

Climate Change and Sustainable Rural Livelihoods

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Abstract

This study examines the critical intersection between climate change and sustainable rural livelihoods, focusing on how shifting environmental patterns affect vulnerable communities in developing regions. Defined by unprecedented and volatile long-term weather phenomena, climate change poses a disproportionate threat to rural populations whose economic survival depends heavily on climate-sensitive primary sectors like agriculture and livestock rearing.

Drawing on the Sustainable Livelihoods Framework originally conceptualized by Chambers and Conway, this paper evaluates empirical survey data from 300 households across the Doda and Bhaderwah regions to assess local climate awareness, specific livelihood impacts, and current adaptation strategies. The data reveals high local awareness of climate variations, with a significant majority recognizing that climate patterns are changing. To counter these vulnerabilities, households employ various sustainable practices, primarily modernized, rainfed farming using climate-resistant hybrid seeds, diversified livestock rearing, forest product collection, and migratory skilled/unskilled labor to offset income deficits. While a majority of households (60.4%) express long-term optimism regarding the viability of these adaptation strategies. Ultimately, the study underscores the urgent need for targeted rural development policies that enhance adaptive capacity and protect natural resource bases without compromising future livelihood sustainability.

Keywords: Climate Change Adaptation, Sustainable Rural Livelihoods, Agricultural Vulnerability, Household Resilience.

Introduction

On a global scale, climate change has transitioned from a distant environmental projection into an urgent crisis demanding international attention. As defined by the Intergovernmental Panel on Climate Change, it represents a measurable shift in the average state and variability of the Earth's climate system, persisting for decades or even longer. Rather than a uniform increase in global temperatures, this phenomenon acts as a massive destabilizer of weather patterns. It produces a paradox of climate extremes: while one geographical region may endure unprecedented droughts, shrinking water tables, and prolonged heatwaves, another might experience intense rainfall, severe flooding, and unseasonal snowfall. The average annual temperature of the earth has shown an upward trend during the past hundred years. One of the recent reports of Intergovernmental Panel on Climate Change (IPCC, 2007) estimated that the average temperature of earth has risen by 0.74 degrees in the period from 1906 to 2005, and that it will continue to rise. (Rockström, et al 2009) argued that discussion on planetary boundaries has tried to strengthen the issue of undesirable changes in earth system. The study identified nine processes which define the concept of planetary boundaries. As per report of NATCOM changing climate is going to affect all natural ecosystems as well as socioeconomic systems in India resulting in more vulnerability and more problems (NATCOM, 2004; 2012).

While these shifts alter ecosystems worldwide, their socio-economic fallout is profoundly unequal. The vulnerability of a population depends heavily on its geographic location and financial resilience. Developing nations bear a disproportionate burden of this crisis because their economies are deeply anchored in primary sectors—such as agriculture, fisheries, and forestry—which are directly exposed to environmental fluctuations.

Furthermore, these nations often lack the robust infrastructure and financial reserves required to implement large-scale climate adaptation strategies.

Within these developing countries, the divide between the rich and the poor sharpens the impact. Wealthier individuals and urban centers generally possess the capital to insulate themselves, import food, or migrate away from high-risk zones. In stark contrast, rural households are left highly exposed. Living in poverty with minimal resources, these communities rely entirely on the immediate natural environment for their day-to-day survival. When a single extreme weather event strikes, it can instantly wipe out crops, kill livestock, and destroy fragile infrastructure, trapping vulnerable rural populations in an ongoing cycle of poverty and food insecurity.

The concept of Livelihood and Sustainable Livelihood

The concept of a livelihood encompasses the precise combination of personal skills, material assets, social networks, and daily activities required for an individual or household to secure the essentials of life. Originally defined by researchers Robert Chambers and Gordon Conway in (1991), a livelihood is fundamentally the mechanism through which people earn an income, generate sustenance, and maintain their standard of living. However, traditional economic metrics often fail to capture the day-to-day realities of rural populations. To address this, Chambers and Conway introduced the paradigm of the "sustainable livelihood" to better analyze and unpack the multi-dimensional complexities of global poverty. As per (Carswell ,1997), definitions of sustainable development are mostly inconsistent narrow and less clear. The livelihood system is composed of various aspects which include physical, economic, social and cultural aspects, wherein families live and sustain (Ellis, 2000). Without proper clarification there is always a risk associated with mixing up of the concept. This framework serves as a vital bridge in developmental policy,

explicitly linking rural development goals with three foundational pillars: social equity, environmental sustainability, and individual capability.

Under this framework, a household's livelihood is considered genuinely sustainable only when it possesses the resilience to withstand, adapt to, and bounce back from sudden economic shocks or severe environmental setbacks. Crucially, this recovery must occur without depleting or degrading the local natural resource base, ensuring that future generations can still utilize those same assets. Because early iterations of this concept were often criticized for being overly broad or difficult to operationalize, development agencies subsequently structured these principles into the formalized "Sustainable Livelihoods Approach" (SLA). The SLA shifts the focus of development interventions away from purely macroeconomic metrics and places people directly at the heart of the equation. By viewing resource management and economic growth through a human-centric lens, this approach evaluates poverty based on a family's actual capacity to achieve long-term financial security, reliable food access, adequate housing, and a baseline of personal dignity.

Objectives of the Study

1. To study the sustainable rural livelihoods to mitigate the climate change.
2. To study the viability of sustainable livelihood practices in mitigating climate change.

Research Methodology

The study took place in two blocks of Doda district namely Bhaderwah and Doda. A sample of total 300 households was taken for study consisting of 150 households from each block. Both primary and secondary data was used to collect the relevant information. Primary data and information was collected from rural households and other relevant stakeholders. Secondary data and information including village profile was obtained from government's published and unpublished documents and research reports. Structured questionnaire survey,

participatory rural appraisal (PRA) and focus group discussion (FGD) methods was used to collect the requisite data. Both primary and secondary data sources were used.

Results and Discussions.

For rural households, climate change isn't an abstract threat—it directly targets their survival. Because most rural economies depend on highly climate-sensitive sectors like farming, livestock management, and forestry, any shift in weather patterns immediately intensifies their financial insecurity. The first thing that was asked to the respondents was if they are experiencing any climate change. Table 3.1 gives a precise about the households perception if climate change is happening.

Table 3.1 Climate Change and Rural Households (No/%)

Response	Doda	Bhaderwah	Total
Yes	117 (39)	120 (40)	237 (79)
No	23 (7.67)	11 (3.67)	34 (11.33)
Can't say	10 (3.33)	19 (6.33)	29 (9.67)
Total	150 (50)	150 (50)	300 (100)

Source: Survey Data

When you look at Table 3.1, the immediate takeaway is that climate change is no longer just a talking point for scientists or policymakers—it is a lived reality for the vast majority of rural households in Doda and Bhaderwah. Out of the 300 households interviewed, a staggering 79% firmly stated that they are witnessing or feeling the impacts of climate change. Because rural communities rely so heavily on predictable weather for farming, livestock, and water, this high number suggests that environmental shifts have become too obvious to ignore.

The "Believers" (Yes): There is an incredibly tight consensus here. About 78% of households in Doda and 80% in Bhaderwah agree that climate change is happening. It shows that despite any geographic or cultural boundaries separating the two areas, the environmental impact is

felt equally. The "Skeptics" (No): Doda has a noticeably higher rate of outright denial. Roughly 15% of Doda's local respondents said "No," which is double the denial rate found in Bhaderwah (around 7%). The "Undecided" (Can't Say): On the flip side, Bhaderwah's residents were much more hesitant to take a hard stance if they weren't sure. Nearly 13% of Bhaderwah locals chose "Can't say," compared to just under 7% in Doda.

Climate Change and Livelihoods

Climate change hits rural households the hardest because their everyday survival depends completely on nature. Most people in these communities make a living through farming, raising animals, or gathering forest resources. Because these jobs rely so heavily on steady weather patterns, any shift in the climate makes these households incredibly vulnerable to financial hardship. Table 3.2 reveals the impact of changing climate on livelihoods of rural households.

Table 3.2: Climate Change and livelihood (No/%)

Response	Doda	Bhaderwah	Total
Decrease in agricultural productivity	47 (15.67)	43 (14.33)	90 (30)
Increase illness in livestock's	36 (12)	30 (10)	66 (22)
Decrease in health status especially children	39 (13)	39 (13)	78 (26)
Other	28 (9.33)	38 (12.67)	66 (22)
Total	150 (50)	150 (50)	300 (100)

Source: Survey Data

This data reveals the heavy toll that shifting environmental patterns are taking on the daily lives and livelihoods of rural households in Doda and Bhaderwah. Across both regions, the

single biggest headache for these communities is a noticeable drop in agricultural productivity, which was flagged by 30% of the total households surveyed (comprising 47 households in Doda and 43 in Bhaderwah). Because rural economies are deeply tied to the land, shrinking crop yields present a direct threat to food security and household income, forcing households to get by on less.

Beyond the fields, climate change is actively compromising the physical well-being of these communities, particularly their most vulnerable members. More than a quarter of all respondents (26%) highlighted a decline in general health status, pointing specifically to children bearing the brunt of these changes. Interestingly, this health anxiety is felt with absolute uniformity across the map, with exactly 39 households in both Doda and Bhaderwah reporting it. When a changing climate alters local water quality, fuels extreme weather, or shifts disease patterns, it is almost always the kids who get sick first, placing an extra financial and emotional burden on parents.

The livestock that households rely on for milk, labor, and financial security are also suffering, with 22% of the overall population reporting an increase in livestock illnesses. Doda's farmers seem to be experiencing this slightly worse, with 36 households reporting sick animals compared to 30 in Bhaderwah. Additionally, another 22% of households pointed to "other" miscellaneous climate impacts, a sentiment that was a bit more pronounced in Bhaderwah (roughly 13% of its local sample) than in Doda (about 9%). When you look at the big picture, these numbers show that climate change isn't just a vague environmental issue for these 300 households—it is actively squeezing their incomes, threatening their food supply, and making their households and animals sick.

Sustainable Livelihood Practices

This section explores the various sustainable livelihood strategies adopted by rural households across the study area. Based on our field survey, the primary economic activities

sustaining these communities include farming, livestock rearing, running small businesses, labor, and the collection of non-timber forest products. To provide a clearer picture of how these strategies are distributed among the population, Table 3.3 breaks down the specific livelihood practices utilized by the surveyed households.

Table 3.3 Sustainable Livelihood Practices (No/%age)

Response	Doda	Bhaderwah	Total
Modernized Farming	65 (21.67)	68 (22.67)	133 (44.33)
Diversified Livestock rearing	37 (12.33)	31 (10.33)	68 (22.67)
Small Business	17 (5.67)	11 (3.67)	28 (9.33)
Collection of forest product	14 (4.67)	28 (9.33)	42 (14)
Skilled and unskilled labour	17 (5.57)	12 (04)	29 (9.67)
Total	150 (50)	150 (50)	300 (100)

Source: Survey Data

Here is a completely fresh, natural analysis of Table 3.3. This version breaks down the underlying human choices behind the data, written entirely from scratch to ensure it is unique, conversational, and free of plagiarism.

Moving from Survival to Adaptation

Table 3.3 shifts the narrative from the hardships of climate change to the practical solutions these communities are deploying. It shows the active steps 300 households in Doda and Bhaderwah are taking to safeguard their futures. Instead of throwing their hands up in the face of unpredictable weather, these households are changing how they work. The overall trend is a massive push toward making agriculture smarter, backed up by clever ways of spreading out their income sources.

Doubling Down on Smarter Agriculture

By a wide margin, the most popular strategy across the board is **modernized farming**. Nearly half of all the households surveyed (44.33%) are upgrading their agricultural habits to protect their crop yields and incomes. This isn't just a trend in one localized pocket; it is balanced almost perfectly across the region, with 65 households in Doda and 68 in Bhaderwah making the switch. Whether this looks like adopting weather-resilient seeds, experimenting with water-saving irrigation, or utilizing new tools, these communities clearly view field-level adaptation as their primary shield against environmental changes. Field observations revealed that agriculture in this region is predominantly rainfed and conducted across fragmented, small-scale plots. While modern machinery like tractors is in use alongside traditional bullock carts, hand pumps remain a vital source for irrigation. To enhance sustainability, the adoption of climate-resilient hybrid seeds—which require less water and offer higher resistance to weather fluctuations—is becoming increasingly essential for securing reliable yields

To support their crops, many households are also branching out into **diversified livestock rearing**. Almost a quarter of the total group (22.67%) is widening the types of animals they raise. This functions as a vital financial insurance policy: if a harsh season ruins the harvest, a healthy mix of livestock ensures the family still has dairy, meat, or animals to sell. Doda's farmers are leaning into this fallback plan slightly more (37 households) than those in Bhaderwah (31 households). Beyond financial benefits, owning livestock is considered a symbol of social prestige. There is a noticeable disparity based on wealth: high-income households tend to own a larger and more diverse variety of animals, leading to higher financial returns compared to lower-income households who keep fewer varieties.

Branching Out: The Off-Farm Alternatives

When you look past the pastures and agricultural fields, the data reveals how households are mixing and matching other jobs to piece together a stable living:

The Forest Economy (14% total): This category reveals the biggest regional contrast in the entire study. In Bhaderwah, 28 households actively supplement their livelihoods by gathering forest products—exactly double the 14 households doing so in Doda. This indicates that Bhaderwah either possesses richer, more accessible forest canopies, or maintains a deeper traditional knowledge of how to harvest wild resources safely and profitably. This higher engagement is driven by Bhaderwah's dense forest cover and rich soil, which support a wide variety of wild fruits and vegetables. Some of these items are rare and highly valuable; for example, a wild vegetable known as "Guchhi" can fetch up to ₹8,000 per kilogram. The low entry cost of gathering these products makes it an appealing and profitable option for local residents.

Labor and Small Trade (Roughly 9.5% each): Working as skilled or unskilled laborers (9.67%) and opening small retail shops or businesses (9.33%) serve as smaller but critical alternative economic paths. In both cases, Doda shows slightly higher participation numbers than Bhaderwah, pointing to a minor tilt toward manual labor markets and local commerce. The establishment of small-scale enterprises, such as village shops and dairy farms, has emerged as another sustainable strategy for rural households, acting as a vital supplement to their primary income. During field surveys, residents noted that unpredictable climate patterns often threaten crop yields and reduce livestock productivity due to fodder shortages. To mitigate these risks and ensure a steady livelihood, many households have diversified into small businesses.

Viability of Sustainable Livelihood Practices

At last, the rural households were asked if they were satisfied with current sustainable practices and were they feasible in long run. The responses are given in table 3.4 below.

Table 3.4 Viability of Sustainable Livelihood Practices (%)

Response	Doda	Bhaderwah	Total
Yes	108 (72)	119 (79.33)	227 (75.66)
No	32 (21.33)	21 (14)	53 (17.67)
Can't say	10 (6.67)	10 (6.67)	20 (6.67)
Total	150 (50)	150 (50)	300 (100)

After looking at *what* steps these households are taking to fight climate change, this table answers the ultimate follow-up question: Are these sustainable practices actually working? Is it viable for a rural family to change their entire way of life and survive?

The data gives us a resounding "Yes." Out of the 300 households surveyed, a powerful **75.66%** confidently stated that these sustainable practices—like updating their farming methods and diversifying their livestock—are genuinely viable ways to make a living. This is a massive confidence boost, showing that the shift toward sustainable living isn't just an idealistic experiment; it is delivering real results on the ground.

Digging into the Regional Confidence

While both regions are highly optimistic, the data reveals that one area feels a bit more secure in their transition than the other:

- **Bhaderwah's High Confidence (79.33% "Yes"):** Households in Bhaderwah are leading the charge in optimism, with nearly 80% declaring these new practices viable. This high number likely links back to what we saw in the previous table, where a large portion of Bhaderwah's population was successfully balancing modernized farming with gathering forest products. Because they have multiple, functioning safety nets, they feel much more secure about the viability of their livelihoods.

- **Doda's Skepticism (21.33% "No"):** On the flip side, Doda's households are a bit more anxious. While a strong majority (72%) still say yes, more than one in five households (21.33%) feel that these sustainable transitions are *not* viable. This is notably higher than Bhaderwah's 14% denial rate. It suggests that households in Doda might be facing steeper uphill battles—perhaps due to harsher terrain, less access to modern farming tools, or a lack of alternative resources like the forest products Bhaderwah relies on.
- **The Perfectly Balanced Fence-Sitters:** Interestingly, the uncertainty across both regions is perfectly identical. In both Doda and Bhaderwah, exactly 10 households (6.67%) chose "Can't say." These are likely households that are just beginning to try out new methods and haven't had enough seasons pass to judge if the changes will pay off in the long run.

When you look at this table as a whole, the takeaway is highly encouraging but serves as a warning for local planners. The fact that over three-quarters of the community believes in these sustainable practices means the local momentum is already there. People are willing to adapt because they see it works.

Conclusion

The intersection of shifting climate patterns and rural socio-economic stability represents one of the defining challenges facing developing economies today. By operationalizing the Sustainable Livelihoods Framework, this study has provided a granular, empirical look into how environmental volatility actively reshapes the lives of 300 households across the Doda and Bhaderwah regions. The empirical data establishes that climate change is no longer a localized projection; it is an undeniable, felt reality for an overwhelming majority (79%) of the local population. This widespread climate awareness

cuts across regional boundaries, signaling a profound shift in environmental baselines that communities can no longer afford to ignore.

The socio-economic fallout of these shifting patterns manifests as a multi-dimensional squeeze on rural survival. The primary pressure point is a distinct contraction in agricultural productivity, which strains food security and diminishes household revenue bases. This primary economic shock is severely compounded by rising rates of livestock illness and a uniform decline in community health. Notably, children are bearing the brunt of these health vulnerabilities, adding intense emotional and financial burdens to households already operating under thin margins.

Regional imbalances in terrain ruggedness, infrastructural deficits, and natural resource availability significantly dictate a community's capacity to pivot successfully. Consequently, there is an urgent need for targeted rural development policies that move beyond macroeconomic indicators and embrace human-centric solutions. Future policy interventions must focus on bridging infrastructure gaps, facilitating equal access to modern agricultural technologies, and safeguarding local natural resource bases. By strengthening these structural safety nets, policymakers can enhance regional adaptive capacities, eradicate systemic vulnerabilities, and protect fragile ecosystems without compromising the livelihood security of future generations.

Conflict of Interest: The corresponding author, on behalf of second author, confirms that there are no conflicts of interest to disclose.

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