

MITIGATING THE IMPACT OF CLIMATIC CHANGE: CROPS ADAPTATION APPROACHES FOR THE PAKISTANI FARMING COMMUNITY

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ABSTRACT

Pakistani agriculture is highly vulnerable to climate change due to diverse climatic conditions in the country. The major factors which effect agriculture output includes shift in rainfall pattern, rise in temperature, increase in carbon dioxide concentration, longer growing season in summer, increase in drought spell, high risk of floods, high erodability and vulnerability of crop to insect pest attack. To cope with the current alarming situation in the country different crop adaptation strategies may be adopted like introduction of drought tolerance species, late sowing cultivars, early maturity crops and development of mid-season Zaid-e-Rabi cropping pattern. Besides these, breeding programs for development of existing crops varieties is required to make it adoptable to the current climatic change. Introduction of innovative and substitute species of crops, fruits and vegetable which can replace the existing crops species and can adjust in the existing cropping patron of the country. By adopting these technologies in the country the farmer will be able to get maximum output from their fields. Besides these practices awareness and capacity building in the subject area may also play a major role in the current situation.

Keywords: Climate change, crops adaptation, farming community

INTRODUCTION

Agriculture is the back backbone of Pakistani economy. Pakistan's principal natural resources are arable land and water. About 25% of Pakistan's agriculture accounts for about 21% of GDP and employs about 43% of the labor force. It is also a major economic, social, and

cultural activity, and it provides a wide range of ecosystem services in the country. Pakistan is one of the world's largest producers and suppliers of food and crops according to the different sources e.g Chickpea 3rd, Apricot 6th, Cotton 4th, Milk 8th, Date Palm 5th, Sugarcane 5th, Onion 7th, Kinnow, mandarin oranges, Clementine 6th, Mango 4th, Wheat 7th and Rice 11th [1].

In Pakistan agriculture remains highly sensitive to climate change. Due to climatic change annual rotation and sowing of crops disturbs which results to low crops yield. For example, the El Niño Southern Oscillation phenomenon, with its associated cycles of droughts and flooding events, explains between 15% and 35% of global yield variation in wheat, oilseeds, and coarse grains [2]. This situation better explains why agriculture production is affected due to climatic change. There is a need to develop strategies for crops adaptation to climatic change [2]. Crops adaptation may be adjusting practices, processes, and capital in response to climate change, as well as responses in the decision environment, such as changes in social and institutional structures or altered technical options that can affect the potential or capacity for these actions to be realized [3]. There is a strong rationale for an increasing focus on adaptation of agriculture to climate change. This need arises from several considerations. Past emissions of greenhouse gases have already committed the globe to further warming of $\approx 0.1^\circ\text{C}$ per decade for several decades [4], making some level of impact, and necessary adaptation responses, already unavoidable.

The main problems regarding crops adaptation is the emissions of the major greenhouse gases are continuing to increase [6], with the resultant changes in atmospheric CO_2 concentration, global temperature, and sea level observed today already at the high end of those implied by the scenarios considered by the Intergovernmental Panel on Climate Change (IPCC) [8]. Furthermore, some climate change impacts are happening faster than previously considered likely [4]. If these trends continue, then more proactive and rapid adaptation will be needed.

This is fact that climate change has increased over time [4];[8], thus due to more temperatures there may be nonlinear and increasingly negative impacts on existing agricultural activities [9]. There are many practices and technologies which may be employed to cope with the climatic change scenario regarding crops adaptation the aim of the study is to suggest some general pathways and technologies for technical assessment of adaptation options to more practical action [7]. Accordingly, we identify some preconditions for more effective uptake of

adaptations; develop an adaptation framework to engage all decision makers (farmers, agribusiness, and policymakers) that builds on the existing substantial knowledge of agricultural systems; and outline how science itself needs to adapt to remain relevant in this issue [5].

RESULTS AND DISCUSSION

The term adaptation in crops science is any alteration in the structure or function of crops cultivars that results from natural selection and by which the organism becomes better fitted to survive and multiply in its environment. Agricultural industry is to effectively manage potential climate risks over the coming decades as a result of climate changes. Adaptation research undertaken now can help inform decisions by farmers, agribusiness, and policy makers with implications over a range of timeframes from short-term tactical to long-term strategic [9].

Crops adaptation strategies to climatic change resilience

Crops adaptation in agriculture industry is one of the key inputs to cope with the current alarming situation in the country [8] for cropping systems, there are many potential ways to alter management to deal with projected climatic and atmospheric changes.

1. Introduction and evaluation of new germplasm for adaptation to a particular environment and checking their yield response in relation to crop water requirements and yield. Local crop varieties may be used as check to compare the yield and yield attributing parameters. Besides adoption altering the existing inputs such as varieties/species to those with more appropriate sowing time, increased resistance to heat shock and drought, altering fertilizer rates to maintain grain or fruit quality consistent with the prevailing climate, altering amounts and timing of irrigation and other water management.
2. Breeding of field crops most adapted to high temperature, drought, high salt concentrations, and efficient in use of water and nutrients and variable biotic stresses in addition to high yield potential.
3. Management of crops residues in the field may increase water holding capacity, bulk density and soil porosity which alter crops growth and reproduction. Capacity building and of farmers to avoid burring of crops residues in the filed may also be helpful.

4. Optimal use of irrigation water at proper stage and prevention water logging, erosion, and nutrient leaching where rainfall increases.
5. Altering the sowing time of cultivated crops according to climatic change scenario, like delay in sowing of Rabi crops due to delay rain.
6. Diversifying income through altering integration with other farming activities such as livestock rising and agro-forestry.
7. Integrated pest management of pest, disease, and weeds and use of resistant plants varieties to insect pest attack.
8. Using climate forecasting to reduce production risk.
9. Organic farming is another approach in agriculture production system which is environment friendly and produces safe food.
10. Replacement of less productive and susceptible crop cultivars with improved crops varieties with high productivity and resistance to stresses.
11. Introduction, acclimatization and dissemination of a biotic stress resistant crop species.
12. Use of green manuring crops and addition of organic matter is another healthy activity through which soil fertility can be boosted.
13. Efficient crop rotation practices may be employed for increasing crop yield and soil health.
14. Introduction of zaid-rabi cropping in rain fed areas (where low precipitation occur during sowing season) thus the farmer may have choice of alternate crops.
15. Revision in annual crop calendar according to current climatic change scenario.

The adaptation of above mention strategies may enable Pakistani agriculturist to help poor farmers in the country and cope with the negative climate change impacts and to take advantage of positive ones.

CONCLUSIONS

Crops adaptation and innovation new crops to the existing cropping pattern is cry of the day to cope with future climate change. Introduction of new germplasm and breeding of field crops, development of heat and salt stress cultivars, promotion of organic farming, mix cropping, dissemination of improved seeds, consideration of agro-forestry, seed priming, better irrigation system like drip and sprinkler, use of organic matter, use biological control measure and adaptation of climatic smart agriculture may play a vital role in crops adaptation to climatic change.

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