Agricultural Research & Technology
Open Access Journal
ISSN: 2471-6774

Juniper Publishers
key to the Researchers

Mini Review
Volume 7 Issue 4 - June 2017
DOI: 10.19080/ARTOAJ.2017.07.555716

Agri Res & Tech: Open Access J

Climate Change Implications for Food Security; Pakistan Perspective

Ghani A[1*] and Muhammad A[2]

[1]*Senior Scientific Officer, Pakistan Agricultural Research Council, Pakistan*

[2]*Scientific Officer, Pakistan Agricultural Research Council, Pakistan*

Submission: March 11, 2017; **Published:** June 02, 2017

[*]**Corresponding author :** Dr. Ghani A, Senior Scientific Officer, Pakistan Agricultural Research Council, Islamabad, Pakistan, Tel: +92519255395; +923005735395; Email: ghani_akbar@hotmail.com

Abstract

The agro based economy of Pakistan has largely been impacted by climate change induced floods and droughts. Despite negligible contributor to climate issues, Pakistan is at the fore front of climate change induced hazards, which challenges its food security. Unfortunately, there is lack of national and international focus on climate change induced risks mitigation and adaptation practices in Pakistan. Importantly, agricultural production in Pakistan has both regional and global implications, thus needs emergency measures for ensuring agricultural sustainability. There is need to conserve the available water through improved rainwater harvesting, increased water productivity and increased irrigation efficiency on farms. Sustainable watershed management practices for controlling erosion, sedimentation and increasing surface storage and groundwater recharge needs to be pursued through larger national and international spending. Capacity building of stake holders can be helpful in promoting sustainable agriculture and greater community livelihood and resilience to climate change in the country.

Introduction

Climate change is a global phenomenon, but their impacts are more pronounced in south Asia during the past few decades, which challenges food security in this region. At the fore front, Pakistan despite a negligible contributor to climate change, is facing frequent climate change induced annual droughts and floods, more specifically since 2010. The rapidly depleting freshwater resources and frequent floods during the past decade pose a serious threat for sustaining agriculture of the rapidly populating and climatically changing regional conditions [1,2]. Flash floods are continuously deteriorating soil, water and other natural resources due to erosion, sedimentation besides inflicting huge damages to standing crops and infrastructure. Similarly, droughts are negatively impacting on crop health, soil fauna and biota, which reduces productivity potential of lands. All these factors are negatively affecting community livelihood and farm profitability. Notwithstanding, the present apparent symptoms of climate change and elevated pressure on our natural resources due to population growth are causing non-availability of water at the right time, the existing traditional practices, skills and drought/flood risks mitigation practices on household, farm and watershed levels are not sufficient [3-5] to cope with the huge emerging issues and risks. Consequently, a significant impact of climate change on agriculture and livelihood of remote watersheds has already been started as reported [6-8]. These changes have started severely impacting on the socio economic conditions of small watersheds thus leading to increasing poverty and food insecurity.

Pakistan, once a water-surplus country, is now a water-deficit country. The rainfall is neither sufficient, nor regular, to meet the growing needs of water. About 70 percent of the annual rainfall occurs in the months of July to September. The surface water resources of Pakistan mainly consist of flows of the Indus River and its tributaries, which bring in about 138 million acre feet (MAF) of water annually. The Indus River alone provides 65% of the total river flows, while the share of Jhelum and Chenab is 17 and 19%, respectively. The months of peak-flow are June to August during the monsoon season. The flow during the Kharif (summer) is 84% and during Rabi (winter) season is 16%. The alluvial plains of Pakistan are blessed with extensive unconfined aquifer, with a potential of over 50 MAF, which is being exploited to an extent of about 44 MAF by over 0.6 million private and public tube wells. In Baluchistan (outside the Indus Basin), out of a total available potential of about 1MAF of groundwater, has been almost fully utilized or over exploited. The Indus River System, as such, will not be able to continue self-reliance in agricultural production, as majority of watersheds where the

rivers flow originates are neglected in government spending. Consequently, due to enormous amounts of sediments brought in by the feeding rivers, the three major reservoirs -Tarbela, Mangla and Chashma-have lost over 25% storage capacity, which had further aggravated the water availability situation [9].

Irrigation is central to Pakistan's economy, as agriculture is almost wholly dependent on irrigation and irrigated land supplies more than 90 percent of agricultural production, which contributes ~21% of the country's gross domestic product. The Indus River basin supplies water to the largest contiguous irrigation system in the world. Massive investments were made in the development of Indus Basin Irrigation System but investment in rain-fed agriculture and watershed management were largely overlooked. Despite heavy budgetary inputs in irrigation system, it is facing shortage of resources and suffering from operational problems. The sustainability of irrigated agriculture is threatened due to problems of water logging and salinity, inadequate operation and maintenance, insufficient recovery of O&M expenditure, inequitable distribution, environmental degradation, barren and fragile watersheds, institutional issues etc. The growing scarcity of water sets the future stage for intensive competition over water between agriculture and non-agricultural users. The growing need for food and fiber requirements of increasing population further limits the per capita availability of water. Due to the limited prospects for expanding irrigation facilities, the projected increase in irrigated agriculture will have to come from significant improvement in the performance of existing systems at basin and watershed scale [10,11].

Climate Change Induced Food Security Challenges of Pakistan

Pakistan could face food shortages due to water scarcity. Forty seven percent of the population of Pakistan is food insecure, as access to food is uneven and malnutrition is widespread. In addition, food production depends greatly on irrigation, including the use of substantial volumes of water from already stressed aquifers. A continuation of current trends leads to nearly a doubling of the (already unsustainable) groundwater use. There is uncertainty in the magnitude of climate change impacts, but climate change may further exacerbate matters [12]. It is estimated that, by 2025, the shortfall of water requirements will be ~32%, which may cause food shortage of ~70 million tons. Recent estimates suggest that climate change and siltation of main reservoirs will reduce the surface water storage capacity by 30% till 2025. The per capita water storage capacity in Pakistan is only ~150m^3, compared with more than 5000m^3 in the United States and Australia and 2200m^3 in China. There is evidence of decrease in canal irrigated areas and increase in tube well irrigated area in the Indus basin of Pakistan. The reduction in surface supplies and consequent decreases in groundwater abstraction will have a serious effect on irrigated agriculture. Supply-side solutions aimed at providing more water will not be available as in the past, because of the local and trans boundary issues. Current low productivity in comparison with what has been achieved in other countries under virtually similar conditions points to the enormous potential that still exists [13].

Strategies for Improving Food Security in Pakistan

Pakistan's irrigated and rain-fed agriculture requires new strategies to enhance water use efficiency and maintain and improve the quality and sustainability of the resource base at basin and watershed levels. To harness the available potential for productivity improvement, Pakistan needs to invest soon in increasing rainwater harvesting by increasing storage capacity, improving water-use efficiency, conservation agriculture and managing surface-water and groundwater resources in a sustainable way to avoid problems of soil salinization and water logging. Building capacity between individuals and organizations, and strengthening institutions are key elements for sustaining irrigated agriculture in the Indus Basin.

To encounter the decreasing irrigation water availability and ensure sustainable supply, the suggested short-term strategies may include starting a mass-awareness campaign, propagation of high-efficiency irrigation systems, changes in watershed management practices, changes in cropping-patterns, identification of feasible surface-water storage sites and dams, and activation of water user organizations. The medium-term strategies could be giving priority to sustainable water management practices in key watershed areas, launching of national integrated watershed management program, lining of distributaries, minors and watercourses in saline groundwater areas, construction of small dams, developing mini dam command areas and installation of solar driven efficient tube wells in technically feasible areas, improving flood and drought forecasting methods, and a much wider application of conjunctive water-use approach and propagation of high-efficiency irrigation systems. Institutional reforms for better coordination and a wider formulation of a national water-policy are other priority areas under the medium-term strategic plan. Long-term strategies may include formulation of a regulatory framework on groundwater abstraction, construction of large storage dams, better flood and drought-forecasting mechanisms and resolving water-distribution problems between provinces. To avoid further increases of groundwater use, some combination would be required of: more dams and other irrigation infrastructure; increasing crop yields (particularly yields per unit volume of water) at a greater rate than in the past; a change in crop mix away from high water use crops like rice and sugarcane, to crops that use less water.

References

1. Gupta SK, Deshpande RD (2004) Water for India in 2050: first-order assessment of available options. Current Science 86(9) 1216-1224.

2. Rafiq L, Blaschke T (2012) Disaster risk and vulnerability in Pakistan at a district level. Geomatics, Natural Hazards and Risk 3(4): 324-341.

How to cite this article: Ghani A, Muhammad A. Climate Change Implications for Food Security; Pakistan Perspective. Agri Res & Tech: Open Access J. 2017; 7(4): 555716. DOI: 10.19080/ARTOAJ.2017.07.555716

3. Ahmad S, Hussain Z, Qureshi AS, Majeed R, Saleem M (2004) Drought mitigation in Pakistan: current status and options for future strategies. International Water Management Institute, Colombo.
4. Prabhakar S, Shaw R (2008) Climate change adaptation implications for drought risk mitigation: a perspective for India Climatic Change 88(2): 113-130.
5. Akbar G (2013) Mitigating Climate Change and Soil Salinity Impacts in the Indus Basin Using Skimming Wells with Pressurized Irrigation. Palawija News 30(2): 6-8.
6. Nelson GC, Rosegrant MW, Koo J, Robertson R, Sulser T, et al. (2009) Climate change: Impact on agriculture and costs of adaptation. International food policy Research institute, USA.
7. Ashraf A, Naz R, Mustafa N (2011) Evaluating Drought Impact on Vegetation Cover of Rarkan Rod-Kohi Area, Balochistan using Remote Sensing Technique. Pakistan academy of sciences 48(3): 143-150.
8. Tariq M, Aziz R (2015) An overview of deforestation causes and its environmental Hazards in Khyber Pukhtunkhwa. Journal of Natural Sciences Research 5(1): 52-57.
9. Kahlown M, Majeed A (2003) Water-resources situation in Pakistan: challenges and future strategies. Water Resources in the South: Present Scenario and Future Prospects 7(3): 33-45.
10. Afzal M (1996) Managing water resources for environmentally sustainable irrigated agriculture in Pakistan. The Pakistan Development Review 35(4): 977-988.
11. GOP (2010-11) Agricultural Statistics of Pakistan. Pakistan Bureu of Statistics, Islamabad, Pakistan.
12. Kirby M, Mainuddin M, Khaliq T, Cheema M, Tasneem K (2017) Agricultural production, water use and food availability in Pakistan: Historical trends, and projections to 2050. Agricultural Water Management 179: 34-46.
13. Qureshi AS (2011) Water management in the Indus basin in Pakistan: challenges and opportunities. Mountain Research and Development 31(3): 252-260.

DOI: 10.19080/ARTOAJ.2017.07.555716

How to cite this article: Ghani A, Muhammad A. Climate Change Implications for Food Security; Pakistan Perspective. Agri Res & Tech: Open Access J. 2017; 7(4): 555716. DOI: 10.19080/ARTOAJ.2017.07.555716