Relationship Between Rainfall Variability and Livestock Population in Marwar Region

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Abstract

The Marwar region of Rajasthan is characterized by arid and semi-arid climatic conditions where rainfall is highly variable and uncertain. Livestock rearing is one of the most important livelihood activities in the region and serves as a source of income, food security, and economic stability for rural households. Rainfall variability directly affects the availability of water and fodder resources, which in turn influences livestock population dynamics. This study examines the relationship between rainfall variability and livestock population in the Marwar region and evaluates the impacts of changing climatic conditions on livestock-based livelihoods.

Keywords: Rainfall Variability, Livestock Population, Marwar Region, Drought, Climate Change, Rajasthan, Rural Livelihoods

1. Introduction

Rainfall is one of the most significant climatic factors affecting agricultural and livestock activities in arid regions. The Marwar region of western Rajasthan experiences low and erratic rainfall, frequent droughts, and high temperature conditions. Due to these environmental constraints, livestock rearing plays a crucial role in sustaining rural livelihoods.

Changes in rainfall patterns have considerable impacts on fodder production, water availability, animal health, and livestock productivity. Therefore, understanding the relationship between rainfall variability and livestock population is important for sustainable resource management and rural development.

2. Objectives of the Study

The study aims to:

1. Examine rainfall variability in the Marwar region.
2. Analyze the livestock population pattern in the region.
3. Assess the impact of rainfall variability on livestock resources.
4. Identify adaptation strategies adopted by livestock owners.
5. Suggest measures for sustainable livestock management under changing climatic conditions.

3. Study Area

Location

The Marwar region is located in western Rajasthan and includes districts such as:

- Jodhpur
- Barmer
- Jaisalmer
- Pali
- Nagaur
- Jalore
- Sirohi

The region lies within the arid and semi-arid climatic zone and forms a major part of the Thar Desert.

Physical Characteristics

- Low and irregular rainfall
- Sandy soils
- High evaporation rates
- Frequent drought conditions
- Sparse vegetation cover

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4. Review of Literature

Several studies have highlighted the relationship between climate and livestock production in arid regions.

- Studies indicate that drought conditions significantly reduce fodder availability.
- Researchers have observed a decline in livestock productivity during years of below-normal rainfall.
- Previous investigations suggest that livestock owners often migrate seasonally in search of grazing resources during drought years.

These studies demonstrate the importance of rainfall as a determinant of livestock sustainability in arid environments.

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5. Data Sources and Methodology

Data Sources

Primary Data

- Household surveys
- Interviews with livestock owners
- Field observations

Secondary Data

- India Meteorological Department (IMD)
- Livestock Census Reports
- Government of Rajasthan publications
- Research journals and reports

Methodology

1. Collection of annual rainfall data.
2. Compilation of livestock census data.
3. Statistical comparison of rainfall trends and livestock population changes.
4. Spatial analysis using geographical techniques.
5. Interpretation of findings through graphical and tabular methods.

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6. Rainfall Variability in Marwar Region

Rainfall variability refers to fluctuations in rainfall amount, intensity, timing, and distribution over time.

Characteristics of Rainfall

Low Annual Rainfall

- Average rainfall ranges between 100 mm and 500 mm.
- Western districts receive less rainfall than eastern districts.

Irregular Distribution

- Rainfall is unevenly distributed across years and locations.
- Short-duration intense rainfall events are common.

Frequent Droughts

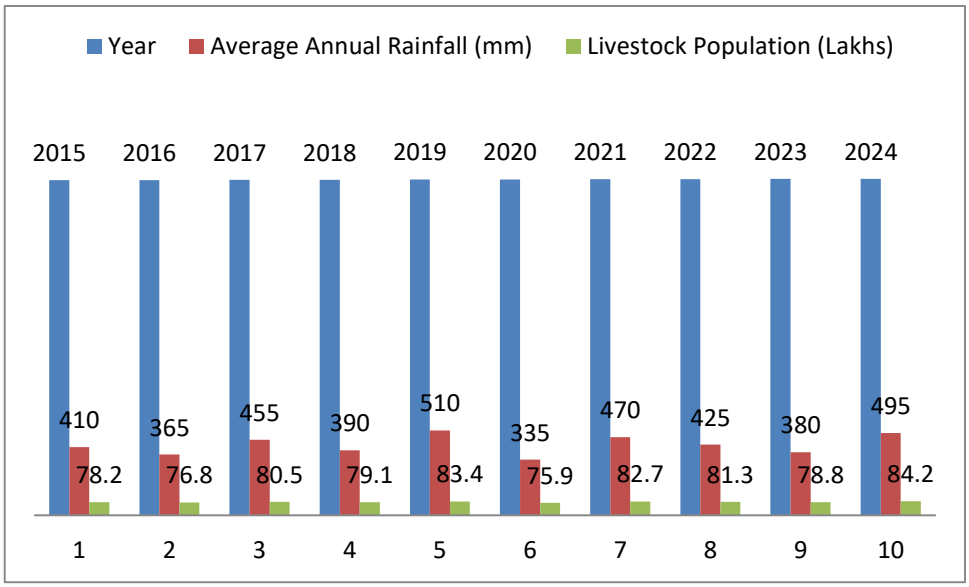
- Meteorological droughts occur regularly.
- Consecutive drought years adversely affect natural resources.

Monsoon Dependence

- Most rainfall is received during the southwest monsoon season.
- Failure of monsoon leads to severe resource scarcity.

Table 1: Rainfall Variability and Livestock Population in Marwar Region

Year	Average Annual Rainfall (mm)	Livestock Population (Lakhs)
2015	410	78.2
2016	365	76.8
2017	455	80.5
2018	390	79.1
2019	510	83.4
2020	335	75.9
2021	470	82.7
2022	425	81.3
2023	380	78.8
2024	495	84.2



Interpretation of the Table

- Years with **higher rainfall** generally show **higher livestock population**.
- **2019** and **2024** received high rainfall and recorded the highest livestock populations.
- **2020** experienced low rainfall and showed a decline in livestock numbers.
- The data suggests a **positive relationship** between rainfall availability and livestock population in the Marwar region.

7. Livestock Population in Marwar Region

Livestock forms an essential component of the rural economy.

Major Livestock Species

Cattle

Used for milk production and agricultural activities.

Buffaloes

Important source of milk and dairy products.

Sheep

Raised mainly for wool and meat production.

Goats

Highly adaptable to arid environments and widely reared.

Camels

Traditionally known as the "Ship of the Desert" and important in desert transportation.

8. Relationship Between Rainfall Variability and Livestock Population

Rainfall variability influences livestock both directly and indirectly.

8.1 Availability of Grazing Resources

Good rainfall years result in:

- Better pasture development
- Increased fodder availability
- Improved livestock health

Poor rainfall years lead to:

- Reduced vegetation cover
- Grazing scarcity
- Increased pressure on rangelands

8.2 Water Availability

Rainfall replenishes:

- Ponds
- Tanks
- Groundwater resources

During drought years:

- Drinking water becomes scarce.
- Livestock travel longer distances for water.

8.3 Livestock Productivity

Adequate rainfall contributes to:

- Higher milk production
- Better reproductive performance
- Reduced mortality rates

Low rainfall often causes:

- Reduced milk yield
- Weight loss
- Increased disease susceptibility

8.4 Livestock Population Changes

In drought years:

- Farmers may sell livestock due to fodder shortages.
- Livestock mortality may increase.
- Population growth slows down.

In favorable rainfall years:

- Herd size tends to increase.
- Livestock productivity improves.

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9. Socio-Economic Impacts

Rainfall variability affects rural communities in several ways:

Positive Effects of Good Rainfall

- Improved income levels
- Better livestock productivity
- Increased market opportunities

Negative Effects of Drought

- Economic losses
- Rural indebtedness
- Seasonal migration
- Food insecurity

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10. Adaptation Strategies

Livestock owners in Marwar adopt several coping mechanisms:

Traditional Strategies

- Seasonal migration
- Community grazing systems
- Water conservation practices

Modern Strategies

- Fodder banks
- Livestock insurance
- Improved veterinary care
- Drought-resistant fodder cultivation

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11. Suggestions and Recommendations

To reduce the impact of rainfall variability, the following measures are recommended:

1. Strengthening rainwater harvesting systems.
2. Development of community pasture lands.
3. Promotion of drought-resilient livestock breeds.
4. Expansion of veterinary infrastructure.
5. Implementation of climate adaptation programs.
6. Encouraging scientific livestock management practices.
7. Strengthening livestock insurance coverage.

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12. Discussion

The analysis indicates a strong relationship between rainfall variability and livestock population in the Marwar region. Rainfall determines the availability of critical resources such as water and fodder, which

directly affect livestock productivity and survival. Frequent droughts increase vulnerability among livestock-dependent households and threaten long-term sustainability.

13. Conclusion

The study concludes that rainfall variability is a major factor influencing livestock population dynamics in the Marwar region. Variations in rainfall affect fodder availability, water resources, animal health, and economic returns from livestock rearing. Sustainable livestock development requires effective drought management, improved resource conservation, and climate-resilient adaptation strategies. Strengthening these measures can enhance livelihood security and reduce vulnerability to future climatic uncertainties.

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