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Adaptation measures practiced by the farmers rearing dairy animals at farm level to mitigate the influence of climate change

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ABSTRACT

Climate change has an adverse effect on climate sensitive livestock sector. A well-structured interview schedule was used to collect the practices adopted by the livestock farmers at farm-level in irrigated and rainfed areas of Namakkal district in Tamil Nadu. Practices adapted to mitigate the effects of climate change were documented from 320 livestock farmers, 160 from irrigated and 160 from rainfed areas. Providing shade during day time was the major practice adapted in housing, cooling animals by washing, alteration in the grazing time, cooling and not allowing for grazing after insemination, deworming animals two to three days prior to insemination, feeding lemon after insemination, feeding mineral mixture during summer, soaking concentrate feed in water, feeding aloevera and neem oil for 15 days before insemination and shifting from buffalo to white cattle were the practices adapted by the livestock farmers to mitigate the effect of climate change. Further, the field experts opined that feeding mineral mixture (100%), alteration in grazing time (100%), cooling animals after insemination (97.22%), deworming of animals two or three days prior to insemination (91.67%) had effect at field level. Field experts suggested that feeding lemon after insemination, feeding mineral mixture during summer and feeding aloevera and neem oil for 15 days before insemination were the practices need further scientific research for up-scaling of practices.

Key words: Adaptation practices, Climate change, Field validation, Irrigated area, Rainfed area.

INTRODUCTION

Climate sensitive enterprises such as crop farming and livestock farming are mainly owned by the marginal and small farmers in India who account for more than 80 % of total farm households (Dev, 2012). Climate change has an adverse effect in livestock sector. Heat stress adversely affects the livestock and even their survival (Sejian *et al.* 2012). Livestock system and mixed farming are more affected due to lower rainfall and droughts by its effects on pasture growth and direct effect of temperature and solar radiations on animals (Nardone *et al.* 2010). Adaptations are the adjustments or practices followed by the farmers with available resources to reduce or lessen the effect of adverse climatic factors (Sahu and Mishra, 2013). Agriculture with livestock farming is the mainstay in Namakkal district. Water scarcity accompanied by hot weather was the scenario of study area. Adaptations are the coping mechanisms. Thus it is important to identify the adaptation practices followed by the farmers based on their perceptions and experience to mitigate the effect of climate change. In this context, a survey was conducted to analyse the adaptations followed by the livestock farmers at farm level and validating the adapted practices with field experts.

MATERIALS AND METHODS

Namakkal district of Tamil Nadu was selected for the study based on the following reasons. Namakkal district had continued intense agricultural drought (Agricultural Drought Assessment Report, 2012) with non-availability of balanced ground water potential for future irrigation (Tamil Nadu State Perspective and Strategic Plan, 2012). Namakkal district consists of 15 blocks, of which Kolli hills is avoided due to hilly terrain. Out of 14 blocks selected, 7 were classified into irrigated and 7 were classified into rainfed blocks. Based on the 19th livestock census, the total livestock population of each block was converted into Standard Livestock Units (SLU). The conversion factor adopted by Akter *et al*. (2008) was used.

Livestock intensity for each block was calculated using the formula

$$\text{Livestock Intensity} = \frac{\text{Standard Livestock Unit}}{\text{Area in sq.km}}$$

Based on livestock intensity the top four blocks each from irrigated (Rasipuram, Kabilarmalai, Pallipalayam and Sendamangalam) and rainfed (Mallasamudram, Puduchatram, Paramathi and Namakkal) areas were selected for the study. Village panchayats in each selected block were

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classified into high and low categories based on standard livestock units. From each category, two village panchayats were randomly selected for the study. From each selected village 10 livestock farmers were randomly selected. Thus a total of 320 livestock farmers (160 from irrigated and 160 from rainfed area) constituted the sample for the study. A well-structured, pre-tested interview schedule was used for data collection. Data collection was carried out from April 2015 to April 2016. The practices adapted by the livestock farmers were documented. The adapted practices were categorized into housing, feeding, breeding, management and fodder preservation. Further, the total score of the individual respondent was calculated by assigning the score "1" for adoption and "0" for non-adoption and it was classified into low, medium and high by using cumulative square root frequency method. The adapted practices were discussed with 36 subject matter specialists and selected practices were given to the field experts for validation.

RESULTS AND DISCUSSION

The practices adapted by the farmers were collected and it was categorized into housing, feeding, breeding, management and fodder preservation (Table 1). In housing, providing tree shade to animals during day time to reduce the heat stress was one of the adaptive measures followed by 83.12 per cent and 86.88 per cent of the respondents in irrigated and rainfed areas respectively.

Majority of the respondents (86.25 % in irrigated and 98.12 % in rainfed areas) did not change the feeding practices to mitigate the effect of climate change. The difference between irrigated and rainfed areas indicates that standardizing area specific feeding practices would help the livestock farmers to mitigate the effects of climate change. Feeding of green fodder during night time was reported by the 11.24 per cent of the respondents in certain pockets of irrigated area. The respondents felt that the intake of fodder during night time would reduce the stress. Sejian and Naqvi (2011) also reported that increased day temperature reduce the feed intake and increase water consumption. Ahmed *et al*. (2013) also reported that the farmers altered the feeding practices to mitigate the effect of heat stress. Only a meager per cent of the respondents' adapted soaking concentrate feed in water (0.63 %) and feeding mineral mixture (1.25 %). The respondents opined that soaking concentrate feed overnight in water improves the digestibility.

Table 1: Adaptation strategies to mitigate the influence of climate change by the respondents

(n=160 +160)

Category	Irrigated#	Rainfed#
Housing		
No change	15 (9.38)	14 (8.75)
Providing tree shade during day time	133 (83.12)	139 (86.88)
Providing shelter	12 (7.50)	7 (4.37)
Feeding		
No change	138 (86.25)	157 (98.12)
Feeding green fodder during night	18 (11.24)	0 (0.00)
Soaking concentrate feed in water	1 (0.63)	1 (0.63)
Feeding mineral mixture during summer	2 (1.25)	2 (1.25)
Breeding		
Cooling animals after insemination	133 (83.12)	140 (87.50)
Cooling and not allowing for grazing after insemination	17 (10.62)	16 (10.00)
Reducing greens for one week after insemination	10 (6.25)	16 (10.00)
Double insemination	7 (4.38)	1 (0.63)
Avoiding bran after insemination	2 (1.25)	0 (0.00)
Avoiding kitchen waste for 1 week after AI	0 (0.00)	1 (0.63)
Deworming animals two to three days prior to insemination	6 (3.75)	4 (2.50)
Feeding lemon after insemination	9 (5.63)	2 (1.25)
Feeding lemon and neem oil after insemination	2 (1.25)	0 (0.00)
Feeding aloevera and neem oil for 15 days before insemination, if conception is a problem	2 (1.25)	0 (0.00)
Preservation of fodder		
Preserved fodder	144 (90.00)	153 (95.63)
Not preserved fodder	16 (10.00)	7 (4.37)
Management		
Alteration in grazing time	137(85.62)	147 (91.88)
Night time grazing	1(0.63)	0 (0.00)
Shifting from buffalo to white cattle	6 (3.75)	8 (5.00)
No change	22 (13.75)	13(8.12)

- Multiple response; Figures in parenthesis indicate percentage

In breeding, majority of the respondents in irrigated (83.12 %) and rainfed (87.50 %) areas practised cooling of animals after insemination as a means of adaptation measure to improve the conception rate. Around 10.00 per cent of the respondents in both rainfed and irrigated areas were not allowing the animals for grazing in addition to cooling after insemination and reducing greens for one week after insemination to improve breeding efficiency. The practices like double insemination (4.38 % and 0.63 %), feeding of lemon after insemination (5.63 % and 1.25 %) and deworming before artificial insemination (3.75 % and 2.50%) were adapted by the respondents in irrigated and rainfed areas. Feeding mineral mixture is essential to meet the mineral deficit created by walking for grazing, cooling animals and avoiding grazing reduce stress and maintain normal energy balance in animals and paves ways for better conception were reported by Sejian (2013).

Most of the respondents in irrigated (85.62 %) and rainfed (91.88 %) areas altered the grazing time to reduce the effect of heat stress under managemental practices. They preferred early morning or late evening and even night time for grazing and they were not allowing animals for grazing during 11:00 a.m to 4:00 p.m. Livestock farmers observed panting of animals and reduction in feed intake during peak summer. Providing shade, cooling animals and altering grazing time were the practices adapted by the livestock farmers to mitigate the effect of climate change. Sejian *et al.* (2013) also reported that adaptation of providing shade and partial stall feeding during day time alleviate heat stress.

The overall adaptation of the respondents was calculated and presented in Table 2. It reveals that 66.87 per cent of the respondents in irrigated area had medium level of adaptation followed by low (18.12 %) and high (15.00 %) levels of adaptation to mitigate the influence of climate change. Similarly, in rainfed area, 77.50 per cent, 18.75 per cent and 3.75 per cent had medium, low and high levels of adaptation respectively. High significant difference between the farming systems was noticed. More experience, literacy level, land holding and organizational participation of the respondents had motivated them to adapt the practices to mitigate the effects of climate change.

Table 2: Overall adaptation level of the livestock farmers

(n=160 +160)

Category	Irrigated No. (%)	Rainfed No. (%)	Chi square value
Low	29 (18.12)	30 (18.75)	10.453**
Medium	107 (66.87)	124 (77.50)	
High	24 (15.00)	6 (3.75)	

Evaluation of adapted strategies by the field experts: The strategies adapted by the respondents were validated with field experts and presented in Table 3. A vast majority of the field experts opined that feeding mineral mixture (100.00 %), alteration in grazing time (100.00 %), cooling animals after insemination (97.22 %), deworming of animals two or three days prior to insemination (91.67 %) had validity at field level. Further, most of the field experts' perceived feeding aloevera and neem oil for 15 days before insemination (88.89 %), not allowing for grazing after insemination (86.11 %), soaking concentrate feed in water (83.33 %) and feeding lemon after insemination (83.33 %) had effect at field level. While half of the field experts opined that the practice of reducing greens for one week after insemination also had effect at field level.

Further, 83.33 per cent of the field experts felt that feeding aloevera and neem oil for 15 days before insemination needs scientific validation. Use of aloevera had effect at field level and is gaining momentum might be the reason for majority of the field experts recommended further scientific research. Further, feeding mineral mixture, feeding lemon after insemination, soaking concentrate feed in water and alteration in grazing time also need further scientific research by 41.67 per cent, 41.67 per cent, 36.11 per cent and 27.78 per cent of the field experts to understand the relevancy of the practices in mitigating the effect of climate change on dairy animals.

Table 3: Evaluation of adapted strategies by the field experts

n=36

Practices adapted	Valid at field level		Need scientific research	
	Yes	No	Yes	No
Soaking concentrate feed in water	30 (83.33)	6 (16.67)	13(36.11)	23(63.89)
Feeding mineral mixture during summer	36 (100.00)	0	15(41.67)	21 (58.33)
Cooling animals after insemination	35 (97.22)	1 (2.78)	6 (16.67)	30 (83.33)
Not allowing for grazing after insemination	31 (86.11)	5 (13.89)	9 (25.00)	27 (75.00)
Reducing greens for one week after insemination	18 (50.00)	18 (50.00)	4 (11.11)	32 (88.89)
Deworming of animals two or three days prior to insemination	33 (91.67)	3 (8.33)	7 (19.44)	29 (80.56)
Feeding lemon after insemination	30 (83.33)	6 (16.67)	15(41.67)	21 (58.33)
Feeding aloevera and neem oil for 15 days before insemination	32 (88.89)	4 (11.11)	30(83.33)	6 (16.67)
Alteration in grazing time	36(100.00)	0 (0.00)	10(27.78)	26 (72.22)

It could be concluded that physical alterations such as providing shade under trees, alteration in grazing time and cooling animals were practiced by the dairy farmers and they were not changing the feeding practices to mitigate the heat stress. The respondents developed adaptive measures based on experience and available resources to reduce the climatic effect. Scientific research on the adapted practices such as feeding aloevera and neem oil for 15 days before insemination, feeding mineral mixture during summer and feeding lemon after insemination would help to understand the relevancy of the practices in mitigating the effect of climate change on livestock.

REFERENCES

Agricultural Drought Assessment Report. (2012). National Remote Sensing Centre, ISRO, Mahalanobis National Crop Forecast Centre, Department of Agriculture and Cooperation, New Delhi. Available at http://bhuvan.nrsc.gov.in/bhuvan/PDF/ NADAMS_July12_Report.pdf.

Ahmed, F., Alam, G.M., Al-Amin, A.Q. and Hassan, C.H.B. (2013). The impact of climate changes on livestock sector: Challenging experience from Bangladesh. *Asian J. Ani. & Vety. Adv.* **8:** 29-40

Akter, S., Farrington, J., Deshingkar, P. and Freeman, A. (2008). Livestock, vulnerability, and poverty dynamics in India. Findings from the ODI Livelihood Options Project Panel Survey. Discussion Paper No. 10. Targeting and Innovation. ILRI (International Livestock Research Institute), Nairobi, Kenya. 43 pp.

Dev, S.M. (2012). Small farmers in India: Challenges and Opportunities. Working paper. Indira Gandhi Institute of Development Research, Mumbai. Available at http://igidr.ac.in/pdf/publication/WP-2012-014.pdf

Nardone, A., Ronchi,B., Lacetera, N., Ranieri, M.S. and Bernabucci, U. (2010). Effects of climate changes on animal production and sustainability of livestock systems. *Livestock Sci.*130. 5769

Sahu, N.C. and Mishra, D. (2013). Analysis of perception and adaptability strategies of the farmers to climate change in Odisha, India. APCBEE Procedia **5:** 123-127

Sejian, V. (2013). Climate change: impact on production and reproduction, adaptation mechanisms and mitigation strategies in small ruminants: A review. *The Indian J. Small Ruminants.* **19:**1-21

Sejian, V. and Naqvi, S.M.K. 2011. Climate change and sheep production: Concept of multiple stresses, adaptation and mitigation strategies to sustain production. In: Trends in small ruminant production: Perspectives and prospectus. [Eds. A. Sahoo, S.K. Sankhyan, C.P. Swarnkar, A.K. Shinde and S.A. Karim]. Satish Serial Publishing House, Delhi

Sejian, V., V.P. Maurya, K. Kumar and Naqvi, S.M.K. (2013). Effect of multiple stresses on growth and adaptive capability of Malpura ewes under semi-arid tropical environment. *Trop. Ani.Health Prod.* **45:**107–116

Sejian,V., Naqvi, S.M.K., Ezeji, T., Lakritz, J and Lal, R. (2012). Environmental stress and amelioration in livestock production.Springer-Verlag GmbH Publisher, Berlin Heidelberg, Germany. DOI: 10.1007/978-3-642-29205-7

Tamil Nadu State Perspective and Strategic Plan. (2012). Available at http://dolr.nic.in/dolr/downloads/spsp/TAMILNADU%20STATE%20PERSPECTIVE%20&%20STRATEGIC%20PLAN.pdf