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# Level of Adoption of Flood Disaster Mitigation Strategies by Livestock Farmers during Flood Disaster in Cuddalore District of Tamil Nadu

***P. Silambarasan[1*], Thanga Thamil Vanan[2], N. Kumaravel[3], R. Richard Churchil[4], N. Vengadabady[5] and N. Vimal Rajkumar[6]***

*[1]Assistant Professor & Head, Veterinary University Training and Research Centre, TANUVAS, Cuddalore (Tamil Nadu), India.*
*[2]Professor and Head, Department of Livestock Production Management, (Tamil Nadu), India.*
*[3]Professor, Department of Livestock Production Management, Madras Veterinary College, Chennai (Tamil Nadu), India.*
*[4]Professor and Head, Department of Poultry Science, Madras Veterinary College, Chennai (Tamil Nadu), India.*
*[5]Professor and Head, Department of Veterinary Microbiology, Veterinary College and Research Institute, Theni (Tamil Nadu), India.*
*[6]Assistant Professor, Department of Veterinary and Animal Husbandry Extension Education, Madras Veterinary College, Chennai (Tamil Nadu), India.*

*(Corresponding author: P. Silambarasan*)*
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**ABSTRACT: The frequent occurrence of flood disaster causes damages to human as well animal life leading to heavy economic loss, which forced the Government organizations to formulate suitable mitigation measures. In spite of its recommendations, loss to life of animals and economy continues to occur every year due to poor implementation of mitigation measures. The present study was conducted with the objective of assessing the level of adoption of flood mitigation strategies of livestock farmers during flood disaster. For this study, the data on long-term and short-term mitigation strategies adopted by livestock farmers was collected from 600 livestock farmers residing in different flood prone zones of Cuddalore District, Tamil Nadu, by using an interview schedule. The survey revealed that only small number of farmers in the study area adopted the short-term general management practices like moving animals to raised platform (15.16%), moving animals to community shelter (13.50%), moving animals inside residential house (20.30%) and moving animals to friend's/relatives' safe shelter (5.00%). The short-term feeding management practices like keeping feed and fodder in safe area such as under the roof, receiving feed and fodder as relief material from Government bodies/NGOs/Volunteers, borrowing feed and fodder from friends/relatives and bulk purchase of feed and sharing were adopted by only less number of respondents (9.20, 17.00, 4.66 and 3.16% respectively). Majority of the farmers in the study area adopted long-term general management practices like getting coverage of animals under insurance schemes (56.30%) and rearing indigenous breeds (53.50%). Although many farmers adopted the long-term general management practices like keeping dry fodder in preserved haylage (65.66%) and feeding un conventional feeds to animals (89.17%), other practices like constructing feed and fodder storage (17.80%), keeping green fodder in preserved silage form (8.34%) and growing flood-tolerant fodder varieties (12.64%) were poorly adopted by them. In conclusion, scientific interventions like capacity building programmes for farmers to improve the adoption rates and construction of multipurpose evacuation shelters in elevated areas are required as mitigation strategies.**

**Keywords:** Management of livestock, Disaster, Feeding Management, Flood.

## INTRODUCTION

The consequence of flood can be devastating which includes loss of life and economy. The flood can damage the buildings, roads, bridges etc. affecting the normal life. Disaster is a sudden calamitous event bringing great damage, loss, destruction and devastation

to life and property. The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface/degree of vulnerability (Shankar *et al.,* 2012). Among the Asian countries, India is highly vulnerable to natural disasters especially earthquakes, floods, drought, cyclones and landslides which destroys more than 40 million hectares of agricultural crops. (Khan and Ahmad 2017; Roxy and Chaitra 2018). India is ranked 11$^{th}$ among 15 countries facing "extreme risk" from natural disasters. In Tamil Nadu, Cuddalore district is categorized as disaster prone district due to its geological position andlow-lying nature.

As Cuddalore district lies in the coastal line and receives draining of three major rivers of Tamil Nadu, this district is more frequently hit by natural flood disaster every year. Out of the 13 blocks in Cuddalore district, 10 blocks have been identified as flood prone blocks and 7 blocks have been put under the most affected list. The district witnessed human loss of upto 49 numbers, damage of more than 50,000 huts; complete damage of over 24,000 hectares of land and cash crops due to cyclone/flood, and submerging flood in 53 villages during the year 2015. In addition to the above damages, the flood disaster also affects livestock wealth by destroying thousands of cattle and animal houses and fodder fields (Gourav *et al.,* 2020). In spite of implementation of various preventive measures, occurrence of flood disaster could not be prevented. However, the loss due to flood disaster can be minimized by adopting suitable mitigation strategies and is being recommended periodically with limited success rate. In this context, it was proposed to study the level of adoption of mitigation strategies by the livestock farmers residing in different flood prone zones of Cuddalore district.

## MATERIALS AND METHODS

Among the thirteen blocks of Cuddalore District, 10 blocks, which were already identified as vulnerable blocks by the department of district disaster management were selected for this study. The selected 10 blocks include Bhuvanagiri, Keerapalayam, Cuddalore, Kammapuram, Kattumannarkoil, Kumaratchi Kurinchipadi, Panruti, Vadalur, and Viridhachalam. From each block, two villages were chosen purposively and from each village thirty livestock farmers were selected through simple random sampling with a total of 600 livestock farmers. These farmers were interviewed individually, and data on short-term and long-term general and feeding management mitigation strategies adopted and expected in future were collected using an interview schedule.

The data were subjected to per centile and chi-square statistical analysis as per Snedecor and Cochron (1996). The data were analysed separately for adoption level of short-term general management strategies, short-term feeding management strategies, long-term general management strategies and long-term feeding management strategies

## RESULTS AND DISCUSSION

The adoption level of mitigation strategies by farmers during flood disaster was analyzed and presented in the Tables 1 to 4.

**Short-term general management strategies.** The survey on adoption of short-term general management strategies revealed that, 15.16 % of the respondents fully adopted the practice of moving their animals to elevated place, 26.66% partially adopted and 58.18 % of respondents did not adopt the practice. Secondly, the data on moving of animals to community shelter showed that 13.50 % of respondents adopted the practice, 32.80% partially adopted and 53.66% of respondents did not follow the practice (Table 1).

The third practice of moving their animals especially sheep, goat and poultry into their residential houses, 20.30% of respondents adopted the practice, 27.00% partially followed, and 52.66 % did not follow the practice. Finally, the data revealed that 5.00% of respondents adopted the practice of moving their animals to neighbour/friends/relative's place, 24.20% partially adopted and 70.80% of respondents did not follow the practice (Table 1).

**Table 1: Adoption level of short-term general management strategies by the farmers.**

| Sr. No. | Practice | Level of adoption (%) | | | $\chi^2$ |
|---|---|---|---|---|---|
| | | Adopted | Partially adopted | Not adopted | |
| 1. | Moving animals to raised platform/ Elevated place | 15.16 (91) | 26.66 (160) | 58.18 (349) | ** |
| 2. | Moving animals to community shelter | 13.50 (81) | 32.80 (197) | 53.66 (322) | ** |
| 3. | Moving animals inside the house | 20.30 (122) | 27.00 (162) | 52.66 (316) | * |
| 4. | Moving animals to friend's / relatives' safe shelter | 5.00 (30) | 24.20 (145) | 70.80 (425) | ** |

* Significant (P<0.05); ** Highly Significant (P<0.01) ; (Values in parentheses indicates number of respondents)

The percent adoptability of all the four short-term general management practices recorded in this study was below 21%. Sastry, (2010); Adedeji *et al*. (2012); Mishra *et al.* (2017) in their studies following flood in Odisha, reported that, the per centadoptability of shifting animal to safe place was less than 15%, and was correlated with the lack of awareness. Similar observation was reported by Behera *et al.* (2021) in Odisha. The results of the present study correlate with the reports of above authors. However, in addition to lack of awareness, availability of suitable shelters in elevated places is also a constraint to adopt these practices in the study area. The multipurpose shelters available in the area are few and are located in distant places or in a low-lying area.

**Short-term feeding management strategies.** The survey on adoption of short-term feeding management strategies revealed that 9.20% of respondents adopted the practice of storing feeds and fodder in a safe area, 29.00% of the farmers partially adopted the practice and 61.80% of respondents did not adopt the practice. Only 17% of respondents adopted the second practice of receiving feed and fodder as relief material from Government organizations/NGOs/volunteers; while, 29.67 % of respondents partially adopted and 53.33% of respondents did not adopt the practice of getting assistance (Table 2).

The survey on third practice of borrowing feed and fodder from neighbors/friends/relatives revealed that 4.66% of respondents adopted the practice; while, 6.84% of respondents partially adopted and 88.50% of respondents did not follow the practice. The fourth practice of bulk purchase and sharing of feed and fodder by neighboring farmers during flood was followed by 3.16% of the respondents; whereas, 5.84 % of respondents partially followed and 91.00% of respondents did not follow the practice (Table 2).

**Table 2: Adoption level of short-term feeding management strategies by the farmers.**

| Sr. No. | Practice | Level of adoption (%) | | | χ2 |
|---|---|---|---|---|---|
| | | Adopted | Partially adopted | Not adopted | |
| 1. | Keeping feed and fodder in safe area such as under the roof. | 9.20 (55) | 29.00 (144) | 61.80 (371) | ** |
| 2. | Receiving feed and fodder as relief material from Government bodies/ NGOs/Volunteers. | 17.00 (102) | 29.67 (178) | 53.33 (320) | ** |
| 3. | Borrowing feed and fodder from friends/ relatives | 4.66 (28) | 6.84 (41) | 88.50 (531) | ** |
| 4. | Bulk purchase of feed and sharing | 3.16 (19) | 5.84 (35) | 91.00 (546) | ** |

** Highly Significant (P<0.01); (Values in parentheses indicates number of respondents)

During rainy season, unprotected animal feed become prone for aflatoxicosis and develop unpleasant odour making the feed unfit for feeding animals (Collins, 2010; Villers 2014; Alam and Shah *et al*., 2017). It was advised that, during monsoon, the farmers should assess feed requirement at least for 2 to 3 weeks well in advance, procure and store them in safe place. In the present study, the adoption level is only 9.2%; while, majority (88.5%) of the respondents did not store feed in safe place which could lead to starvation and production loss during flood or immediately after that. Similarly, the assistance extended by government organizations and NGOs did not fulfill the requirements of more than 17 % of respondents, which might be due to lack of publicity among the farming community and or improper distribution system.

Very few farmers (4.66%) had the habit of borrowing feeds and fodder from neighboring farms or friends. Similarly, bulk purchase and sharing of feed among farming community is also very minimum (3.16 %); which reflects the lack of awareness on the essentiality of feeds and fodder during flood and lack of socialism and unity among farming community.

**Long-term general management strategies.** The survey on adoption of long-term general management strategies by the farmers in the flood prone area revealed that 10.33% of the farmer had adopted the practice of constructing animal house in elevated place; while, 14.50% partially adopted and 75.17% of respondents did not follow the practice (Table 3).

With regard to the second practice of insuring animal as a long-term measure, majority of the respondents either adopted (56.30 %) or partially adopted (30.20%) the practice and only 13.50% of respondents did not adopt the practice. The survey also revealed majority of the respondents either adopted (53.50%) or partially adopted (33.00%) the practice of rearing indigenous animals and only 13.50% of respondents did not follow the concept of rearing indigenous animals (Table 3).

Agarwal *et al.* (2014) highlighted the importance of constructing animal house in elevated locations especially in flood prone areas and pointed out the damages of low-lying animal houses during flood. In the present study, only, 10.33% of the respondents erected their animal shed in elevated place and 75% of respondents had their animal sheds in low-lying area facing the problem of inundation during flood. Most of

the study area covered in this study were coastal and low lying that forced the farmers to erect their shed in the available place.

As far as animal insurance is concerned, more than 50% of the respondents insured their animal as a long-term mitigation strategy. When compared to other strategies, adoption level on animal insurance is found to be significantly high, which might be due to the subsidy extended by department of animal husbandry for cattle insurance. The present finding of animal insurance correlates with the earlier reports (Khandker, 2007; Behera *et al.*, 2021). Similarly, the rearing of sturdy indigenous animal by 50 % of the farmers is mainly due to easy availability of these animals and low cost of them.

**Long-term feeding management strategies.** The survey on the long-term feeding management strategies revealed that only 17.80% of respondents followed the practice of constructing feed and fodder store; while most of them either partially adopted (38.8%) or did not adopt (43.40%) the practice. The other practice of silage making was adopted by 8.34% and partially adopted by 11.66% of respondents only; whereas, a vast majority of 80.00% of the farmers did not adopt the practice. On analyzing the survey data on haymaking as a method of dry fodder preservation, 65.66% of respondents adopted the practice, 23.34 % partially adopted and 11.00% did not adopt the practice. The study on adoptability of growing flood tolerant varieties of green fodder revealed that 12.64% of respondents adopted the practice, 36.86% partially adopted and 50.50% did not cultivate flood tolerant fodder variety. The long-term practice of feeding unconventional feed to animals; 89.17% of respondents followed the practice, 6.83 % partially adopted and 4.00% did not practice the use of unconventional feed (Table 4).

**Table 3: Adoption level of long-term general management strategies by the farmers.**

| Sr. No. | Practice | Level of adoption (%) | | | $\chi^2$ |
|---|---|---|---|---|---|
| | | Adopted | Partially adopted | Not adopted | |
| 1. | Constructing animal house in an elevated place | 10.33 (62) | 14.50 (87) | 75.17 (451) | ** |
| 2. | Animal Insurance | 56.30 (338) | 30.20 (181) | 13.50 (81) | ** |
| 3. | Rearing indigenous breeds | 53.50 (321) | 33.00 (198) | 13.50 (81) | ** |

** Significant (P<0.01) ; (Values in parentheses indicates number of respondents)

**Table 4: Adoption level of long-term feeding management strategies by the farmers.**

| Sr. No. | Practice | Level of adoption (%) | | | $\chi^2$ |
|---|---|---|---|---|---|
| | | Adopted | Partially adopted | Not adopted | |
| 1 | Constructing feed and fodder storage | 17.80 (106) | 38.80 (232) | 43.40 (260) | ** |
| 2 | Keeping green fodder in preserved silage form | 8.34 (50) | 11.6 (70) | 80.00 (480) | ** |
| 3 | Keeping dry fodder in preserved haylage form | 65.66 (394) | 23.34 (140) | 11.00 (66) | ** |
| 4 | Growing flood-tolerant fodder varieties | 12.64 (76) | 36.86 (221) | 50.50 (303) | ** |
| 5 | Feeding un conventional feeds to animals | 89.17 (535) | 6.83 (41) | 4.00 (24) | ** |

** Significant (P<0.01) ; (Values in parentheses indicates number of respondents).

In the present study, very limited (17.80%) farmers constructed feed store for safe storage of feed and fodder. Baruah *et al*. (2006) reported the essentiality of feed and fodder in flood prone areas. However, very limited farmers had the facility of feed store, which were mainly located in farms with more than 10 animals (Kumarand Ramaiah, 1999; Pyna and Samata 2009; Sheheli and Khan 2015). Remaining farmers had very limited space for their livestock, the sheds were made of thatch, and sheets with minimum protective facility and provision of separate feed store could not be practiced. Similarly, the practice of silage making was very limited (8.34%) among the respondents. The importance of silage making and storage for use in scarcity has been stressed by many authors (Prasad, 2003; Sen and Chander, 2003; Patnaik and Bahinipati 2013; Rasool *et al.*, 2020). However, in the study area, most of the farmers depended on common grazing land and very few farmers cultivated green fodder and these farmers grew flood tolerant fodder variety of CoFs29 and Para grass and hence silage making was not being practiced by many of them.

In the present study, adoptability of haymaking and use of unconventional feed was practiced by 65.66% and 89.17% respectively. The main occupation being agriculture, the livestock farmers have good access to agricultural byproducts for hay making and persevering for future use. In addition, there exists sugar mill, modern rice mills and oil mills, from which huge quantity of agricultural byproducts are expelled, and used as unconventional feed.

## CONCLUSIONS

In conclusion, it was found that, the farmers need to be enlightened on the flood disaster mitigation strategies, in terms of construction of shed in elevated place, mobilization of animals to elevated and safe place and proper storage of feed and fodder. Many scientific

mitigation practices are not fully adopted by the farmers of the study area, indicating the need for capacity building of farmers to face the disasters logically with scientific methods. It was also found that, the available multipurpose evacuation shelters are located in low-lying area making unfit to use for animal mobilization and hence suitable sites need to be identified in elevated locations and steps may be initiated to construct community animal shelter with the assistance of District disaster management.

## FUTURE SCOPE

The level of adoptability of short and long-term mitigation measures by farmers was studied through this research and found that the adoptability level is comparatively poor, which might have predisposed to continuous loss. In future, in addition to extending mitigation support by government agencies, much effort had to be put on creating awareness on mitigation procedures.

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**Conflict of Interest**. None.

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