



RESEARCH PAPER

Climate Change and Its Impact on Agricultural Labourers

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Abstract

Climate Change and unlimited economic growth are increasingly pushing the planet beyond its ecological limits, threatening environmental sustainability and human survival. Rapid industrialization, population growth, urbanization, deforestation, and excessive dependence on fossil fuels have intensified greenhouse gas emissions, resulting in global warming, biodiversity loss, sea level rise, and frequent extreme weather events such as droughts, floods, heat waves, and wildfires. The study examines the historical development of climate change, major causes of the climate crisis, impacts on ecosystems, agriculture, biodiversity, and human health, as well as the role of international initiatives and policies in mitigating environmental degradation. It highlights how the concept of unlimited growth on a finite planet has accelerated resource depletion and ecological imbalance. The paper further discusses global climate agreements, including the Intergovernmental Panel on Climate Change and Paris Agreement, and emphasizes the importance of renewable energy, sustainable development, carbon reduction, climate-resilient infrastructure, and nature-based solutions. The study concludes that immediate global cooperation, sustainable resource management, and transition toward low-carbon economies are essential to protect the planet and ensure a secure future for coming generations.

KEYWORDS:

Climate Change, Global Warming, Sustainable Development, Greenhouse Gas Emissions, Renewable Energy

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Introduction

Climate change refers to long-term changes in Earth's temperature, rainfall, and weather. In recent years, we are seeing more heat waves, irregular rainfall, droughts, floods, and storms. These changes are greatly affecting agriculture because farming is closely connected to weather and climate. When the climate changes, farming activities also change — which directly affects Agricultural labourers who do fieldwork.

Agricultural labourers are the primary workforce in farming. Their responsibilities involve numerous essential Farm work such as soil preparation, seed planting, weeding, crop cultivation, harvesting and finishing work after completion. Most of the work is outside and requires a lot of physical effort. labourers are directly affected by changing weather conditions due to this. The extreme elevation of temperature makes it difficult and hazardous to work for extended periods. The excessive warmth can cause fatigue, insufficiency of water, and other health issues that affect the worker's ability to work and produce a significant amount.

Agricultural labourer is one of the main ways climate changes affect the workforce and the economy. When the weather is too hot, workers can't work for long hours safely. After a certain point, they need to cut back their working hours to avoid getting too hot, getting heatstroke, or even serious health issues. This is especially important in farming where most work is done in the sun. Rising temperatures decrease the total number of working hours available. At the same time, worker productivity also goes down because workers under heat stress take longer

breaks, need more time to drink water, and move slower. High body temperature and lack of water can also reduce concentration and lead to more mistakes, which might cause accidents and injuries.

Agricultural labour contributes a large share to total economic value — in some sectors up to about half of the total output. Because of this, many economic studies show that the impact of climate change on labour is one of the biggest reasons for overall economic loss from climate change. If temperature shocks are not managed with proper cooling facilities, shade, rest systems, and safety measures, they can reduce total economic activity and slow economic growth. This problem is more serious in low-income and middle-income countries, where protective infrastructure is often limited. As a result, climate change can also increase inequality and poverty among working populations, especially among outdoor and manual workers like agricultural labourers.

Climate change also affects rainfall patterns. Sometimes rains come late, sometimes too early, or sometimes very heavily in a short time. This disturbs the crop cycle and farm planning. When crops fail due to drought or flood, farmers need fewer workers, and labourers lose job opportunities and income. In some cases, sudden weather changes create urgent labour demand for a short time, which increases pressure and uncertainty for workers.

Another important effect is on income and livelihood security. Agricultural labourers, especially small and marginal workers, often depend on seasonal farm jobs. If the season becomes uncertain due to climate change, their earnings also become uncertain. Many labourers may be forced to migrate to other places in search of work. Women labourers and migrant workers are often more affected because they have fewer resources and less protection.

Climate change is also changing the way farming is done. Some farmers are shifting crop types, changing sowing dates, or using machines to reduce risk. Mechanization can reduce manual labour demand in some operations, while new practices like water conservation and soil improvement may create different types of work. So, climate change does not only reduce labour demand — it also changes the type and timing of labour needed.

Because of all these reasons, it is important to understand how climate change affects agricultural labour. Proper planning, safe working conditions, flexible work hours, skill training, and support programs can help protect labourers. This chapter explains how climate change is linked to agricultural labourers, the problems faced by agricultural labourers, and what steps can be taken to reduce risk and improve their livelihoods.

1. Agricultural labour

People who mainly work in farming activities, like plowing land, growing crops, working with fruits and vegetables, raising animals, keeping poultry, fishing, and all related agricultural activities, are considered agricultural labourers. Similarly, people who don't own land and work on others' land are also called agricultural labourers.

1.1. Types of Agricultural Labourers

The agricultural labourers are mainly divided into three types: family labourers, hired labourers and bonded labourers.

1.2. Family Labourer

People who own small farms and don't have enough money to pay workers are called family labourers. These people don't hire labourers, but instead use their own family members for farming tasks like transplanting, weeding, and harvesting. For heavy tasks, they may hire workers for a short time to finish the job on time.

1.3. Hired Labourer

Hired labourers work for a specific time or work for the same employer for a long period. Once the job is done, they move to other employers for new work. They are paid daily, weekly, monthly, quarterly, half-yearly, or yearly.

1.4. Bonded Labourer

The special class in the agricultural labours are called the bonded labourers. The bonded labourers are at the bottom of the agricultural ladder in India. A person or his whole family will make a pledge to the employer to do all the works in order to compensate against the loan. A person who is receiving a loan from the landlord will and if they are unable to repay the loan will become a bonded labourer till the loan gets finally settled.

2. Structure of Agricultural Labor Systems

Agricultural labor systems explain how farm work is organized and carried out by agricultural labourers in agriculture. In many areas, especially in developing countries, farming still depends heavily on human labor along with small machines. Agricultural laborers help in every stage of crop production. Most agricultural activities are time-sensitive and need to be performed at the right time, which makes the availability of labourers even more crucial.

2.1. Types of works in Agriculture & Allied activities

Agricultural labourers perform many various activities during the crop season. These jobs change according to the stage of the crop. In General farm activities include:

- Land preparation and tillage
- Sowing seeds and transplanting plants
- Irrigation and fertilizer application
- Weeding and interculture operations

- Harvesting crops
- Cleaning, grading, and storing produce after harvest

2.2. Level of Mechanization

Small and marginal farms usually depend more on manual labor. Bigger farms may use more machines but still need workers for many operations. Farm activities are using different levels of tools and machines:

- Some work is fully manual (done by hand tools (Kurpi), *e.g.*, weeding, etc.)
- Some is semi-mechanized (small machines and equipment)
- A few operations are fully mechanized (tractors, harvesters, etc.)

2.3. Employment Pattern

Agricultural labour jobs are not regular throughout the year. Because of this, agricultural labourers may not get steady income every month. Their main features are:

- Mostly seasonal work.
- More work during peak season sowing and harvesting time.
- Fewer work in the off-season.
- Daily wage or task-based payment.

2.4. Hiring and Work Arrangements

In mostly places in rural India, agricultural labourers are hired through simple and informal methods. For example:

- Verbal agreements instead of written contracts.
- Short-term or daily hiring.
- Family members also work on farms.
- Migrant laborers come during peak seasons.

3. Vulnerability in Agricultural Labour Systems

Agricultural labour systems are considered vulnerable because workers face many risks and have limited protection. So, any weather change directly affects their work and health.

3.1. Direct Exposure to Weather

Agricultural labourers mostly work outdoors. They face:

- High heat
- Cold weather
- Rain and storms
- Humidity and strong sunlight

3.2. Heavy Physical Work

Most farm activities need strong physical effort. This becomes worse during heat waves and extreme weather. so, long hours of hard work can cause are:

- Tiredness
- Dehydration
- Body stress
- Health problems

3.3. Limited Safety Measures

Safety facilities are often poor in farm activities areas; this increases the risk of accidents and illness.

- Less protective equipment
- Limited shade and rest places
- Inadequate drinking water
- Limited medical support

3.4. Low Income and Savings

Because of this, when climate shocks like drought, flood, or extreme heat happen, agricultural labourers quickly face financial and livelihood problems. Most agricultural labourers have:

- Low wages
- Irregular income
- Very little savings
- Limited social security

4. Climate Change Stressors Relevant to Agricultural Labourers

These factors influence labour need, safety, and efficiency. Major climate drivers affecting agricultural labour include:

4.1. Rising Temperature

- Higher mean temperatures
- Increased heatwave frequency

4.2. Rainfall Variability

- Delayed monsoon onset
- Short intense rainfall spells
- Longer dry periods

4.3. Extreme Events

- Droughts
- Floods
- Storms and cyclones
- Unseasonal rainfall and hail

4.4. Ecological Shifts

- Expanded pest and disease ranges
- Changes in weed flora
- Increased pesticide application frequency

5. Direct Occupational Impacts on Agricultural Labour

Climate change has a direct effect on the daily working conditions of agricultural labourers. Since most farm activities are done outdoors, agricultural labourers feel the impact of rising temperature and changing weather immediately.

5.1. Heat Stress and Work Capacity

Heat exposure is the most immediate risk. Agricultural labourers often operate under direct sunlight during peak temperature hours. Scientific studies show that labour productivity declines sharply beyond safe heat index thresholds, forcing shorter work shifts and altered schedules. Impacts include:

- Reduced physical work capacity
- Faster exhaustion
- Increased rest requirements
- Lower daily work output
- Greater accident probability

5.2. Health and Safety Risks

Agricultural labourers in informal systems often lack protective equipment and medical coverage, increasing vulnerability. Climate change intensifies occupational health threats:

- Heat stroke and dehydration
- Kidney stress from chronic heat exposure
- Skin damage from UV radiation
- Respiratory problems from dust and wildfire smoke
- Vector-borne diseases in warmer climates
- Higher pesticide exposure due to increased spraying cycles

6. Impacts on Labour Demand and Employment Patterns

Climate change not only affects how agricultural labourers work, but also how much work is available to them. Changes in temperature, rainfall, and extreme weather events disturb crop production. When crop production becomes uncertain, labour demand and employment patterns also become unstable. Two major areas where this effect is clearly seen are crop yield instability and changes in cropping patterns.

6.1. Crop Yield Instability

Irregular rainfall, droughts, floods, and heat waves — causes strong fluctuations in crop yield. In bad seasons, crops may partially or fully fail. When farmers face yield loss, their income reduces, and they are forced to cut labour costs. This directly affects agricultural labourers in several ways:

- Farmers reduce hiring of labourers
- Total number of workdays becomes lower
- Wages may fall during distress seasons
- Labour demand becomes irregular and unpredictable

6.2. Cropping Pattern Changes

These shifts often reduce labour-intensive operations such as transplanting and manual weeding, lowering labour demand. Farmers adapt by shifting to:

- Short-duration crops
- Drought-tolerant varieties
- Less water-intensive crops
- Reduced acreage cultivation

6.3. Mechanization Response

While mechanization improves timeliness, it may displace unskilled labour while increasing demand for skilled machine operators. Climate uncertainty and labour shortages accelerate mechanization:

- Mechanical planters
- Combine harvesters
- Power weeders
- Automated irrigation

7. Income, Wages, and Livelihood Security

Climate change has a strong effect on the income and livelihood security of agricultural labourers. Among all landless labourers are the most vulnerable because they do not own land and depend completely on daily or seasonal wages for their survival. When climate shocks such as droughts, floods, or heat waves damage crops, farmers earn less and reduce labour hiring. As a result, labourers lose both work opportunities and income. When such shocks happen repeatedly, many labour households are forced to take loans for basic needs. In difficult times, they may even sell their small assets such as livestock, tools, or household items to manage expenses. This weakens their long-term financial stability.

Climate change creates income instability for agricultural labourers through several pathways:

- Crop loss that reduces farmers' ability to pay wages
- Employment gaps between agricultural seasons
- Wage fluctuation depending on crop success or failure
- Delays in wage payments during distress periods
- Rising input costs that push farmers to cut labour expenses

8. Migration and Demographic Shifts

Climate change is also changing where and how agricultural labourers live and work. When farming becomes risky due to drought, flood, heat, or repeated crop loss, local job opportunities decrease. Because of this, many workers move to other places in search of income. These movements create changes in labour mobility and rural population structure. The main patterns include seasonal migration, permanent migration, and feminization of agricultural labourers.

8.1. Seasonal Migration-when climate problems reduce local farm work; labourers move temporarily to other areas for short-term jobs. They usually return after the season. This type of migration is increasing due to irregular rainfall and crop failure.

8.2. Permanent Migration-Repeated climate shocks and crop losses push some labour families to leave villages permanently and shift to cities. They often take up informal jobs like construction or small services, and slowly move out of agriculture.

8.3. Feminization of agricultural labourers- When men migrate for work, women stay back and take on more farm duties. Their workload increases, but their wages and decision-making power often do not increase equally.

9. Strategies for Protecting Agricultural labourers

Climate change risks for agricultural labourers can be reduced through practical adaptation steps at the workplace, skill level, farming system, and policy level. These strategies help protect worker health, income, and employment stability.

9.1. Workplace Adaptation

Workplace adaptation means making simple changes to the work environment in the field to protect workers from heat and weather-related problems. Working hours can be shifted to the cooler parts of the day, such as early morning or late evening, to avoid extreme heat. Providing shade and rest areas in fields allows workers to take breaks and cool down. Clean drinking water should be available to prevent dehydration. Basic heat safety guidelines and awareness help workers know when to rest and how to avoid heat-related illnesses.

9.2. Skills Development

Skills development means providing agricultural workers with the right training to work more effectively in changing climate conditions. Workers can be trained in using farming machinery and tools. They can learn climate-smart

farming techniques that conserve water and protect crops. Training in improved irrigation methods helps with efficient water use. Learning integrated pest management helps control pests with less chemical exposure and safer methods.

9.3. Farming System Adaptation

Farming system adaptation means changing farming practices to reduce climate risks and make work opportunities more stable. Growing diverse crops instead of just one reduces risk and provides a wider range of work. Agroforestry, where trees and crops are grown together, provides additional income and support. Soil moisture conservation techniques help crops survive during periods of drought. Adjusting crop calendars to new weather patterns helps farmers and workers plan their work more securely.

9.4. Institutional and Policy Measures

Institutional and policy measures mean support from the government and organizations to protect agricultural workers. Rural employment guarantee programs provide minimum job security when agricultural work is scarce. Weather-based insurance helps mitigate income losses after climate-related damage. Heat action plans inform people about how to stay safe during heat waves. Labor protection regulations improve working conditions. Climate advisories and weather warning services help farmers and laborers plan their activities in advance.

10. Conclusion:

Climate change is seriously affecting agricultural labourers because their work is fully dependent on weather conditions. Rising temperatures, heat waves, irregular rainfall, droughts, and floods reduce safe working hours and lower work capacity. Health risks, accidents, and productivity loss are increasing. Climate stress also causes crop failures and unstable yields, which reduce labour demand, create employment gaps, and lead to wage fluctuation and income insecurity – especially for landless labourers.

These changes are also increasing seasonal and permanent migration from rural areas and shifting overall labour patterns. To reduce these risks, practical steps are needed such as better work timing, shade and drinking water facilities, safety awareness, skill training, climate-smart farming practices, crop diversification, insurance support, and rural employment programs. Protecting agricultural labourers is essential for secure livelihoods as well as stable agricultural production in the future.

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