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A Review on Coping Strategies to Current Climate Change Effects on Agricultural Sector of Afghanistan

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ABSTRACT

Afghanistan, characterized by an extremely arid and semi-arid climate, stands as one of the world's sixth most climate-vulnerable countries. A staggering 36% of the Afghan population lives below the poverty line, with approximately 80% engaged in the agriculture and livestock sector. Over the years, the average annual temperature in Afghanistan has surged by approximately 1.8 degrees Celsius, accompanied by a decrease in average annual precipitation. Looking ahead, climate projections paint a worrisome picture, with an anticipated 6–7 Degree Celsius increase in the average temperature over Afghanistan by 2100. This high dependence on agriculture and low economy, renders Afghanistan exceptionally susceptible to the current and anticipated impacts of climate change. In response to these challenges, adaptation to climate change emerges as an immediate and critical priority. Recognizing the urgency of the situation, a comprehensive program is slated to be designed and implemented, particular focus on the vulnerable agriculture sector.

Keywords: Climate Change, Coping Strategies, Afghanistan

INTRODUCTION

Climate change, attributed to human activities, has resulted in significant global impacts, with nearly 2 million deaths and economic losses of US$ 2.4 trillion reported from 1970 to 2012 due to extreme events (COP21-CMP11, 2015). The global temperature has risen by 0.85 °C between 1880 and 2012 (IPCC, 2014). Afghanistan, identified as the sixth most climate-vulnerable country globally, has experienced a substantial increase in mean annual temperature by 1.8°C from 1950 to 2010. Predictions indicate the likelihood of extreme warming, reaching 2–3°C by 2050 and up to 7°C by 2100 (WFP, NEPA & UNEP 2016; Akhundzadah et al., 2020). The country faces multiple challenges, with 36% of the population living below the poverty line, and rural areas being particularly vulnerable due to the combined impact of droughts, erratic rainfall, poor agricultural productivity, and degraded lands. Consequently, adaptation is deemed an immediate priority (NEPA, 2020). Recognizing the central role of agriculture in Afghanistan's growth, enhancing farmers' adaptive capacity to cope with climate change and extreme weather events is crucial. Addressing climate change requires a comprehensive approach involving institutional development, capacity building, and infrastructure investment (Jawid & Khadjavi, 2019). Mitigation and adaptation are essential components of climate change responses, with simultaneous efforts crucial for community resilience. Afghanistan, due high vulnerability, must swiftly adapt its economy, agriculture, water management, energy, and environment to minimize harm and enhance community resilience (ACT, 2018).

CLIMATE CHANGE MITIGATION

Mitigation, focusing on addressing the causes of climate change, aims to reduce or reverse man-made factors contributing to it. In the context of Afghanistan, where it is a low emitter of greenhouse gases (only 0.19% of the global total), prioritizing mitigation is less urgent (ACT, 2018). Mitigation examples include adopting clean energy, plant-based diets, electric cars, energy-efficient lighting, reduced energy consumption, and tree planting. Successful mitigation strategies hinge on global collaboration involving individuals, government, and businesses, emphasizing the collective role in achieving positive outcomes (Pelling, 2010).

CLIMATE CHANGE ADAPTATION AND RESILIIENCY

Adaptation to climate change involves adjustments in natural or human systems to mitigate harm or capitalize on beneficial opportunities. It considers both the capacity and ability to enact change, with a focus on the scope for action (Marshall et al., 2010). Adaptation strategies must be tailored to specific environments (ACT, 2018). These actions aim to reduce vulnerability to future environmental challenges, encompassing measures such as expanding planning, protecting critical habitats, connecting landscapes for migration, and managing water resources (EPA, 2018). Resilience, defined as overcoming negative events, emerges when individuals, communities, businesses, and sectors collaboratively cope with climate change effects (ACT, 2018). In Afghanistan, some 80% of population reliant on agriculture, resilience is evident in the shift towards integrated water resource management. Different people groups within regions differ in their ability to adapt to the climate change based on different sensitivity to climate variability or change. Some fundamental adaptation initiatives to reduce Afghanistan agricultural system vulnerability to extreme climatic events are discussed in the following:

Water Resource Management

Mountains play a crucial role in Afghanistan's water sources. Approximately 61% of the country situated within the Hindukush area, hosting 4.4% of the region's total glaciated area. The nation's annual renewable surface water resources, amount to 57 billion m^3; with an estimated availability of 2,775m^3 per capita per year, which surpasses the standard figure of 1,700 m^3, considered sufficient for meeting various needs. Groundwater recharge is predominantly linked to river infiltration. Proper management of these water resources has the potential to significantly enhance resiliency and adaptability in the face of climate challenges (Saffi & Kohistani, 2013).

Efficient Use of Irrigation Water

Irrigation systems at the farm level, including surface, micro-irrigation (drip or trickle), and sprinkler systems, exhibit varying efficiency and water delivery methods (Koech, 2018). Despite the common use of furrow and border irrigation systems in Afghanistan's summer season, their limited efficiency results in substantial water losses through evaporation, runoff, and percolation (Eisenhauer, 2021). Drip systems within micro-irrigation, offer distinct advantages. They reduce water run-off, minimize deep percolation and evaporation, create unfavorable conditions for diseases, and enhance irrigation scheduling precision and chemicals application efficiency. Micro-irrigation technology's adaptability to various topographies, particularly its effectiveness in sandy areas with permanent crops, adds to its versatility (Koech, 2018). Deep pipe irrigation is another type of micro-irrigation, which concentrates water in the deep root zone, improving water use efficiency and weed control, especially on steep slopes (Bainbridge, 2001).

Strengthen of Early Warning Systems

Early Warning Systems (EWS) are crucial for minimizing the impact of natural hazards, providing timely information and improving resilience to disasters and climate-related risks. The interconnected elements of EWS include risk knowledge, monitoring and warning services, dissemination and communication, and response capability. (UNDP, 2018).

Adopting Genetically Modified Crops

Genetically modified crops can act as an effective adaptive strategy against climate change through higher yield potential, reduction in pesticides and chemical fertilizers use, and higher tolerance against droughts and temperature. There are some crop species in which stress-tolerant plants have been developed through genetic modification, e.g. rice, wheat, maize, mustard, soybean, sugarcane, tobacco, cotton, banana, potato, etc. (Suruchi, et al., 2022; Das, *et al.,* 2023)

Agroforestry Systems

Agroforestry systems, incorporating diverse combinations like agrosilvicultural, silvopastoral, and agrosilvopastural, which integrate trees with crops, pastures, and/or animals, providing substantial benefits (World Bank, 2012). The emphasis on multipurpose agroforestry trees, for instance, *Faidherbia albida*, not only aids in climate change mitigation but also serves as a mutually beneficial fertilizer-agroforestry strategy. Specific agroforestry systems, such as home orchards, trees for property delineation or windbreaks emerge as adaptable strategies contributing to climate change adaptation. Overall, agroforestry proves to be a promising approach with potential for both mitigation and adaptation (Maposse et al., 2010).

Benefit from International Treaties

Afghanistan, a UN member, actively engages in international efforts against climate change. Signing the UNFCCC in 1992, ratifying the Kyoto Protocol in 2013, and the Paris Agreement in 2017, Afghanistan is committed to managing and reducing greenhouse gas emissions in line with global climate goals. Despite being a low emitter, it seeks advantages from international agreements, particularly under the Kyoto Protocol, which offers financial and technical assistance for emission control. Afghanistan aims for a 13.6% reduction in emissions by 2030, requiring $17.405 billion. To achieve this, it has appealed for $6.62 billion in funding from the international community (Islamic Republic of Afghanistan, 2015; Zaki, 2023).

CONCLUSION

Afghanistan confronts significant vulnerability to climate change, particularly impacting its agriculture sector due to rising temperatures, high evapotranspiration, and low precipitation. The present reality includes a 1.8°C increase in annual temperature and a 22% reduction in surface water, requiring urgent action for adaptation and mitigation. Priority areas include agriculture and water management to minimize associated risks. Crucial measures involve integrating climate considerations into policies and investing in sustainable agricultural practices.

RECOMMENDATIONS

- Building new water reserves; avoiding water losses through efficient irrigation systems; recharging aquifers by rain water through digging wells and making dams; restricting the use of ground water for agriculture.
- Introduction of new and improved crop varieties; systematic researches through regularly engaging local universities, and training farmers; reforestation and implementing appropriate agroforestry systems.

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