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AGRICULTURAL METEOROLOGY AND SOCIETY: A SOCIOLOGICAL PERSPECTIVE ON WEATHER, CLIMATE AND FARMING

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INTRODUCTION

Agricultural meteorology plays a major role in shaping farming decisions, crop survival, rural livelihoods and the overall well-being of agrarian society. Weather and climate influence not only crop production but also the social behaviour, economic stability, risk perception and cultural practices of farming communities. Therefore, understanding agricultural meteorology through a sociology and society angle helps explain how farmers respond to weather uncertainties, how rural institutions adapt, and how climate change reshapes community life. This article explores key meteorological concepts and links them with social implications for Indian agriculture.

MEANING AND SCOPE OF AGRICULTURAL METEOROLOGY

Agricultural meteorology is the scientific study of weather and climate in relation to crop and livestock production. Its scope includes understanding atmospheric behaviour, predicting weather events, assessing climate variability and helping farmers make informed decisions.

From a sociological viewpoint, it acts as a bridge between science and society, influencing farming culture, labour organization, rural planning, resource use and community resilience.

Earth's Atmosphere: Structure, Composition and Social Implications

The atmosphere consists of gases like nitrogen, oxygen, carbon dioxide and trace gases. It is divided into layers — troposphere, stratosphere, mesosphere and thermosphere.

Changes in atmospheric behaviour directly shape food availability, rural livelihoods, migration patterns, and vulnerability of different social groups. Small farmers, landless labourers and women often face the highest risks.

WEATHER VARIABLES AND SOCIAL DIMENSIONS

Atmospheric Pressure and Wind

Atmospheric pressure varies with height and influences wind movement. Different wind types (monsoon winds, cyclones, land and sea breezes) affect sowing time, pest outbreaks and rainfall distribution. In rural society, wind-driven rainfall variations often lead to crop failures, debt cycles, social stress and livelihood insecurity.

Cyclones and Anticyclones

Cyclones bring intense rainfall and damage. Socially, they result in household displacement, loss of stored grains, livestock mortality, and increased vulnerability among coastal communities.

Solar Radiation and Community Impact

Solar radiation controls temperature, photosynthesis and crop growth. Net radiation and albedo influence heat balance. Socially, radiation changes affect crop choices, work culture (timing of field labour), traditional knowledge, and heat-stress issues among farmers.

Atmospheric Temperature, Lapse Rate and Social Impacts

Temperature variations determine crop germination, flowering and yield. Temperature inversion and lapse rate influence frost formation. Socially, extreme temperature events cause heat waves, cold waves, which disrupt labour productivity and increase health risks for outdoor workers.

Atmospheric Humidity and Condensation Processes

Humidity, saturation, dew, fog, frost and cloud formation influence irrigation needs, pest attacks, harvesting and storage. In society, humidity variations impact post-harvest losses, food security, and traditional storage practices of rural households.

Precipitation Types and Rural Life

Rain, snow, sleet and hail determine water availability.

Social impacts include:

1. **Drought** → migration, social conflict, crop failure, indebtedness
2. **Floods** → loss of property, disease spread, disruption of local institutions
3. **Hailstorms** → sudden income loss, mental stress
4. **Erratic rainfall** → breakdown of traditional farming calendars

Cloud classification and precipitation knowledge help farmers prepare socially and economically.

ARTIFICIAL RAINMAKING AND SOCIAL ACCEPTANCE

Cloud seeding attempts to increase rainfall. Its success depends not only on science but also on community trust, cultural beliefs, local acceptance and government support.

MONSOON AND INDIAN AGRICULTURE: A SOCIOLOGICAL VIEW

The monsoon is a lifeline for Indian farming. It shapes:

1. Cropping patterns
2. Labour migration cycles
3. Festivals and cultural traditions
4. Village economy and social stability

A delayed or failed monsoon often causes social distress, unemployment and increased rural–urban migration.

WEATHER HAZARDS AND SOCIETY

1. **Drought**
   Leads to unemployment, food insecurity, farmer suicides, and weakened social networks.
2. **Floods**
   Damage homes and crops, increase disease risk, and force community displacement.
3. **Frost**
   Harms horticultural crops affecting farmer income and market prices.
4. **Cyclones**
   Impact coastal populations, creating long-term psychological and economic stress.
5. **Heat and Cold Waves**
   Affect farm labour, women's household work burden, and health outcomes.

Agriculture–Weather Relations and Microclimate Management

Farmers modify crop microclimate using mulching, intercropping, windbreaks and irrigation.

Sociologically, these practices reflect traditional wisdom, community cooperation, and social learning systems.

Climatic Normals and Livestock Production

Climatic normals (30-year averages) guide sowing dates, crop choice and livestock care.

These decisions shape rural livelihood structures, labour demand and household income patterns.

Weather Forecasting and Its Social Usefulness

Types:

1. Short-range (1–2 days)
2. Medium-range (3–10 days)
3. Long-range (seasonal)

Social benefits include:

1. Reduced risk of crop loss
2. Better labour planning
3. Improved disaster preparedness
4. Strengthened farmer confidence

Weather information systems (mobile apps, TV, radio) help modernize rural society.

Climate Change, Variability and Social Impact

Climate change caused by greenhouse gases leads to global warming, erratic rainfall and extreme weather events. Social impacts on agriculture:

1. Lower yields
2. More pests and diseases
3. Higher cost of cultivation
4. Water conflicts
5. Rural poverty and migration
6. Changing gender roles (women take more farm responsibility)

It also challenges traditional knowledge systems and requires new forms of community adaptation.

CONCLUSION

Agricultural meteorology is not only a scientific discipline but also a social reality that shapes the everyday life of farming communities. Weather, climate and environmental changes affect rural livelihoods, cultural practices, labour patterns, food security and social well-being. Integrating sociology with agricultural meteorology helps create community-based solutions, promotes climate-resilient farming and strengthens rural society's ability to adapt to climate change. Understanding these connections is essential for building a sustainable and socially just agricultural future.

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