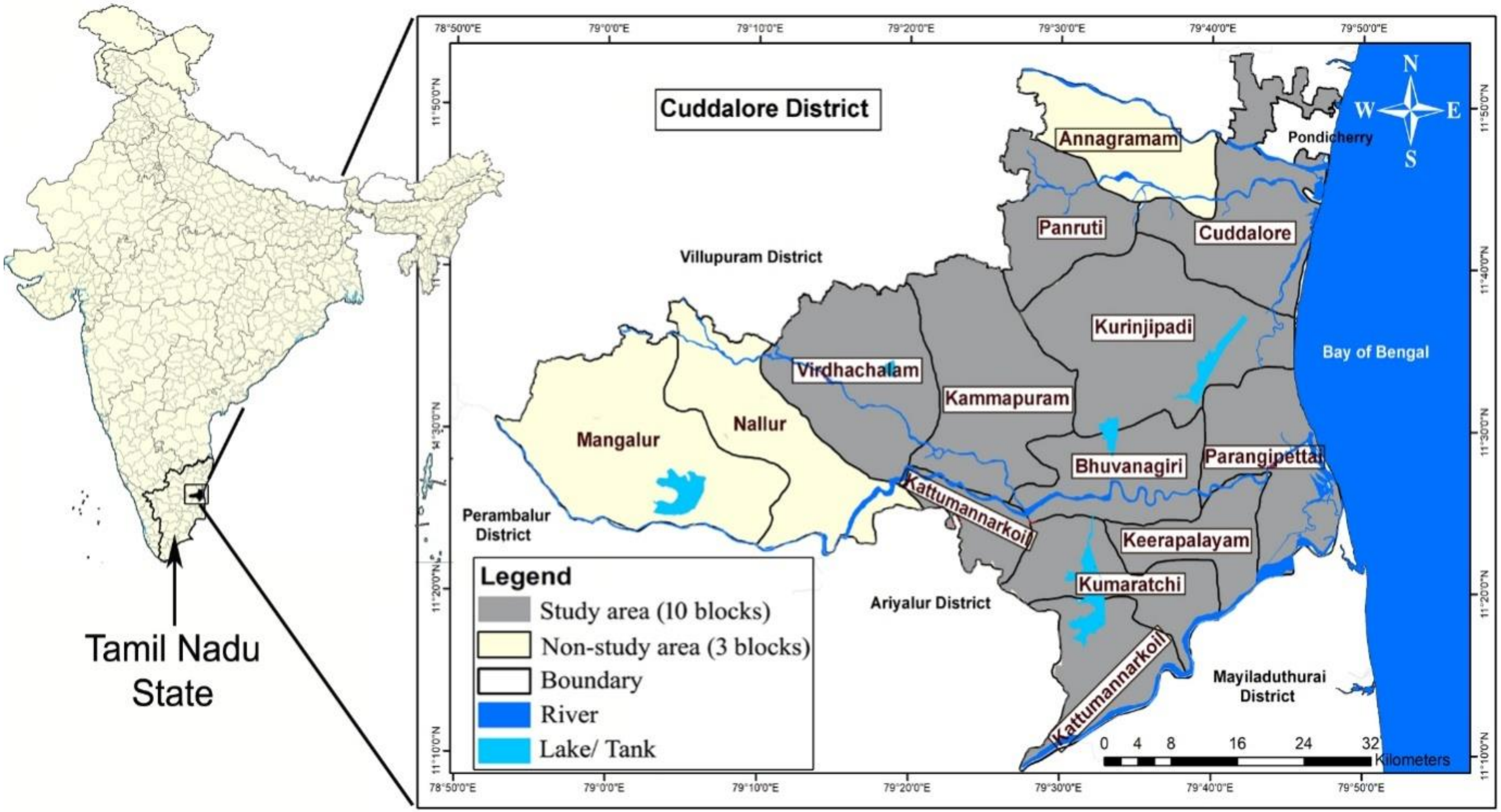

Fig. 1. Map of Cuddalore district, Tamil Nadu, showing the study area highlighted

3. RESULTS AND DISCUSSION

3.1 Water Management Strategies

In case of flooding, livestock got stranded and they need access to safe drinking water and dry ground. In order to avoid co-habitation of people and animals for sanitary reasons (to control disease and animal bites) more water resources are needed because existing water systems cannot support a large number of livestock and people. Water may be available from a range of sources and deliverable by a number of methods. The most appropriate, cost-effective and sustainable option should be selected (Distribution points or water trucking). There are also potential problems related to inequitable access to water. The degrees of adoption of water management strategies by livestock farmers during flood disasters are presented in Table 2 and Fig. 2. Among the practices studied, boiling of drinking water before feeding the animals was adopted by only 10.00% of respondents, while 26.83% occasionally boiled the feeding water and 63.17% did not adopt the practice of boiling the water at all. The use of sanitizer chlorine in drinking water was adopted by 10.83% of farmers, with 18.35% partially adopting the practice and 70.82% reporting no adoption. Traditional ractice of adding turmeric to drinking water of livestock for cleaning/ hygiene purpose was practiced by 20.50% of respondents, while 20.66% partially adopted the practice and 58.84% were not adopted to the practice of adding turmeric to the water of livestock before feeding. Filtering and sieving the water was adopted by 12.33% of farmers, 15.00% partially adopted it, and 72.67% did not adopt the practice. Conversely, the practice of directly allowing livestock to drink from natural sources such as rivers, lakes, and ponds was common (66.84%) amongst the respondents. This practice poses substantial health risks, as floodwater is often contaminated with pathogens, chemicals and debris, leading to waterborne diseases such as leptospirosis and botulism (DEECA, 2025). The low adoption rates of water purification methods like boiling (10.00%), adding sanitizers (10.83%), and filtering (12.33%) highlight a critical gap in awareness and resource availability.

Long-term mitigation measures such as protecting community water resources (tanks and ponds) from flooding and rainwater harvesting were less commonly adopted. Only 5.33% of respondents actively protected water sources by deepening and strengthening of bunds while 38.50% partially adopted the practice and 56.17% did not adopt it. Rainwater harvesting in home was adopted by 16.50% of respondents, with 37.17% partially adopting and 46.33% not adopting the practice.Effective water management during floods necessitates proactive measures, including the protection of community water resources and the implementation of rainwater harvestingsystems. However, only 5.33% of respondents engaged in protecting water sources, and 16.50% practiced rainwater harvesting. These findings align with previous studies emphasizing the need for community-level interventions and education to ensure safe drinking water for livestock during disasters like floods (Tamagnone et al., 2020; Wuijts et al., 2021).

Table 2. Level of adoption (%) of water management strategies by livestock farmers to mitigate the effect of flood disaster

Sl. No.	Practice	Level of adoption Per cent (No.)			
		Adopted	Partially adopted	Not adopted	χ^2
1	Boiling drinking water	10.00 (60)	26.83 (161)	63.17 (379)	**
2	Adding sanitizer into water	10.83 (65)	18.35 (110)	70.82 (425)	**
3	Adding turmeric into water	20.50 (123)	20.66 (124)	58.84 (353)	**
4	Filtering and sieving	12.33 (74)	15.00 (90)	72.67 (436)	**
5	Directly allowing to drink from river / lake/ pond	64.16 (385)	22.68 (136)	13.66 (79)	**
6	Protecting community water resources tanks/ ponds from flood	5.33 (32)	38.50 (231)	56.17 (337)	**
7	Harvesting and storing of rain water	16.50 (99)	37.17 (223)	46.33 (278)	**

*** Significant (P<0.01)*

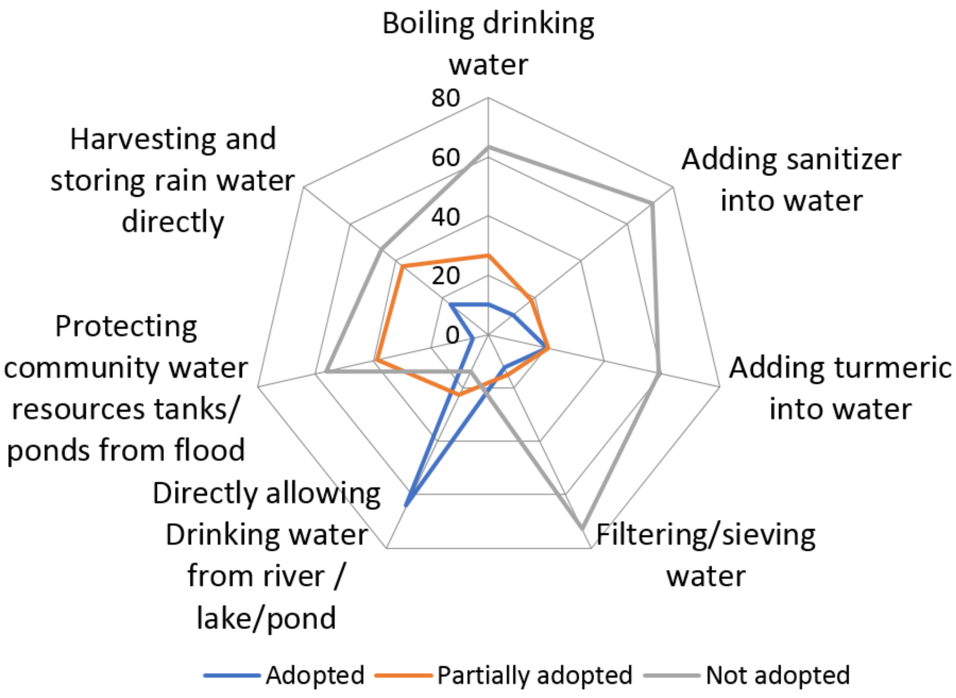

Fig. 2. Level of adaption (%) of water management mitigation strategies by the livestock farmers

Chi-square analysis revealed that all seven practices showed statistically significant differences ($p < 0.01$), indicating a predominant trend towards non-adoption. The high proportion of non-adoption across most strategies may be attributed to several factors including low socio-economic status, lack of awareness, and limited access to technical knowledge on flood-resilient livestock management.

These findings are consistent with those of Mishra et al. (2017), who reported poor adoption of clean water practices during floods, leading to outbreaks of waterborne diseases among livestock. The low adoption of infrastructure-intensive practices, such as protecting community water resources and rainwater harvesting, can be explained by their cost-prohibitive nature, especially for landless and smallholder farmers. Furthermore, inadequate attention to providing clean drinking water during flood emergencies has been linked to significant economic losses due to livestock morbidity and mortality (NDMA, 2025), underscoring the need for proactive water resource management.

3.2 Breeding Management Strategies

Breeding management practices adopted by farmers during flood disasters are summarized in Table 3 and depicted in Fig.3. The results indicate that 65.33% of farmers chose to postpone breeding during flood periods, whereas 34.67% continued with breeding activities. Among those who bred their animals, 89.42% relied on artificial insemination (AI), while 10.58% used natural service within the village.

Chi-square analysis indicated that the postponement of breeding during floods was a highly significant practice ($p < 0.01$). Among the methods employed, artificial insemination was significantly more prevalent ($p < 0.01$) than natural service.

The tendency to postpone breeding during floods may be linked to farmers prioritizing immediate survival needs such as ensuring feed availability and relocating animals to safer areas. Moreover, several logistical challenges constrained breeding services during floods. These included reluctances to visit veterinary dispensaries for AI due to poor accessibility, and a shift in focus of Veterinary and Animal Husbandry Departments towards emergency health care and relief distribution. Additionally, the unavailability of breeding bulls within reachable distances, many of which were also relocated to safer places, further discouraged farmers from engaging in natural breeding practices during this period.

These constraints collectively influenced the breeding decisions of livestock farmers in the surveyed flood-prone blocks of Cuddalore district, reinforcing the need for better integration of breeding services in disaster preparedness plans.The postponement of breeding during flood disasters was a common strategy, with 65.33% of farmers delaying breeding activities. Among those who continued breeding, 89.42% utilized artificial insemination (AI), while 10.58% relied on natural services. The preference for AI may be attributed to its controlled environment and reduced risk of disease transmission. However, the overall reduction in breeding activities reflects concerns over animal health and resource constraints during floods. Previous research underscores the importance of maintaining breeding programs during disasters to ensure herd sustainability. Implementing mobile AI services and establishing breeding centers in flood-prone areas can mitigate the disruption of breeding activities (National Academy of Agricultural Sciences, 2019).

3.3 Health Management Strategies

The adoption levels of various health management practices followed by livestock farmers during flood disasters are presented in Table 4 and Fig. 4. The results indicated that only 1.83% of respondents were vigilant in recording abnormal clinical signs in animals, while 38.83% partially adopted this practice, and the majority (59.33%) did not adopt it at all. Ensuring that young animals were kept in a safe and warm environment was reported by 4.66% of farmers; 17.84% partially adopted this measure, and 77.50% did not follow it. Isolation of ailing animals was practiced by 9.16% of respondents, with 24.68% partially adopting the measure and 66.16% not adopting it. Seeking veterinary assistance for the immediate treatment of sick animals was reported by 13.16% of respondents, while 23.68% partially followed this practice and 63.16% did not seek veterinary support.

Table 3. Level of adoption (%) of breeding management strategies by livestock farmers to mitigate the effect of flood disaster

Sl. No.	Practice	Level of adoption Per cent (No.)		
		Breeding followed	Postponed	χ^2
1	Postponement of breeding	34.67 (208)	65.33 (392)	**
2	Artificial insemination done	89.42 (186)	0	-
3	Natural service done.	10.58 (22)	0	-

*** Significant (P<0.01)*

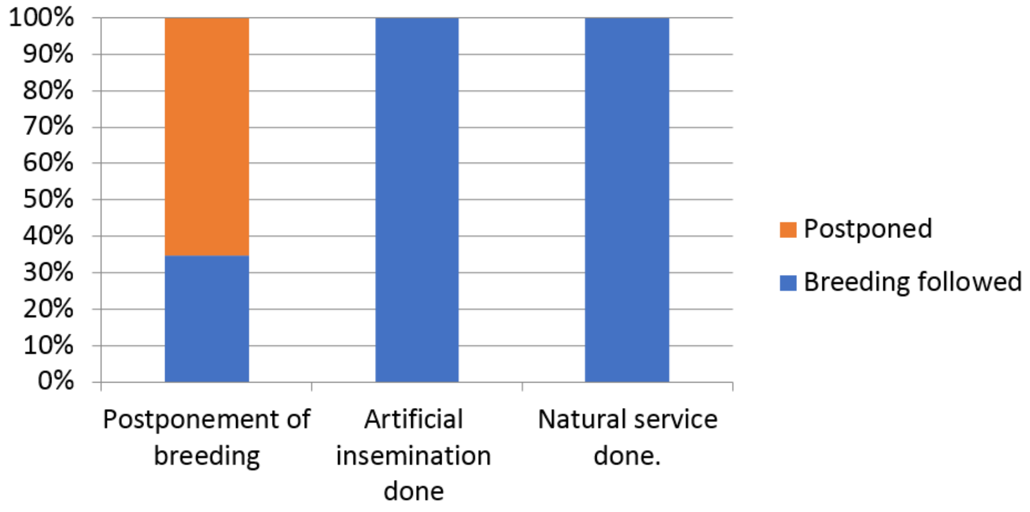

Fig. 3. Per cent of adoption of breeding management mitigation strategies by Livestock farmers

Table 4. Level of adoption (%) of health management strategies by livestock farmers to mitigate the effect of flood disaster

Sl. No.	Practice	Level of adoption Per cent (No.)			
		Adopted	Partially adopted	Not adopted	χ2
1	Recording abnormal signs of animals.	1.83 (11)	38.83 (233)	59.33 (356)	**
2	Keeping young ones in safe place	4.66 (28)	17.84 (107)	77.50 (465)	**
3	Isolating ailing animals	9.16 (55)	24.68 (148)	66.16 (397)	**
4	Seeking veterinary assistanec for immediate treatment of ailing animals.	13.16 (79)	23.68 (142)	63.16 (379)	**
5	Sharing first aid medicines with among needy farmers.	16.33 (98)	22.51 (135)	61.16 (367)	**
6	Willingness of farmers to treat ailing animals	17.16 (103)	20.66 (124)	62.18 (373)	**
7	Periodical deworming	11.50 (69)	21.66 (130)	66.84 (401)	**
8	Vaccination as per schedule	28.00 (168)	17.50 (105)	54.50 (327)	**
9	Quarantining newly arrival of purchased animals	3.83 (23)	21.83 (131)	74.34 (446)	**
10	Avoiding community grassing during monsoon period	5.33 (32)	11.67 (70)	83.00 (498)	**

*** Significant (P<0.01)*

The sharing of first aid medicines among neighbouring farmers was reported by 16.33% of respondents, 22.51% partially adopted the practice, and 61.16% did not engage in this activity. The overall willingness to treat sick animals was demonstrated by 17.16% of farmers, while 20.66% made partial attempts, and 62.18% did not attempt to treat ailing animals during flood periods.

With respect to long-term preventive measures, periodical deworming was adopted by 11.50% of respondents, 21.66% partially adopted it, and 66.84% did not follow the practice. Regular vaccination was adopted by 28.00% of farmers, while 17.50% partially adopted and 54.50% did not follow the practice. The quarantine of newly purchased animals was practiced by only 3.83% of respondents, with 21.83% partially adopting it and 74.34% not adopting the practice. Similarly, avoiding community grazing, an important biosecurity measure, was adopted by 5.33%, partially adopted by 11.67%, and not adopted by 83.00% of the respondents.

Chi-square analysis revealed that for all ten health management practices studied, non-adoption was significantly higher ($p < 0.01$) across flood-prone villages of Cuddalore district. This trend highlights critical gaps in awareness and implementation of health management strategies during and after flood events.

These findings concur with the observations of Mishra et al. (2017), who reported the frequent occurrence of disease outbreaks in flood-prone regions due to poor adoption of preventive measures such as vaccination predispose the livestock to disease outbreaks. The low interest of farmers towards veterinary interventions can also be attributed to damage in transport infrastructure during floods, which restricts the mobility of veterinary professionals. As noted by Heath et al. (1999), veterinary intervention is vital during disasters, not only for treatment but also for implementing preventive measures. However, during emergency response periods, veterinarians are often redirected to immediate relief activities, such as the provision of essential inputs and addressing acute morbidity, leading to the neglect of routine preventive services like vaccination and deworming.

These constraints significantly affect the resilience of livestock systems during flood disasters and highlight the need for robust, decentralized and community-based animal health infrastructure in vulnerable areas.

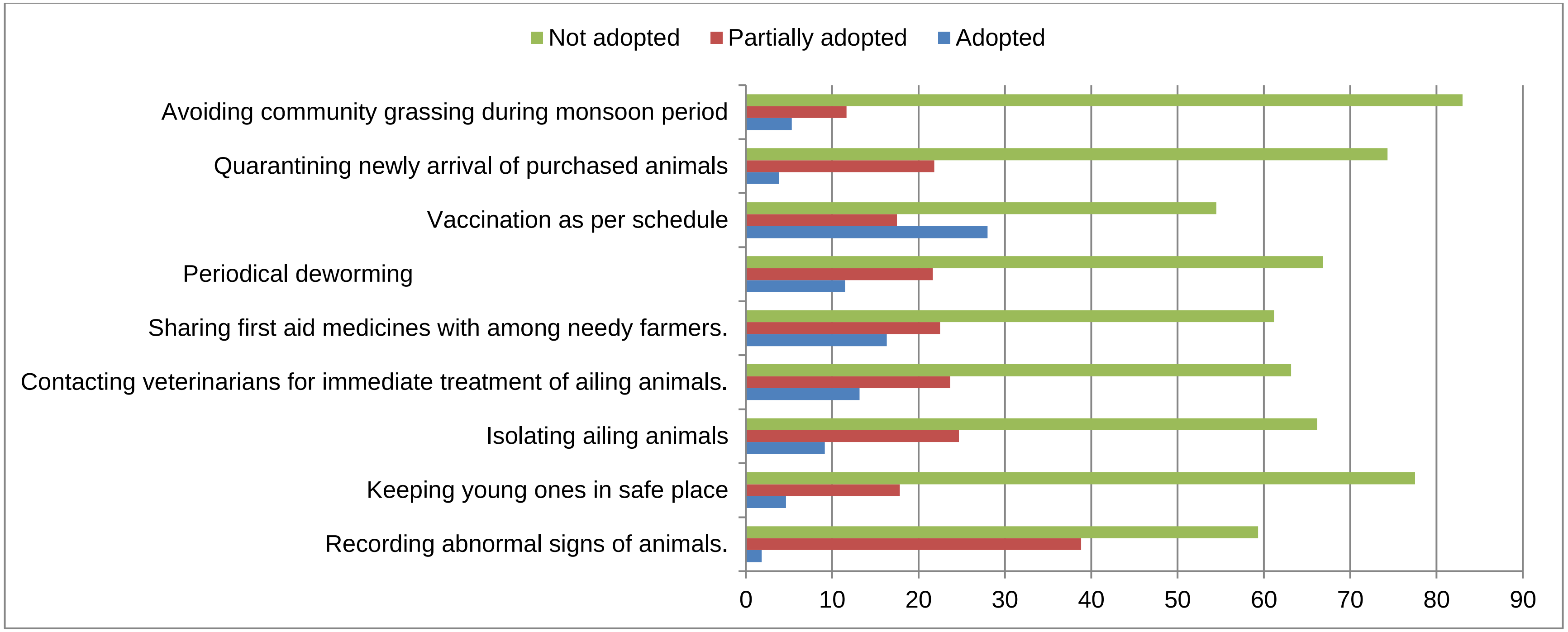

Fig. 4. Per cent of adaption of short-term disease management mitigation strategies by the Livestock farmers in the study area

Health management practices were notably underutilized, with only 1.83% of farmers recording abnormal clinical signs and 13.16% seeking veterinary assistance for ailing animals. Preventive measures such as regular vaccination (28.00%) and deworming (11.50%) were also inadequately adopted. The lack of health interventions increases the vulnerability of livestock to diseases prevalent during floods, including foot rot, mastitis and clostridial infections (Local Land Services, 2025). Barriers to effective health management include limited access to veterinary services, inadequate infrastructure and insufficient farmer training. Enhancing veterinary outreach programs, establishing emergency response teams, and conducting farmer education initiatives are critical steps toward improving animal health outcomes during flood events (FAO, 2014; Kippermanet al., 2019).

4. CONCLUSION

The findings emphasize the need for targeted interventions, including farmer education programs, improved veterinary outreach services, promotion of low-cost water purification methods, and development of localized disaster preparedness plans. Establishing community-based models for breeding and health care, along with infrastructure support for rainwater harvesting and water resource protection, can significantly enhance the resilience of rural livestock systems in the face of recurring flood disasters. Investing in these areas is crucial not only for reducing economic losses but also for safeguarding animal welfare and sustaining rural livelihoods in vulnerable agro-ecological zones.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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