

IMPACT OF CLIMATE CHANGE ON AGRICULTURE AND LIVESTOCK: POLICY FEEDBACK FROM GRASS ROOTS

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ABSTRACT

Title of the research is "Impact of Climate Change on Agriculture and Livestock: Policy Feedback from Grass Roots". Locale of the research was Islamabad. The research objectives were to study the Impact of Climate Change on Agriculture and Livestock. Secondly, it aimed to explore appropriate measures for better use of Climate Change on Agriculture and Livestock. Thirdly, to study the problems and practices of stakeholders at grass root level and policy feedback from them. For the purpose of this study, a researcher used exploratory methodology and a qualitative method. Researcher collected data through the methods of interviews (interview guide), observations and focus group discussions (FGD guideline). This research contributes significantly to policy making and provides a valuable resources for individuals, policy makers and researchers seeking knowledge in agriculture and livestock production. It strengthens people's capacity in food production, environmental conservation and livestock management.

Keywords: Climate Change, Agriculture, Livestock, Policy, Feedback, Grass Root

1.INTRODUCTION

The term "climate" refers to the general or extended weather patterns in a region. Change' means an act or process through which something becomes different' (Schug & Berger, 2023).

Agriculture is the practice of preparing the soil for the growth of plants and animals. It includes preparing both plant and animal products for consumption by people and distributing them to markets'. (Gergely, 2023).

Art, discipline, or practice of cultivating the earth, making crops, and increasing cattle and in varying degrees the preparation and promotion of the subsequent products clean the land to practice it for purpose of Agriculture' (Ellwanger & Kaminski, 2023). 'Domesticated animals that are raised for meat or dairy production, typically on a farm or smallholding, include beef cattle, dairy cows, goats, sheep, pigs, chickens, and turkeys' (Dictionary, 2023).

Policy is the particular plan of action selected from a variety of possibilities and taking into account the circumstances at hand to lead and influence decisions taken in the present and the future. A detailed, high-level plan that contains the big goals and standard procedures, especially for a government organization' (Abdullayev & Nurmetova, 2008). 'The foundational position within a society or an organization, particularly when compared to more senior or centralized levels of authority' (Milder, 2023).

1.1 ANTHROPOLOGICAL BAGROUND

Agriculture and anthropology have a deep connection because agriculture played a crucial role in the development of human societies. Anthropologists study how farming shaped cultures, economies, and social structures. They explore how different agricultural practices emerged and evolved over time, impacting human settlement patterns and

lifestyles. Agriculture also influenced the rise of complex civilizations and the spread of ideas and technologies. By studying agriculture, anthropologists gain insights into how humans interact with their environments and how these interactions shape cultural diversity. Overall, agriculture is central to understanding the past, present, and future of human societies from an anthropological perspective' (Lewis & David, 2012). Livestock and anthropology are closely intertwined as livestock rearing has been a fundamental aspect of human societies for millennia. Anthropologists study how domestication of animals like cattle, sheep, and goats transformed human lifestyles, leading to settled communities and agricultural economies. Livestock also play vital roles in cultural practices, rituals, and social structures across diverse societies worldwide. By examining the relationships between humans and their livestock, anthropologists gain insights into the dynamics of food production, labor division, and resource management within various cultures' (Mullin & Molly, 2012).

1.2 STATEMENT OF THE PROBLEM

This study looks at how climate change affects Agriculture and Livestock. It also checks the rules and plans/ Policies made by the government are working. Climate change is causing problems like strange weather and more pests for farms and making it harder to grow certain crops and take care of animals. This research wants to know how regular people in farming areas feel about these policies and how they are using them. It wants to help make the rules better by understanding what people need and think in the places where they farm and raise animals.

1.3 OBJECTIVES

1. To Study the Impact of Climate Change on Agriculture and Livestock.
2. To Study Appropriate Measures for better use of Climate Change on Agriculture and Livestock.
3. To Study the problems and practices of Stakeholders at the Grass-Root level

2.REVIEW OF LITERATURE

The impacts of weather modification on livestock productivity will have a result on food security. Livestock output may be negatively impacted, especially in dry and semiarid locations by infections, accessibility of water, etc. The weather modification will also have an influence on the

nutritional value of cattle products, which are a significant source of, proteins, calories, and important micronutrients worldwide. However, rearing animals also have an impact on climate change' (Gerber, 2017).

The geographical distribution of livestock species is also subject to change as a consequence of climate change. Analyses by Thornton et al. (2019) suggest that shifting climatic conditions may force farmers to relocate their herds to higher elevations or more temperate regions in search of suitable grazing lands and climatic conditions. Such migrations can exacerbate land use conflicts, strain natural resources in receiving areas, and disrupt traditional pastoralist livelihoods, underscoring the complex socio-economic implications of climate-induced livestock mobility.

Policy interventions play a crucial role in facilitating climate-resilient livestock production systems. Studies by FAO (2017) underscore the need for supportive policies that promote sustainable land management, access to weather information and early warning systems, as well as investments in infrastructure for water harvesting and storage. Moreover, fostering multi-stakeholder partnerships and knowledge-sharing platforms can enhance adaptive capacity, facilitate technology transfer, and foster innovation within the livestock sector. While significant strides have been made in understanding the impacts of climate change on livestock production, considerable research gaps remain. Investigations into the synergistic effects of climate change with other stressors such as land degradation, land use change, and socio-economic dynamics are needed to develop holistic mitigation and adaptation strategies. Furthermore, longitudinal studies assessing the long-term resilience and socio-economic implications of climate-smart interventions are essential for informing evidence-based policy and practice in the face of an increasingly uncertain climate future.

The primary challenge facing organic farming is to make better use of the biophysical and human resources that are currently available. 'The usage of internal resources should be optimized, external inputs should be used sparingly, or both should be used at once. The wise and practical utilization of natural assets and the durability of any improvements are ensured when dependence on other systems is limited to an acceptable level. The utilization of various integrated pest, nutrient, agroforestry, soil,

and water management techniques is the aim of sustainable agriculture. Byproducts or waste from one area of a business are used as raw materials in another. Natural processes gradually take the place of external inputs, which has a lessening impact environment' (Pretty, Thompson, & Hinchcliff, 2022).

To overcome the difficulty brought on by climate change, long term adaptations relate to significant structural modifications. 'The farmer's reaction to the diverse crop responses to climate change leads to changes in land use. According to Parry for Central Europe "optimal land use" is a concept in which the region dedicated to grain is grown for wintertime, maize, and vegetables grew while the area devoted to the cultivation of spring wheat, barley, and potatoes dropped. Production can be stabilized by altering land allocation. Wheat and other crops with significant inter-annual variation may be replaced in this situation with crops that produce less yet greater consistent harvests' (Olesen & Bindi, 2002).

Information about the climate is crucial for tracking the effectiveness of initiatives to cut greenhouse gas emissions that cause climate 'change. In order to adapt to climate change and manage the dangers connected with it, WMO assists its members in monitoring the planet's climate on a worldwide basis. Encouraging initiatives to improve energy efficiency and make the switch to a carbon-neutral economy. Using important climate indicators and reporting on extreme occurrences and their effects, the report is prepared annually and offers an authoritative perspective on the present state of the climate' (Provisional State of the Global Climate, 2022).

3.MATERIALS AND METHODS

3.1 Locale

Islamabad is the capital of Pakistan. About 1.2 million people are living in the city of Islamabad. It is the tenth most populous city in the country and is controlled federally by the Pakistani government as part of the Islamabad Capital Territory. It took Rawalpindi's place as Pakistan's capital in the 1960s after being constructed as a planned city. The town is renowned for its good living standards, security, tidiness, and plenty of greenery' (Prentice & Anne, 1996). The researcher selected locale areas for research study first one was Pakistan Agriculture Research Center , Ministry of Climate Change and Livestock and Dairy Development Board which were located in G5 Islamabad and another locale was

Barakoh which is a commercial zone located at the southwest of Sector G-6, Islamabad, Pakistan.

3.2 DATA COLLECTION PROCESS

3.1.1 Sampling

Sampling is a process by which researchers select respondents from a huge population. Through sampling, the researcher studies characteristics of the whole population. "Sampling is the process or technique of selecting a representative part of a population" (Merraiam Webste, 2018). A researcher used quota sampling for research. Researcher selected 20 respondents for data collections. 8 respondents were those who were farmers and connected with agriculture, 8 respondents were livestock holders and 4 respondents were from different organizations.

3.1.2 Methodology

The methodology is a general research strategy in which the researcher outlines the way in which research is to be undertaken. In methodology, the researcher identified the method to be used throughout the research. It may be an art of study. 'Analysis of the guiding principles or practices of an area of investigation is known as methodology' (Gravetter & Friedrick, 2018, & Neuman, 2007). Researcher used exploratory methodology for the study because it helped researchers uncover the important factors and reasons behind how climate change affects agriculture and livestock policies at the grassroots level.

3.1.3:Method

Research method is used by the researcher to conduct research. It is very helpful to know about the facts of society. "A method is an automatic system that is defined as a part of a class and included in any purpose of that class" (Rouse & William, 2005). Researcher used Qualitative Method for the Study because it allows for a comprehensive assessment of the issue. Qualitative methods, such as observations, interviews and focus group discussions with grassroots stakeholders, offer essential insights into the lived experiences, challenges, and perspectives of those directly affected. Qualitative data ensured a stronger and better understanding of the problem, which is vital for formulating effective policies that address the needs and concerns of local communities.

3.1.4:Observation

A researcher used Observation because to assess the Impact of Climate Change on Agriculture and Livestock, observation is crucial to directly record changes in weather patterns, crop yields, and animal behavior, providing real-time data for studying climate-induced effects. For studying Production Practices in Agriculture and Livestock, observation helps researchers gain firsthand insights into operational techniques, workflow, and decision-making processes, offering a comprehensive understanding of production methods. To analyze Appropriate Measures for better utilization of Climate Change in Agriculture and Livestock, observation informs researchers about current practices' effectiveness and identifies opportunities for adaptation and sustainable strategies through on-the-ground assessment.

3.1.5 Interview

An interview is a directed interaction in which a clinician, employer, researcher or other interviewer generates specific information from an individual for a researcher or any other purpose" (Nugent & Pam, 2013). Researcher used Interview method because Interviews were suitable for one of the study 'researcher used this method because it allows researchers to gather insights and perspectives from stakeholders, such as farmers and experts, regarding potential measures and strategies to adapt to climate change in agriculture and livestock. Interviews facilitate in-depth discussions and the collection of qualitative data, which can provide valuable input for identifying and recommending appropriate measures. A researcher conducted interviews from 20 respondents.

3.1.6 Focus group Discussion

Focus group discussion is a method which is used in qualitative research. In focus group discussion there should be 6/to eight participants. A researcher uses this method to collect data from a selective group which select from a huge population' (Wilson & Darik, 2018). A researcher conducted focus group discussion therefor 6 participants were participated and a researcher collected data from them.

3.1.7 Tools

Tools were the one most important thing in research using these tools researcher precedes their research in the best way. Researcher used tools during research which were an observatory checklist, an in-

depth interview guide.

3.1.8 In-depth Interview Guide

An in-depth interview is a qualitative data-collecting method. The in-depth interview Guide is a process through which the researcher collects data about the attitude, behavior, and perception. "In-depth interview guide is a list of proper questions relevant to the researcher topic. In-depth interviewing is a qualitative research technique that involves conducting intensive individual interviews" (Carolyn, 2016). Case Study Checklist Case study checklist is a list of questions made by a researcher to briefly know about the respondent. "According to the checklist researcher ask questions to respondents about the specific matter" (Robert & Heald, 20117).

3.1.9 Observatory Checklist

An observatory checklist is a list of questions that an observer or researcher looking to answer when they doing a specific observation. The Observatory checklist was a list of questions, during research observant absorbs according to the observatory checklist. Through this method, researchers collect data' (Newhall & Christopher, 2021).

3.1.10 Key Informant

A key informant is a local person in the field where the researcher conducts research. Key informant is 'a methodology to obtain information about the need and utilization pattern of the target population from a people who know about the community issue and have full knowledge about community' (Hajj & Tryfona, 2009). Raja Hidayat Shah and Irfan Ali were key informants of the study.

3.1.11 Research Design

According to the demand and nature of the study, anthropologists use a variety of methods during research. Methods are different for qualitative and quantitative research. The current research was qualitative. So researcher used a qualitative method because of the feasibility and nature of the research topic. Therefore In-depth interview methods applied.

3.1.12 Data Source

Both Primary and Secondary data will use to collect data. The researcher will collect primary data through interviews, Socio-economic surveys, Systematic observation, and case studies. While secondary data through literature review.

Flow Chart of Methodology and Methods

Methodology		Methods	Tools	Instruments	Data Type	Data Representation Thematic/ Software
Exploratory	Qualitative Method	Observation	Participant as complete observer	Observation schedule	Qualitative	Thematic analysis
		Interviews	In depth interview	Interview guide checklist	Qualitative	Thematic analysis
		Focus Group Discussions(FDGs)		Focus group discussion guideline	Qualitative	Thematic analysis

RESULTS AND DISCUSSION

4.1 IMPACT OF CLIMATE CHANGE ON AGRICULTURE

4.1.1 Climate Change Affected Agricultural Productivity



Figure 4.1 Picture of Agriculture land

According to Pakistan Agriculture Research Center (PARC) research in Islamabad, climate change significantly affected wheat production in Pakistan. Changes in weather, like irregular rainfall and temperature shifts, made wheat grow less and made the wheat not as good. Sometimes, there were big problems like droughts or floods that hurt the wheat, making less wheat and not good wheat. Also, temperature changes messed up when to plant and harvest wheat.

4.1.2 ADAPTATION STRATEGIES

PARC suggested a policy to deal with the effects of climate change on growing wheat in Pakistan. The

Pakistan Agricultural Research Council (PARC) recognizes the unique agricultural challenges faced by farmers in regions with limited rainfall, such as Barakaho, Islamabad. To address these challenges, PARC recommended the cultivation of drought resistant wheat varieties that require less water, ensuring sustainable agricultural practices and improved crop yields. They also recommended that farmers can change the way of cultivation in their land and try out different crops alongside wheat. This could make the soil healthier and help it hold onto more water, which is important when there's less rain.

Additionally, PARC talked about managing water in a better way is crucial. They suggested innovative way of collecting rainwater and use a up to date methods to cultivate the wheat fields, like efficient

irrigation systems. This way, farmers could make sure they could improve irrigation system, especially during dry times, to help their wheat crops grow better despite the challenges of climate change.

4.1.3 WHEAT FARMING PRACTICES



Figure 4.2 picture of wheat production
PARC suggested that farmers can change the way they grow wheat due to changing weather. The Pakistan Agricultural Research Council (PARC) has suggested that farmers adapt their wheat growing practices in response to changing weather conditions. PARC recommended that farmers plant wheat seeds at the optimal time when temperatures are neither too hot nor too dry to ensure better growth and yield. Additionally, incorporate natural soil amendments, such as organic matter, to enhance the soil's ability to retain moisture. This helps the wheat withstand dry periods more effectively.

Furthermore, PARC advised farmers to practice crop diversification by planting different crops alongside wheat and growing trees on their land. This strategy can provide alternative sources of income and help protect their crops from adverse weather conditions caused by climate change.

Due to climate change farmers face economic crisis such as it effects crops productivity and livestock. it results increase in production costs, higher expenses for irrigation and pest control directly contributed to financial strain on farmers.

4.1.4 CHALLENGES POSED BY CLIMATE CHANGE TO WHEAT PRODUCTION

According to PARC's findings, research and innovative methods played a crucial role in dealing the challenges led by climate change to wheat production. There is a need to continued investment in agricultural research, essential for developing new wheat varieties that were climate resilient, such as heat and drought tolerance. Furthermore, use of innovation in agricultural technologies helped

farmers to gain better result in regards to crops production more effectively, by using optimal use of resource and minimizing environmental impact.

4.1.5 CLIMATE CHANGE IMPACTED FOOD SECURITY



Figure 4.3 Picture of Grass

Climate change posed threats for food security in Islamabad by reducing agricultural productivity and increasing food prices. Climate change results into high risk of food security particularly, for vulnerable populations, such as smallholder farmers and low income households.

4.1.6 COLLABORATE WITH FARMERS AND OTHER STAKEHOLDERS

PARC in collaboration with farmers and relevant stakeholders to implement climate-resilient agricultural practices in wheat cultivation through various programs. This includes organizing training workshops and field demonstrations for the capacity building of farmers to adopt climate-smart agricultural techniques and best climate friendly practices. Additionally, PARC is working with agricultural extension services including farming support services and local government agencies to decentralize information and help farmers in adopting sustainable farming methods. Through knowledge-sharing and collaboration among stakeholders, PARC aimed to enhance wheat production method during climate changing regime.

4.1.7 IMPACT OF CLIMATE CHANGE ON LIVESTOCK



Figure 4.4 Picture of livestock

The Ministry of Climate Change in Islamabad conducted detailed evaluation to know the effects of climate change on livestock. Through scientific research and data analysis, they observed changes in weather patterns, including temperature fluctuation, precipitation, and extreme weather events. These changes directly impacted the health, well-being, and productivity of livestock, resulting in economic losses for farmers and affecting food security in the region.

4.1.8 CLIMATE CHANGE AFFECT DAIRY MILK PRODUCTION



Figure 4.4 Pictures of Cattle

The Ministry of Climate Change in Islamabad find out that there are several ways in which change in climate pattern affected dairy milk production. Global warming and heat waves caused heat stress in dairy cows, leading to reduced milk production. It also changes in precipitation pattern negatively affect the availability of water and quality of grazing land for dairy cattle, thus, reduce their overall health and milk yield. Extreme weather situations like floods or droughts further make worsen these challenges, result into significant reduction in dairy milk production.

4.1.8 SPECIFIC FINDINGS OF THE MINISTRY OF CLIMATE CHANGE

The Ministry of Climate Change in Islamabad established a result that changes in climate pattern had significant implications for dairy milk production. They observed that high temperature stress in dairy cows during periods of extreme weather conditions led to health problems in animals, thus, lead reduced milk production. These changes in weather conditions, such as irregular rainfall or prolonged droughts, affected the availability and quality of food for dairy cattle, further impacting milk yield. Moreover, extreme weather events like storms or floods damaged dairy infrastructure and disrupted milk supply chains, further result into economic crisis for dairy farmers.

4.1.9 COLLABORATE WITH DAIRY FARMERS AND OTHER STAKEHOLDERS

The Ministry of Climate Change in Islamabad in cooperation with dairy farmers and other stakeholders to implement climate-resilient practices in dairy milk production through various consultation events and programs. Further, they organized training workshops, provided technical assistance, and disseminated information on heat stress management, water conservation, and food cultivation techniques. Additionally, the Ministry closely collaborated with dairy industry associations and research institutions to support and promote the adoption of sustainable dairy farming practices and encourage knowledge-sharing among stakeholders. Through these systematic efforts, the ministry aimed to enhance the resilience of dairy milk production systems to climate.

Summary

In Barakahu, Islamabad, climate change has profoundly affected agriculture and livestock, particularly wheat production and dairy milk production. Global warming and change in weather patterns, including irregular rainfall and temperature shifts, have significantly decreased crop yields and compromised crop quality, results economic losses for farmers. These adaptation strategies recommended by PARC involved cultivating drought-resistant wheat varieties, improving soil health through sustainable farming practices, and improving water management techniques. Similarly, climate change has negatively affected dairy milk

production, through rising temperatures causing heat stress in cows, thereby reducing milk yields. These challenges underscore the urgent need for collective efforts between farmers, stakeholders, and government agencies to implement climate-resilient agricultural practices and maintain food security during changing environmental conditions in the region.

Conclusion

In conclusion, climate change affects Barakahu, Islamabad, thus, has significantly harmed agriculture and livestock. Farmers faced lower crop yields and poorer quality due to unpredictable weather, while dairy farmers struggled with reduced milk production from heat stress in cows and buffalos. It's crucial to adopt advance farming practices and collaborate closely to mitigate these impacts and safeguard food production in the face of ongoing climate challenges

Recommendation

Followings are the key recommendations after studying climate change impact on agriculture and livestock, Firstly there is a significant demand to sustained investment in research and to inventions to improve climate resilient farming practices and drought resistance crop. Secondly, policy makers from government and non-governmental organizations (NGOs) should collaborate with international organizations to improve agriculture and livestock farming. This partnership is essential for advancing sustainable agriculture and enhancing crop and livestock resilience to climate change and ensuring food security. By working together with these stakeholders influence global expertise resources and innovative solutions to addresses the challenges faced by farmers and promote long term agricultural sustainability.

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