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Adaptation strategies followed by the dairy farmers' to mitigate the adverse effect of climate change in Jharkhand

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Abstract

For sustainable livestock farming, it is very important to reduce the climatic vulnerability which can be achieved through climatic adaptation at the farm level. As the climatic adaptations enable the rural households and communities to reduce adverse effects of climate change, it is utmost needed to have the knowledge of location-specific adaptation strategies followed by the dairy farmers'. With this view, the present study was conducted on 240 dairy farmers in three different agro-climatic regions of Jharkhand to assess the adaptation strategies followed by them. The data was collected through a pre-structured interview schedule and analyzed to draw a meaningful interpretation.

The results indicated that majority of the respondents (63.75%) belonged to the medium level adaptation category followed by low (25.83%) and high (10.42%) level adaptation category, respectively. The study also revealed that maximum respondents adapted preservation of fodder, using more amounts of crop residues and hay, changing the feeding and grazing schedule, providing frequent clean and fresh drinking water during hot days, extra bathing of animals, changing the micro-climate in shed, providing bedding during extreme winters, and providing more health care practices on continuous basis. The level of adaptation of the respondents was found to be significantly correlated with age, experience, land holding, annual income, socio-economic status, mass media exposure, extension person contact, decision making ability, innovativeness, risk orientation and scientific orientation.

Thus, the findings of the study suggest that there is need to organize awareness camp and trainings to make the farmers more aware about the benefits of adapting various mitigation strategies for sustainable dairy farming,

Keywords: Adaptation strategies, dairy farmers, climate change and Jharkhand

Introduction

Climate change has emerged as the most severe threat to the agricultural sector. The UNFCCC has defined climate change as the change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. The climate change is mainly recognized by the changes in its three major indicators *viz*. Temperature, humidity and rainfall.

Unlike agriculture, animal husbandry has direct as well as indirect impacts of the changing climate. The direct impacts of climate change includes heat stress, increased morbidity and mortality whereas, the indirect impacts includes quality degradation and reduced availability of feed and forages, and increased incidence of animal diseases.

Therefore, to have a sustainable livestock farming system, it is very important to reduce the climatic vulnerability which can be achieved through climatic adaptation at the farm level. Adaptation is the adjustment in natural or human

systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001) [1]. The climatic adaptations enable the rural households and communities to reduce adverse effects of climate change (IPCC 2001) [1]. The adaptation process at the micro-level encompasses the interdependence of agents through their relationships with each other, with the institutions in which they reside and the resource base on which they depend (Adger, 2003) [2].

According to Adiyoga (2018) [3], adaptation to mitigate adverse effects of climate change can be achieved only when (a) farmers are able to perceive that climate change is really occurring, (b) farmers are capable to identify the available adaptation options for mitigating the climate change and (c) farmers respond to climate change adaptation as per their production practices followed in agriculture and allied sector.

Some studies have documented effects of climate change and adaptation on livestock farming systems in several agricultural regions. However, compared with crops, there has been little research on the livestock farmers particularly dairy farmers on climate change. More so, research on livestock farmers is often neglected in agricultural research. In this background, the present study was conducted with an objective to know the adaptation strategies followed by the dairy farmers of Jharkhand.

Materials and Methods

The present study was conducted in all the three agro-climatic regions *viz*. Central North-eastern plateau, Western plateau and South-eastern plateau of Jharkhand. Two districts from each region namely Ranchi, Jharkhand, East Singhbhum, Saraikela, Latehar and Khunti were selected randomly. From each district, two blocks and four villages were selected randomly. From each village, ten dairy farmers having at least two dairy animals with farming experience of minimum 10 years were selected purposively. Thus, a total of 240 dairy farmers were interviewed for the present study. The data was collected through pre-structured interview schedule. The collected data was then analyzed through appropriate statistical tools like frequency, percent and correlation to interpret the findings of the present study.

Results and Discussions

1. Socio-economic profile of the dairy farmers

Table 1 reveals that majority of the respondents were middle aged (47.5%), illiterate (32.5%), male (80%) belonging to OBC category (79.2%) mostly having nuclear (52.92%) and small sized (77.92%) family with farming experience of up to 20 years (49.58%).

Table 1: Socio-economic profile of respondents

Characteristics	*f* (%)	Characteristics	*f* (%)
Age		**Land Holding**	
Young (Up to 45 years)	110 (45.83)	Landless	10 (4.17)
Middle (46-66 years)	114 (47.50)	Marginal (Up to 1 Ha)	152 (63.33)
Old (Above 66 years)	16 (6.67)	Small (1.01 - 2.0 Ha)	51 (21.25)
Education		Semi-medium (2.01 – 4.0 Ha)	23 (9.58)
Illiterate	78 (32.50)	Medium (4.01 – 10.0 Ha)	3 (1.25)
Up to Primary school	9 (3.80)	Large (10.01 Ha and above)	1 (0.42)
Up to Middle school	48 (28.30)	**Occupation**	
Up to High &Higher Secondary	61 (25.40)	Only one occupation	1 (0.40)
Up to Degree and Above	24 (10.00)	Two occupations	176 (73.40)
Gender		Three occupations	62 (25.80)
Female	48 (20.00)	Four occupations	1 (0.40)
Male	192 (80.00)	**Herd Size**	
Caste		Small (Up to 5 animals)	178 (74.17)
SC	2 (0.80)	Medium (6 to 9 animals)	50 (20.80)
ST	44 (18.30)	Large (More than 9 animals)	12 (5.00)
OBC	190 (79.20)	**Annual Income**	
General	4 (1.70)	Very low (Up to 0.75 lakh.)	9 (3.70)
Family Type		Low (0.75 to 1.5 lakh)	88 (36.70)
Nuclear	127 (52.92)	Medium (1.5 to 3.0 lakh)	122 (50.80)
Joint	113 (47.08)	High (3.0 to 4.5 lakh)	16 (6.70)
Family Size		Very High (More than 4.5 lakh)	5 (2.10)
Small (Up to 8 members)	187 (77.92)	**Socio-Economic Status**	
Medium (9 – 14 members)	48 (20.00)	Lower group (Up to 18)	28 (11.67)
Large (More than 14 members)	5 (2.08)	Lower Middle group (19-23)	104 (43.33)
Farming Experience		Middle group (24-28)	97 (40.42)
Low (Up to 20 years)	119 (49.58)	Upper Middle group (29-33)	7 (2.92)
Medium (21 – 40 years)	105 (43.75)	Upper group (Above 33)	4 (1.66)
High (More than 40 years)	16 (6.67)		

Maximum respondents were marginal farmers (32.92) having agriculture and animal husbandry as their occupations (73.4%) bearing small herd size (74.17) with medium level of annual income (50.8%) belonging to lower-middle socio-economic status group (43.33%).

2. Communicational and psychological characteristics of the dairy farmers

The communicational and psychological characteristics play an important role in determining the nature of an individual. Therefore an attempt was made to know these variables and the results are presented in the table below.

Table 2: Communicational and psychological characteristics of respondents

Access to Weather Forecast		**Cosmopoliteness**	
Nil (0)	27 (11.25)	Low (Up to 8)	83 (34.58)
Low (1 to 11)	156 (65.00)	Medium (9 – 13)	125 (52.08)
Medium (12 to 22)	52 (21.67)	High (Above 13)	32 (13.34)
High (More than 22)	5 (2.08)	**Decision making ability**	
Mass Media Exposure		Low (Up to 5)	70 (29.16)
Nil (0)	22 (9.16)	Medium (6 to 11)	67 (57.92)
Low (1 to 4)	121 (50.42)	High (More than 11)	103 (27.92)
Medium (5 to 7)	72 (30.00)	**Innovativeness**	
High (Above 7)	25 (10.42)	Low (Up to 6)	59 (24.58)
Contact with Extension Person		Medium (7 to 11)	116 (48.34)
No contact (0)	49 (20.42)	High (More than 11)	65 (27.08)
Low (1 to 2)	152 (63.33)	**Risk orientation**	
Medium (3 to 4)	27 (11.25)	Low (Up to 6)	108 (45.00)
High (Above 4)	12 (5.00)	Medium (7 to 9)	68 (28.33)
Extension Participation		High (More than 9)	64 (26.67)
Nil (0)	86 (35.83)	**Scientific orientation**	
Low (1 to 2)	124 (51.67)	Low (Up to 4)	14 (5.83)
Medium (3 to 4)	28 (11.67)	Medium (5 to 8)	104 (43.34)
High (Above 4)	2 (0.83)	High (More than 8)	122 (50.83)

Majority of the respondents were having low access to weather forecast (65%), low mass media exposure (50.42%), low contact with extension personnel (63.33%), low extension participation (51.67%) and low cosmopoliteness (52.08). Most of them were having decision making ability (57.92%) and innovativeness (48.34%), low risk orientation (45%) and high scientific orientation (50.83%).

3. Adaptation level of the dairy farmers

Adaptation is a means which helps an individual to mitigate the adverse effect of something or some situation. It reduces the climatic vulnerability of the dairy farmers. Therefore, the level of adaptation of the dairy farmers was studied and is presented in Table 3. The data revealed that maximum respondents belonged to the medium level adaptation category (63.75%) followed by low (25.83%) and high (10.42%) level category, respectively to mitigate the adverse effect of changing climate. Similar findings were also documented by Biswas *et al.* (2020) [4] where majority (40%) of the famers followed more or less adaptation strategies.

4. Adaptation strategies followed by the dairy farmers

The data related to various strategies adopted by the dairy farmers were collected and are presented in Table 4. The table below depicted that majority of the respondents adopted but discontinued changing the herd composition during adverse climatic conditions (47.92%) and selling of few animals from the stock to meet other necessary financial requirements (55.42%) followed by not adopting (30.83% and 31.67% respectively) and adopting on continuous basis (21.25% and 12.91% respectively). Most of the respondents adopted but discontinued reducing the herd size during adverse climatic conditions (55.42%), self production of feed at lower cost (42.92%), planting fodder tree lines around cattle shed to reduce effects of cold/heat waves (74.58%) and switching over from livestock farming to other livelihood options (52.50%) followed by adopting continuously (31.67%, 35.83%, 15.42% and 41.25% respectively) and not adopting the strategies (12.91%, 21.25%, 10% and 6.25% respectively).

Table 3: Distribution of respondents according to their level of adaptation

Category	*f*	%
Low (Up to 16)	62	25.83
Medium (17 to 25)	153	63.75
High (More than 25)	25	10.42

Table 4: Distribution of respondents according to the adaptation strategies followed

Sl. No	Statements	AC *f* (%)	AD *f* (%)	NA *f* (%)
1.	Changing the livestock/herd composition during adverse climatic conditions	51 (21.25)	115 (47.92)	74 (30.83)
2.	Reducing the herd size during adverse climatic conditions	76 (31.67)	133 (55.42)	31 (12.91)
3.	Replacing the exotic/cross bred with local breeds	24 (10.00)	14 (5.83)	202 (84.17)
4.	Preservation of fodder	141 (58.75)	39 (16.25)	60 (25.00)
5.	Self production of feed at lower cost	86 (35.83)	103 (42.92)	51 (21.25)
6.	Providing extra concentrate to animals	75 (31.25)	52 (21.67)	113 (47.08)
7.	Providing mineral supplements and feed additives	41 (17.08)	67 (27.92)	132 (55.00)
8.	Using more amount of crop residues and hay	134 (55.83)	90 (37.50)	16 (6.67)
9.	Changing the feeding schedule	138 (57.50)	74 (30.83)	28 (11.67)
10.	Changing the grazing time	148 (61.67)	11 (4.58)	81 (33.75)
11.	Providing frequent clean and fresh drinking water during hot days	149 (62.08)	63 (26.25)	28 (11.67)
12.	Extra bathing of cattle and buffalo	108 (45.00)	74 (30.83)	58 (24.17)
13.	Changing the micro-climate in cattle shed/grazing area	128 (53.33)	69 (28.75)	43 (17.92)

14.	Planting fodder tree lines around cattle shed to reduce effects of cold/heat waves	37 (15.42)	179 (74.58)	24 (10.00)
15.	Providing bedding during extreme winters	132 (55.00)	66 (27.50)	42 (17.50)
16.	Providing more health care practices	118 (49.17)	106 (44.17)	16 (6.66)
17.	Regular deworming of the animals	12 (5.00)	100 (41.67)	128 (53.33)
18.	Routine vaccination of the animals	10 (4.17)	106 (44.17)	124 (51.66)
19.	Using net on all the openings to prevent the entrance of mosquitoes and other vectors in the shed	0 (0.00)	0 (0.00)	240 (100.00)
20.	Availing the cattle insurance facility	0 (0.00)	2 (0.80)	238 (99.20)
21.	Selling of few animals from the stock to meet other necessary financial requirements	31 (12.91)	133 (55.42)	76 (31.67)
22.	Switching over from livestock farming to other livelihood options	99 (41.25)	126 (52.50)	15 (6.25)
23.	Social migration	0 (0.00)	38 (15.83)	202 (84.17)
24.	Rain water harvesting	2 (0.83)	7 (2.92)	231 (96.25)

The results also showed maximum respondents were not adopting the replacement of exotic/cross bred with local breeds (84.17%) and providing extra concentrate to animals (47.08%) followed by adopting continuously (10% and (31.25% respectively) and adopted but discontinued (5.83% and 21.67% respectively). Most of the farmers adopted and continued preservation of fodder (58.75%) and changing the grazing time (61.67%) followed by non-adoption (25% and 33.75% respectively) and adopted but discontinued (16.25% and 4.58% respectively).

Majority of the farmers adopted and continued using more amount of crop residues and hay (55.83%), changing the feeding schedule (57.50%), providing frequent clean and fresh drinking water during hot days (62.08%), extra bathing of cattle and buffalo (45%), changing the micro-climate in cattle shed/grazing area (53.33%), providing bedding during extreme winters (55%) and providing more health care practices (44.97%) followed by adopted but discontinued (37.50%, 30.83%, 26.25%, 30.83%, 28.75%, 27.5% and 44.17% respectively) and not adopted ((6.67%, 11.67%, 11.67%, 24.17%, 17.92%, 17.5% and 6.66% respectively).

Most of the respondents showed non-adoption of providing mineral supplements and feed additives (55%), regular deworming of the animals (53.33%) and routine vaccination of the animals (51.66%) followed by adoption with discontinuation (27.92%, 41.67% and 44.17% respectively) and adoption on continuous basis (17.08%, 5% and 4.17% respectively).

84.17%, 96.25% and 99.2% respondents did not adopt social migration, rain water harvesting and availing the cattle insurance facility respectively and the rest (15.83%, 2.92% and 0.8% respectively) adopted but discontinued in due course of time. 100% of the respondents showed non-adoption of using net on all the openings to prevent the entrance of mosquitoes and other vectors in the shed.

Similar findings were also reported by Abera *et al.* (2020) [5] who revealed that farmers were reducing number of livestock, diversifying livestock species, and replacing Fogera cattle with small ruminants as adaptation strategies. Shahbaz *et al.* (2020) [6] concluded that farmers made an attempt to adapt conventional climate change strategies such as mix farming, reduction in animals, provision of more drinking water, use of tree shades, livestock diversification, use of muddy roof, and floor in order to cope with climate changes. Chand and Kumar (2018) [7] analyzed and found sowing of moisture tolerate short duration varieties in crop farming, arranging for fodder storage, increasing concentrate feeds to the livestock, and protecting animals by hanging wet gunny bags on thatched shed in livestock rearing as the major cope-up strategies.

5. Correlational analysis between the adaptation level of the dairy farmers with their selected independent variables

Adaptation of any technology depends on various factors, with this view an attempt was made to know the relationship between the adaptation strategies followed by the dairy farmers under study area with some of their selected independent variables.

Table 5 indicates that the level of adaptation of the respondents was significantly correlated with age, experience and scientific orientation at 5% level of significance and with land holding, annual income, socio-economic status, mass media exposure, extension person contact, decision making ability, innovativeness and risk orientation at 1% level of significance. Other variables like herd size and extension participation was found to be non-significantly and positively correlated with the level of adaptation whereas occupation was non-significantly and negatively correlated with the level of adaptation.

Some of the earlier researchers have also observed and reported association between various factors and adaptation strategies of the farmers. Kundu and Mondal (2021) [8] observed that size of land holdings, farming experience, subsidiary income source, access to agricultural information and gross irrigated area to gross cropped area have most significant influence on selection of appropriate adaptation strategies of farmers. Sahu and Mishra (2013) [9] concluded factors that have a major influence on their decision to adapt are their income, access to irrigation, access to credit facility and landholding size.

Table 5: Correlation between adaptation level and independent variables

Variables	Correlation Co-efficient (r)	P value
Age	0.129*	0.046
Experience	0.133*	0.039
Occupation	-0.015	0.818
Land holding	0.328**	0.000
Herd Size	0.064	0.326
Annual income	0.310**	0.000
Socio-economic Status	0.261**	0.000
Mass Media Exposure	0.214**	0.001
Extension person contact	0.317**	0.000
Extension Participation	0.068	0.297
Decision making ability	0.240**	0.000
Innovativeness	0.177**	0.006
Risk orientation	0.205**	0.001
Scientific orientation	0.142*	0.028

Conclusion

The result of the study indicated that majority of the respondents belonged to the category of medium level

adaptation followed by low- and high-level adaptation respectively. Maximum respondents adapted preservation of fodder, using more amount of crop residues and hay, changing the feeding and grazing schedule, providing frequent clean and fresh drinking water during hot days, extra bathing of animals, changing the micro-climate in shed, providing bedding during extreme winters, and providing more health care practices on continuous basis.

Majority of the respondents adopted changing the herd composition and herd size, self production of feed at lower cost, planting fodder tree lines around cattle shed, selling of few animals to meet other necessary financial requirements, and switching over to other livelihood options but discontinued with due course of time. Most of the respondents did not adopted replacing the cross bred animals with non-descript, providing extra concentrate to animals, providing mineral supplements and feed additives, regular deworming and routine vaccination of the animals, social migration, and rain water harvesting. All of the respondents expressed non-adoption of using net to prevent the entrance vectors in the shed and availing the cattle insurance facility.

Thus, the findings of the study suggest that there is need to organize awareness camp and training programs to make the farmers more aware about the benefits of adapting various mitigation strategies for sustainable dairy farming. The mass media and extension personnel can play an important role in awarding and motivating the farmers to adopt the mitigation dstrategies.

References

1. IPCC. Climate Change Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change; c2001.
2. Adger WN. Social capital, collective action, and adaptation to climate change. Econ Geog. 2003;79:387-404.
3. Adiyoga W. Farmers' Perceptions on Climate Change in Lowland and Highland Vegetable Production Centers of South Sulawesi, Indonesia. International Conference on Agriculture, Environment, and Food Security IOP Publishing IOP Conf. Series: Earth and Environmental Science. 2018;122.
4. Biswas S, Chatterjee S, Roy DC. Understanding of farmers' perception of climate change and adaptation strategies: A case study in Jhargram district of West Bengal, India. J Appl Nat Sci. 2020;12(2):207-212.
5. Abera M, Mummed YY, Eshetu M, Pilla F, Wondifraw Z. Perception of Fogera cattle farmers on climate change and variability in Awi Zone, Ethiopia. Open J Ani Sci. 2020;4.
6. Shahbaz P, Boz I, Ul Haq S. Adaptation options for small livestock farmers having large ruminants (cattle and buffalo) against climate change in Central Punjab Pakistan. Environ Sci Pollut Res. 2020;27:17935-17948.
7. Chand S, Kumar D. Farmers' perception on climate change and its management strategies; A micro analysis of Rajasthan. Ind Res J Ext Edu. 2018;18(3):49-56.
8. Kundu SK, Mondal TK. Farmers' perception of climate change and adaptation strategies: A study of the Lower Gangetic Plains in India. Arabian J Geosci. 2021;15.
9. Sahu NC, Mishra D. Analysis of perception and adaptability strategies of the farmers to climate change in Odisha, India. APCBEE Procedia. 2013;5:123-127.