

PERCEPTION LEVEL OF DAIRY FARMERS TOWARD CLIMATE VARIABILITY**Sarjeet Yadav¹, Sonam Agrawal² and Chandrika Sharma³**

1 Ph.D. Scholar, M.P.U.A.T. Udaipur-313001

2 Asstt. Prof., Department of Extension Education, CoA, JNKVV Jabalpur-482004

3 Lab Technician, Department of Extension Education, CoA, JNKVV Jabalpur-482004

Email : chandrikasharma1991@gmail.com

ABSTRACT

Climate variability is an increasing concern that poses a threat to dairy farmers globally. Climate change primarily affects the production and consumption systems, our livelihood and the systems related to water and land use, including reduced milk production. Rural communities may not fully understand the reasons behind climate changes, but they can accurately sense and analyze its effects. Dairy production is now increasingly vulnerable due to climate variability. This study examines the perceptions of dairy farmers in the dry region of Rajasthan regarding climate variability and its impact on their livelihoods. Using an ex-post facto research design, data were collected from 100 farmers, including 50 beneficiaries of climate adaptation initiatives and 50 non-beneficiaries. The findings reveal that a majority of both groups have a high perception of climate variability, with key concerns including increased droughts, changes in precipitation timing, and groundwater depletion. Beneficiaries demonstrated greater awareness and adoption of climate-resilient technologies compared to non-beneficiaries. Significant difference in perception level of beneficiaries and non-beneficiaries under different criteria of evaluating perception has been seen. The study underscores the urgent need for policies that integrate farmers' perceptions and adaptive strategies to mitigate climate variability's adverse effects on dairy farming.

Keywords: *adaptive strategies, climate-variability, climate-resilient, dairy farmers, mitigate, perception.*

INTRODUCTION

In developing countries, livestock systems are diverse and evolving rapidly. Dairy farming is means of subsistence for millions of dairy farmers in country. It provides livelihood support to millions of small marginal farmers and land less labours (Tajpara et. al. 2020). Livestock sector is prominent sector among agriculture and allied activities in India . Dairy sector plays a significant role for uplifting rural community in India (Ghasura et. al. 2024). The livestock sector alone contributes nearly 25.6 % of value of output at current prices of total value of output in agriculture, fishing & forestry sector (Ghasura et. al. 2021). Because of limited resources available with the farming community, expected improvement in the milk production per animal is yet to be achieved (Bhatt and Patel, 2009-10). Poor smallholders are particularly vulnerable to climate change due to their reliance on agriculture, small landholdings, and limited assets and savings. Livestock play a crucial role in generating a gainful employment in rural community. Development in this sector have led to more balanced rural economic development, particularly in alleviating poverty among vulnerable groups. India has become the world's largest milk producer in the world. Similarly, in India and globally, the majority of the poorest people rely on farming and livestock for their livelihood,

including food, fiber, income security and companionship (Chakravarty et al. 2012). Various studies have highlighted a gap in knowledge about how climate change perceptions affect livelihood across different production systems (Vinaya et al., 2017). However, the interactions between these factors and their impact on livestock production are not yet fully understood. This article examines vulnerability, focusing on perceptions of climate change and their potential impact on the livelihood of livestock producers.

Climate variability has recently recognized as a significant challenge for Indian farmers (Vinaya and Tapan, 2023). Addressing this issue requires identifying effective solutions to mitigate its adverse impacts. Understanding farmers perception of climate variability is crucial for developing appropriate coping strategies for dairy farming (Vinaya and Shivamurthy, 2021). Perception is affected by factors such as social and cultural backgrounds, past experience, attitude, knowledge and information (Kant et. al. 2015). Insights into these perceptions can enhance scientific and policy discussions on climate variability. Researchers need to assess farmers anticipated response to climate variability, as these responses can either mitigate or exacerbate its effects. Policy makers must also understand the needs and preferences and preferences of the farming

community to design policies that are either supported or at least acceptable. Thus, any strategies or policies aimed at adapting to climate variability should prioritize the concerns of farmers at the grassroots level. Farmers employ various strategies to manage environmental challenges and sustain their livelihood. Additionally recognizing how farmers perceive risks associated with climate change is essential, as these risk perceptions influence their activities and planning decisions in adapting to climate changes. Under the circumstances outlined above, there is a need for the study focusing on dairy farmers perceptions on climate variability in the dry region of Rajasthan. This research would provide insight into farmers attitude toward climate variability and their coping strategies for addressing its impacts.

OBJECTIVE

To study perception level of dairy farmers toward climate variability

METHODOLOGY

The present study was purposively conducted in dry region of Rajasthan. As in the region, livestock serves as the primary livelihood, evidenced by its density of 170 per sq.km, surpassing the national average of 161 per sq.km. This heavy dependence has placed significant strain on the already scare natural resources. The area experiences very low rainfall, averaging around 400 mm, and encounter challenges with water scarcity and inadequate water management practices. These challenges combined with frequent droughts

negatively impact on both crop yields and livestock health, leading to decreased productivity and even animal deaths. Out of 21 blocks in Jodhpur district Luni block was purposively selected because the NICRA project is running in this block. Four villages were selected for the study out of which two are NICRA adopted villages and two are non-adopted villages. Total of 100 farmers were selected for the study out of which 50 respondents are beneficiary and 50 were non-beneficiary selected for the study. An ex-post facto research design was used in this present study. The data were analyzed by using statistical tools like frequency, percentage, arithmetic mean, standard deviation to draw meaningful conclusions for the present study. Z test has been practiced to evaluate the difference in mean score and perception level of both categories of farmers under different criteria.

RESULTS AND DISCUSSION

Overall perception level of the dairy farmers towards climate variability is depicted from the Table 1. that majority (80 percent) of beneficiaries and 72 percent of non-beneficiaries had high level of perception, followed by (20 percent) of beneficiaries and 28 percent of non-beneficiaries had medium level of perception and no beneficiaries and non-beneficiaries had low level of perception towards climate variability. This is likely due to that farmers are becoming aware regarding climate change and their impact on climate, crops and livestock. This finding was in line with the results of Anseera (2018); Naik *et al.* (2024); Swami *et al.* (2024); Parmar *et al.* (2024); Thakur *et al.* (2024).

Table 1 : Overall perception level of dairy farmers towards climate variability

(n=100)

Sr. No.	Categories	Beneficiary (n=50)		Non-beneficiary (n=50)	
		(f)	%	(f)	%
1	Low (20 – 46)	0	0.00	0	0.00
2	Medium (47 – 74)	10	20.00	14	28.00
3	High (75 – 100)	40	80.00	36	72.00

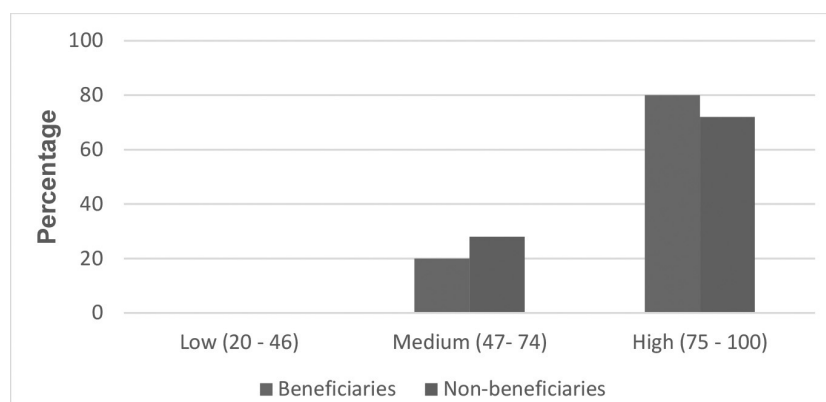


Fig. 1 : Perception level of dairy farmers towards climate variability

Table 2: Distribution of respondents according to their perception towards climate variability under different criteria (n=100)

Sr. No.	Statements	Beneficiary (n=50)		Non-beneficiary (n=50)	
		Weighted mean	Rank	Weighted mean	Rank
1	There are changes in environmental temperature (+/-)	14.26	IX	14.73	III
2	There is change in timing of precipitation (+/-)	15.00	II	16.46	I
3	There are changes in ground water level (+/-)	14.06	X	14.40	V
4	There is increase in number of droughts (+/-)	15.20	I	15.13	II
5	There is change in pattern of cold and heat winds (+/-)	14.60	VI	12.73	XI
6	There is increase in disease/pest infestation (+/-)	10.06	XIV	7.40	XV
7	There is change in feeding behavior of dairy animals (+/-)	14.53	VII	13.60	X
8	There is change in current farm management practices (+/-)	13.26	XI	11.46	XII
9	Uncertainties due to climate variability seriously affects the ability to invest in dairy business (+/-)	14.46	VIII	13.73	VIII
10	Climate variability is an important environmental issue (+/-)	14.86	III	14.46	IV
11	Climate variability need urgent preparedness (+/-)	11.66	XIII	11.40	XIII
12	It is hard to predict/forecast weather through ITK due to climate variability (+/-)	12.26	XII	13.80	VII
13	Climate variability is not a problem (+/-)	4.80	XIX	4.60	XIX
14	Climate variability affects the milk yield (+/-)	14.66	V	13.66	IX
15	Climate variability affects the reproduction/conception of the dairy animals (+/-)	14.73	IV	14.06	VI
16	There is no effect on crop-livestock farming due to climate variability (+/-)	5.80	XVI	5.13	XVII
17	Climate variability is beneficial for livestock farming (+/-)	4.13	XX	4.53	XX
18	Climate variability will increase agricultural production (+/-)	8.60	XV	8.00	XIV
19	There is no variation in rainfall pattern due to climate variability (+/-)	5.53	XVII	5.93	XVI
20	Climate variability improves the standard of living of livestock farmers (+/-)	5.06	XVIII	4.80	XVIII

The analysis of farmer responses reveals varying perceptions of climate variability between beneficiaries and non-beneficiaries over different criteria which are summarized as follows:

- (1) **Environmental temperature change:** Beneficiary farmers ranked this issue ninth (mean score: 14.26), while non-beneficiaries ranked it third (mean score: 14.73). Beneficiaries are more aware of climate-resilient technologies, reducing the impact of temperature change on productivity, unlike non-beneficiaries, who lack such knowledge.
- (2) **Changes in precipitation timing:** This was ranked second by beneficiaries (mean score: 15.00) and first by non-beneficiaries (mean score: 16.46). Altered precipitation disrupts crop productivity and animal health, leading to issues such as reduced biomass,

smaller grain sizes, and reproductive problems in livestock.

- (3) **Groundwater level changes:** Ranked tenth by beneficiaries (mean score: 14.06) and fifth by non-beneficiaries (mean score: 14.40). Beneficiary villages have better water resources, while non-beneficiaries face significant challenges due to declining groundwater levels. Declining ground water levels had significant importance on farmers because this is vital resource for the livelihood of people in the region. Groundwater is essential, particularly during droughts, and is the primary water resource in such times.
- (4) **Increase in droughts:** Beneficiaries ranked this first (mean score: 15.20), while non-beneficiaries ranked it second (mean score: 15.13). The increasing frequency

and severity of droughts highlight the urgency of mitigation efforts. In the recent past years number of droughts had been increased passively and surpasses critical level of droughts.

- (5) **Changes in wind patterns:** This was evaluated and ranked sixth by beneficiaries (mean score: 14.60) and eleventh by non-beneficiaries (mean score: 12.73). Observed changes in heat and cold waves indicate the tangible effects of climate variability on dairy farming.
- (6) **Increase in pests/disease:** Fourteenth rank was given by beneficiaries (mean score: 10.06) and fifteenth by non-beneficiaries (mean score: 7.40). Low-erratic rainfall, less moisture content and poor water availability during off season exacerbate pest and disease problems.
- (7) **Changes in animal feeding behavior:** Beneficiaries assigned seventh rank to this (mean score: 14.53), while non-beneficiaries ranked it tenth (mean score: 13.60). Climate change leads to physiological disorders in animals, which in turn alter their feeding behavior to adapt into the changing environmental conditions.
- (8) **Farm management practices:** This received a ranking of eleven by beneficiaries (mean score: 13.26) and twelfth by non-beneficiaries (mean score: 11.46). Farmers adapt their practices in response to climate variability to sustain productivity.
- (9) **Investment in dairy business:** Both groups ranked this eighth (beneficiaries: mean score 14.46; non-beneficiaries: mean score 13.73). Uncertainty due to climate variability reduces farmers' ability to invest in their operations as uncertainties lead to decrease in income. Farmers had less extra money to invest back into their operations, which could hinder improvements and expansions.
- (10) **Climate variability as an environmental issue:** This was rated third by beneficiaries (mean score: 14.86) and fourth by non-beneficiaries (mean score: 14.46). Farmers increasingly recognize climate variability as a critical problem affecting their livelihoods because farmers are now frequently encountering natural disasters, such as floods, droughts, or storms, which they recognize as a major problem impacting their livelihood. These events disrupt their farming activities, damage crops, and reduce productivity, leading them to prioritize addressing these challenges.
- (11) **Urgent preparedness for climate variability:** Both groups ranked this thirteenth (beneficiaries: mean score 11.66; non-beneficiaries: mean score 11.40). The probable might be due to those farmers had noticed a reduction in the productivity of their crops and livestock, which prompted them to recognize the need for immediate and proactive measures.
- (12) **Difficulty predicting weather:** This was assessed and given twelfth rank by beneficiaries (mean score: 12.26) and seventh by non-beneficiaries (mean score: 13.80), highlighting the challenges of forecasting weather changes using indigenous traditional knowledge due to climate variability.
- (13) **Climate variability as a non-issue:** Both groups ranked this nineteenth, with low mean scores (beneficiaries: 4.80; non-beneficiaries: 4.60), affirming that climate variability directly and significantly affects farming activities through disrupting growing seasons, alter the availability of water resources, and increase the prevalence of pests and diseases.
- (14) **Impact on milk yield:** Ranked fifth by beneficiaries (mean score: 14.66) and ninth by non-beneficiaries (mean score: 13.66). Most farmers recognize that climate variability negatively affects dairy production.
- (15) **Impact on livestock reproduction:** Beneficiaries assigned fourth rating (mean score: 14.73), while non-beneficiaries as sixth (mean score: 14.06). Climate variability disrupts reproductive cycles, affecting animal productivity.
- (16) **No impact on crop-livestock farming:** This was ranked sixteenth by beneficiaries (mean score: 5.80) and seventeenth by non-beneficiaries (mean score: 5.13), indicating widespread acknowledgment of climate-related challenges in crop-livestock systems. This perception suggests that the challenges faced in farming are due to significant negative impacts of climate on both animals and crops. For instance, extreme weather conditions, disease outbreaks, or environmental changes could be harming livestock directly, reducing their health and productivity. Simultaneously, these issues could be damaging crops through factors such as droughts, floods, or pest infestations, which in turn affect the overall yield and quality.
- (17) **Beneficial effects on livestock farming:** Ranked last (twentieth) by both groups (beneficiaries: mean score 4.13; non-beneficiaries: 4.53). A detailed examination of the results revealed that majority of the farmers do not agree or strongly disagree with the statement that

climate variability is beneficial for dairy farming.

- (18) **Increase in agricultural production:** It was rated fifteenth (mean score: 8.60) by those who benefited and fourteenth (mean score: 8.00) by non-beneficiaries, reflecting their perception that climate variability negatively affects production.
- (19) **No rainfall variations:** Ranked seventeenth by beneficiaries (mean score: 5.53) and sixteenth by non-beneficiaries (mean score: 5.93). The results indicated variations in rainfall patterns due to climate variability

- (20) **Improved living standards:** Ranked eighteenth by both groups (beneficiaries: mean score 5.06; non-beneficiaries: 4.80), indicating that farmers recognize the negative impacts of climate variability on their quality of life. The probable reason might be due to the farmers are well aware of the negative impact of climate variability on their living standards. This awareness may arise from the perception that adverse conditions are likely reducing their income.

Table 3: Difference in perception of dairy farmers towards climate variability under different criteria (n=100)

Sr. No.	Statements	Mean values		Mean score difference	Z value
		Beneficiary (n=50)	Non-beneficiary (n=50)		
1	There are changes in environmental temperature	4.46	4.42	0.04	0.40
2	There is change in timing of precipitation	4.50	4.58	-0.08	-0.69
3	There are changes in ground water level	4.28	4.32	-0.04	-0.34
4	There is increase in number of droughts	4.56	4.54	0.02	0.20
5	There is change in pattern of cold and heat winds	4.38	3.82	0.56	3.51**
6	There is increase in disease/pest infestation	3.02	2.22	0.80	3.87**
7	There is change in feeding behavior of dairy animals	4.36	4.08	0.28	1.83
8	There is change in current farm management practices	3.98	3.47	0.52	2.84**
9	Uncertainties due to climate variability seriously affects the ability to invest in dairy business	4.34	4.12	0.22	1.31
10	Climate variability is an important environmental issue	4.50	4.32	0.18	1.05
11	Climate variability need urgent preparedness	3.50	3.42	0.08	0.48
12	It is hard to predict/forecast weather through ITK due to climate variability	3.68	4.14	-0.46	-2.57**
13	Climate variability is not a problem	1.46	1.38	0.08	0.52
14	Climate variability affects the milk yield	4.40	4.06	0.34	1.99**
15	Climate variability affects the reproduction/conception of the dairy animals	4.42	4.22	0.20	1.25
16	There is no effect on crop-livestock farming due to climate variability	1.72	1.76	-0.04	-0.28
17	Climate variability is beneficial for livestock farming	1.28	1.36	-0.08	-0.57
18	Climate variability will increase agricultural production	2.58	2.4	0.18	1.10
19	There is no variation in rainfall pattern due to climate variability	1.66	1.78	-0.12	-0.82
20	Climate variability improves the standard of living of livestock farmers	1.50	1.44	0.06	0.41

** Significant at 1 per cent level of probability,

$Z_{tab} = 1.96$

It is clear from Table 3. that among twenty statements under analysis of perception of dairy farmers towards climate variability significant difference is found in mean score levels under different statements. Responses of farmers for statement first, fourth, fifth, sixth, seventh,

eighth, ninth, tenth, eleventh, thirteenth, fourteenth, fifteenth, eighteenth and twentieth were better for beneficiaries whereas for statement second, third, twelfth, sixteenth, seventeenth and nineteenth were better for non-beneficiaries of NICRA project. Statement fifth, sixth, eighth and fourteenth showed

positive and significant difference in perception level of beneficiaries and non-beneficiaries and statement twelfth showed negative and significant difference because climate change results in changes in the cold and hot wind patterns which directly or indirectly leads to changes in ongoing farm management practices and ultimately affects the milk yield. Also the prediction of weather forecast through ITK is no more reliable in cases of climate change.

CONCLUSION

The study highlights that climate variability significantly affects dairy farming, particularly in water-scarce regions like Rajasthan. While both beneficiaries and non-beneficiaries recognize its impacts, beneficiaries exhibit a better understanding and preparedness due to their exposure to climate adaptation initiatives. Major concerns include changing precipitation patterns, temperature variations, and groundwater depletion, which threaten livestock productivity and livelihoods. Also climate change results in changes in the cold and hot wind patterns which directly or indirectly leads to changes in ongoing farm management practices and ultimately affects the milk yield. Not only this the prediction of weather forecast through ITK is no more reliable in cases of climate change. Addressing these challenges requires proactive measures and targeted interventions such as improved water management, climate-resilient farm practices, and financial support for vulnerable farming communities.

RECOMMENDATIONS

Future research should explore long-term adaptation strategies, including the role of technology and climate-smart interventions in enhancing dairy farming resilience. Studies should also assess policy effectiveness in supporting smallholder farmers and investigate how socio-economic factors influence adaptation choices. Additionally, expanding the study to other arid regions could provide comparative insights for more comprehensive climate adaptation frameworks.

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CONFLICT OF INTEREST

All authors confirm that there is no conflict of interest.

REFERENCES

- Anseera, T.P. (2018). Mainstreaming climate resilience into agricultural development: Readiness of the extension system in Kerala. *M. Sc. Thesis*. Kerala Agriculture University, Thrissur. Pp:118-133.
- Bhatt, P.M. and Patel, H.B. (2009-10). A scale to measure knowledge of dairy farmers regarding improved animal husbandry practices. *Guj. J. of Ext. Edu.* 20-21: 10-14.
- Chakravarty, R., Upadhyay, R.C. Singh, S. and Ranga, J. (2012). Increasing farm and livestock resilience to climate change. *NICRA Bulletin*, NDRI, Karnal: 4.
- Ghasura, R.S., Durga Rani, V. and Singh, R.R. (2021). A scale to measure dairy farmers awareness about climate change issues and its variability. *Guj. J. of Ext. Edu.* 32(1): 1-4.
- Ghasura, R.S., Durga Rani, V. and Singh, R.R. (2024). Dairy farmers' views on overcoming barriers to adopting climate change adaptation strategies. *Guj. J. of Ext. Edu.* 37(2): 195-200.
- Kant, K., Sankhala, G., Prasad, K. and Chakravarty, R. (2015). Dairy farmers' perception towards climate variability in Western dry region of India. *Indian J. of Animal Sci.* 85(11): 1255-1262.
- Naik, R. M., Chaudhary, K. L. and Sharma, O. P. (2024) Professionalism in management of primary dairy cooperatives. *Gujarat Journal of Extension Education*, 37(1):178-182. <https://doi.org/10.56572/gjoe.2024.37.1.0030>.
- Parmar, V.S., Bariya, M. K. and Kapadiya, P. S. (2024) Attitude of farm women toward dairy entrepreneurship. *Gujarat Journal of Extension Education*, 38(1):13-17. <https://doi.org/10.56572/gjoe.2024.38.1.0003>.
- Swami, Shreeja P., Patel, U. M. and Chaudhari, R. U. (2024) Knowledge of dairy farmers about periparturient diseases in bovine. *Gujarat Journal of Extension Education*, 37(1):188-191. <https://doi.org/10.56572/gjoe.2024.37.1.0032>.
- Tajpara M.M., Kalsariya, B.N. and Dadhania, V.P. (2020). Knowledge of dairy farmers towards improved animal husbandry practices. *Guj. J. of Ext. Edu.* 31(2): 163-168.
- Thakur, P., Singh, R., Gour, S. (2024) Development of a knowledge test to evaluate farmers' understanding of climate-resilient dairy farming practices. *Gujarat*

Journal of Extension Education, 38(1):181-191.
<https://doi.org/10.56572/gjoeec.2024.38.1.0030>.

Vinaya K. Hebsale Mallappa and Tapan B. Pathak (2023). Climate smart agriculture technologies adoption among small-scale farmers: A case study from Gujarat, India. *Frontiers in Sustainable Food Systems*, 7: 1202485. <https://doi.org/10.3389/fsufs.2023.1202485>

Vinaya Kumar H. M., and Shivamurthy, M. (2021) Factor influencing fishery-based farmers' perception and

their response to climate-induced crisis management. *Environ. Dev. Sustain.*, 23, 11766–11791. Springer, <https://doi.org/10.1007/s10668-020-01141-x>

Vinaya Kumar H. M., Shivamurthy M., Govinda Gowda V. and Biradar G.S. (2017). Assessing decision-making and economic performance of farmers to manage climate-induced crisis in Coastal Karnataka (India). *Climatic Change*. Springer, May 2017, Volume 142, Issue 1, pp 143–153. <https://doi.org/10.1007/s10584-017-1928-x>

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