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Assessing the Effects of Drought on Livestock Farming Livelihoods in Western Odisha: A Study of Drought and Non Drought Years

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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

The irregular climatic variation, which is causing drought, flood, cyclone, etc., across the globe is increasingly affecting the livestock rearing leading to great distress to livestock farmers financially, socially and economically during the above periods [1,2]. Drought is a recurring phenomenon in Western Odisha, posing significant threats to the livelihoods of livestock farmers. This study investigates the effects of drought on the livelihoods of livestock farmers in the region, exploring the socio-economic and environmental implications. A mixed-methods approach was employed, combining surveys, interviews, and focus group discussions with 72 livestock farmers. Results show that drought leads to reduced livestock productivity, decreased income, and diminished food security. Farmers' coping strategies, such as distress sales of assets and migration, exacerbate their vulnerability. The study highlights the need for drought-specific livestock management practices, improved access to credit and insurance, and enhanced extension services to support climate-resilient livelihoods. The study further revealed that animal rearing in the drought affected areas provides a sense of food security, social status and ability to meet the expenses in social rituals. By understanding the impact of drought on livestock farmers' livelihoods, this research aims to inform targeted interventions to enhance their resilience and adaptive capacity. Therefore, the Government of Odisha may initiate serious efforts to promote animal husbandry activities in these districts to support the farmers to negate the adverse impact of drought and to check the distress migration from these districts during the drought period. Policy recommendations include integrating livestock support into drought relief programs and promoting water harvesting and conservation practices.

Keywords: Drought; livestock farming; livelihoods; western odisha; climate change; vulnerability; resilience.

1. INTRODUCTION

Livestock rearing plays a very significant role in rural economy by providing regular income and employment. The vast livestock resources act as cushion to the rural farmers during drought period. The occurrence of drought is a very regular feature in India. It is a geo-hazard, which results in severe impact on socio-economic and psychological aspects of farming community [3,4]. Especially small and marginal farmers' livelihood is affected seriously. In drought situations, there is below average rainfall creating shortage of water supply which not only affects agriculture but also animal husbandry activities. According to NRC [5], drought is one of the most crucial climatic hazards affecting a large number of people worldwide. More than 50% of the region of India is reported to be exposed to severe drought [6]. The states like Bihar, Uttar Pradesh, Karnataka, Kerala, Maharashtra and Odisha encounters drought more often than other Indian states [7]. The Odisha State Disaster Management Authority, Government of Odisha reported that the districts like Bolangir, Bargarh, Nuapada, Kalahandi and Phulbani comprising of 47 blocks are drought prone districts of Odisha where small and marginal farmers suffered crop losses from 30 to 50% due to moisture stress in these districts. The effects of drought are manifest in the sharp drop in agricultural production and farm incomes, shrinkage in opportunities for rural employment, distress in livestock rearing and wide scale migration from rural areas. The agriculture sector in Odisha is susceptible to natural calamities like cyclones, droughts and flash floods which results in wide annual fluctuations in the agricultural production. The share of agricultural economy to GSDP has been going down over the years. Moreover, there are fluctuations in agricultural income in the state over the years, triggered by environmental factors. In recent decade, the state economy of Odisha has witnessed a sectorial shift from agriculture to towards industry and services sectors. Besides these shifts, agriculture and animal husbandry is still being considered as a priority sector for the State.

Western Odisha, a region in eastern India, is characterized by a fragile ecosystem and a high incidence of drought, which has become more frequent and severe due to climate change. Livestock farming is a vital component of the rural economy in this region, providing employment and income for millions of smallholder farmers. However, drought poses a significant threat to the livelihoods of these farmers, affecting not only their livestock

productivity but also their food security, income, and overall well-being.

Drought impacts livestock farming in multiple ways, including reduced fodder availability, decreased water sources, and increased mortality rates. These effects can lead to significant economic losses, forcing farmers to adopt coping strategies that often exacerbate their vulnerability. Despite the critical role of livestock farming in Western Odisha's rural economy, there is limited research on the specific impacts of drought on livestock farmers' livelihoods.

This study aims to fill this knowledge gap by investigating the effects of drought on the livelihoods of livestock farmers in Western Odisha. By examining the socio-economic and environmental implications of drought, this research seeks to provide insights into the challenges faced by livestock farmers and identify strategies to enhance their resilience and adaptive capacity in the face of climate change.

2. MATERIALS AND METHODS

The nine districts of Western Odisha, namely, Balangir, Samablapur, Kalahandi, Nuapada, Sonepur, Sundergarh, Jharsuguda and Bargarh are mostly affected by droughts. For the present study, three districts-Balangir, Kalahandi and Nuapada were selected purposively because these districts witness frequent droughts, and the small and medium farmers of these districts don't have many options of secondary source of income. From these three districts, three blocks, one from each district namely Bangomunda block of Balangir, Golamunda block of Kalahandi and Boden block of Nuapada district were selected as these blocks face sever drought and there is very less source of alternative livelihood for the farmers during the drought period. These blocks lack any major irrigation project or any industry to provide livelihood to the farmers during drought [8]. Moreover, these blocks are adjacent to each other in a patch which will make the data collection more relevant and easier. Three hundred respondents were selected in a stratified random sampling method for the study out of which 72 (n=72) respondents were having animal husbandry as primary occupation. These 72 animal husbandry farmers constitute the sample size for the present paper. A pilot study was conducted, and a relevant questionnaire was finalized after being consulted, discussed, cross checked, and verified with experts, stake holders related to animal husbandry after judging each item with possible linkage as per the objective set forth in the study. Repeated verifications and proper measures were taken to avoid vague and ambiguous responses that may distort the information flow. Close ended questions were put in the schedule to get appropriate response. For collection of data with respect to the situation, 10 statements were selected and validated by highly experienced professors and exports of Veterinary and Animal Husbandry Extension Education Departments of College of Veterinary Science and Animal Husbandry, OUAT and West Bengal as well as Animal Husbandry Department, Government of Odisha. The responses of the respondents were recorded in the form of dichotomous scale and data mentioning "Yes or No". Scoring was done as follows.

Table 1. The responses of the respondents in the form of dichotomous scale and data mentioning

Sl. No	Response	Score
1	Yes	2
2	No	1

Mean Score is calculated to know the shift of the response towards yes and no as well as this would give an indication on opinion of the majority.

$$\text{Mean Score} = \frac{\text{Total score obtained}}{\text{Maximum score}}$$

Percentage was used in descriptive analysis for making simple comparisons between two responses. For calculating percentage, the frequency of a particular cell was multiplied by 100 and divided by the total number of respondents in the particular category to which the cell belonged.

$$\text{Percentage } (\%) = \frac{\text{No of respondent s}}{\text{Total No. of respondent s}} \times 100$$

3. RESULTS AND DISCUSSION

In the selected villages, 72 respondents with Animal Husbandry as their primary livelihood generating option were asked 10 questions related to both drought as well as in non-drought situations and the responses were compared. In this study, it was found that 88.89 % and 93.06 % of the respondents reported that the total need

Table 2. Response of respondents as per their livelihood from Animal Husbandry during Drought year and non-drought year in western Odisha

Sl. No	Constraints	Response					
		Yes			NO		
		Yes	NO	Mean Score	Yes	NO	Mean Score
1	The total need of the staple food for one year for my family is being met from the animal resources I have	64(88.89)	8(11.1)	1.89	67(93.06)	5(6.94)	1.93
2	I get other food items for my family by selling animal heads	69(95.83)	3(4.17)	1.96	69(95.83)	3(4.17)	1.96
3	The daily needs requirement of my family is being met from the money I get by selling	60(83.33)	12(16.67)	1.83	63(87.50)	9(12.50)	1.88
4	I purchase clothes for my family out of sale proceeds of my animal resources	61(84.72)	11(15.28)	1.85	68(94.44)	4(5.56)	1.94
5	Medicines for any ailment of my family members are usually purchased from the money I keep after selling of animal products and animal resources	60(83.33)	12(16.67)	1.83	62(86.11)	10(13.89)	1.86
6	I go for repair of my house with the money I get from selling of milk, egg, poultry birds, goats etc.	64(88.89)	8(11.11)	1.89	67(93.06)	5(6.94)	1.93
7	My livestock resources provide me a status to be credit-worthy in the village	55(76.39)	17(23.61)	1.76	57(79.17)	15(20.83)	1.79
8	My livestock resources provide me a sense of food security for my family	66(91.67)	6(8.33)	1.92	68(94.44)	4(95.56)	1.94
9	As my vocation is Animal Husbandry, I am able to meet the expenses of my family members when they attend social gatherings in the village	65(90.28)	7(9.72)	1.90	66(91.67)	6(8.33)	1.92
10	I meet the expenses of my social obligations and rituals out of the income I get from Animal Husbandry	61(84.72)	11(15.28)	1.85	61(84.72)	11(15.28)	1.85
		Total Mean Score in Drought Year		18.68	Total Mean Score in Non- Drought Year		19.00

(The figure in upper row is frequency and lower is percentage in 3rd, 4th, 6th and 7th columns)

of the staple food for one year of my family is being met from the animal resources in both drought and non-drought year with a mean score of 1.89 and 1.93. This finding reflects that whether drought or non-drought period, livestock used to play a very important role in supporting the livelihood. The study conducted by Bahta and Myeki reported that the small holder livestock farmers are not resilient to agricultural drought and drought significantly impacted resources and food security [9]. 95.38% of the farmers in both drought and non-drought period reported that they get other items for the family by selling animals and their products. The mean score of the above response was 1.96 each in drought and non-drought situations, which signifies that animal husbandry is independent of drought or non-drought situations in terms of selling animal head to earn food for the respondent and his family. 83.33% respondents agreed and remaining 16.67% disagreed on being questioned whether the daily needs requirement of the respondent family is being met from the money he gets by selling animal products and animals in drought situation, however in non-drought situations 87.50% agreed and remaining 12.50% said no to the same question. The mean score was 1.83 and 1.88 in drought and non-drought situation. On asking whether he can purchase clothes for his family out of sale proceeds of my animal resources in drought year, 84.72% respondents said yes whereas in non-drought years, 94.44% said yes to the statement with a mean score of 1.85 and 1.94, respectively. In drought situations, 83.33% respondents said yes whereas in non-drought situations, 86.11% respondents said yes that they purchase medicine after selling of animal products and Animal resources. The mean scores in drought and non-drought years for the statement were 1.83 and 1.86. On enquiring whether the respondent could repair his house with the money he gets from selling of milk, egg, poultry birds, goats etc., 88.89% respondents in drought year said yes and remaining 11.11% said no. Whereas, in non-drought years 93.06% respondents said yes and remaining 6.94% said no to this statement. The mean scores in drought and non-drought condition were 1.89 and 1.93, respectively. 76.39% respondents agreed (said yes) and remaining 17(23.61%) disagreed (said no) on being questioned whether his livestock resources provide him a status to be credit-worthy in the village in drought conditions. However, in non-drought situations 79.17% agreed and remaining 20.83% said no to the same question. The mean scores were 1.76 and 1.79 in drought and non-drought situation. In drought situations, 91.67% respondents said yes, whereas in non-drought situations 94.44% respondents said yes on asking them whether the livestock resources provide the respondent a sense of food security for his family. The mean scores in drought and non-drought years were 1.92 and 1.94, respectively which signifies that irrespective of the drought or non-drought year majority of the respondents supported the statement. To a question whether they could be able to meet the expenses of his family members when they attend social gatherings in the village from Animal husbandry, all most all agreed (65 respondents) in drought condition whereas 91.67% respondents agreed in non-drought situation with a mean score of 1.90 and 1.92 in the respective situations. On enquiring whether the respondent can meet the expenses of his social obligations and rituals out of the income he gets from Animal Husbandry, both in drought and non-drought years 61 (84.72%) respondents said yes and remaining 11 (15.28%) said no, and having mean score of 1.85 in both the situations. From the above findings it was observed that the responses of the respondents were not in much deviated in drought and non-drought years which indicates that animal husbandry and its practices are mostly independent of the drought and non-drought conditions and always used to support the households in rural areas. The study conducted by Swain et al. also reported that farmers were not able to meet their household food requirement and thus drought affects the agriculture farmers severely and the rearing of animals provides an effective coping mechanism to counter the adverse impact of drought [10,11]. From the above findings presented in Table 1, it is observed that the respondents in the study area were able to meet their basic requirements of life in drought as well as in non-drought years from the income of animal husbandry activities. The studies conducted by the different researchers found that drought and climate change affect the production and productivity of the animals leading loss of livelihood of small and marginal farmers [12,13].

4. CONCLUSION

The districts of western parts of Odisha are frequently affected by drought which seriously affects the food security of small and marginal farmers leading to large scale migration to other parts of the country in search of employment. This study investigated the impact of drought on the livelihoods of livestock farmers in Western

Odisha, revealing significant effects on livestock productivity, income, and food security. The findings highlight the vulnerability of livestock farmers to drought, exacerbated by inadequate access to credit, insurance, and extension services. The study also revealed that animal husbandry is playing a crucial role in supporting the livelihood of the farmers during drought period. However, the majority of the farmers in these areas are not in possession of a good number of animals. The farmers are also not aware of the economic benefit of commercial livestock rearing. Most of the livestock rearing in these districts by the farmers are with zero or minimal inputs. There is a need to Integrate livestock support into drought relief programs and enhance access to credit, insurance, and extension services for livestock farmers. The government must promote drought-specific livestock management practices through training and demonstrations and introduce drought-specific livestock management practices through training and demonstration to negate the adverse impact of drought and to check the distress migration from these districts during the drought period.

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 manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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