

Agricultural climate adaptation: pakistan wheat industry



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Agricultural Climate Adaptation plan: A Case Study of Pakistan wheat industry

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1. 0Introduction

1. 1 Global warming as a result of climate change is projecting higher temperature and unpredicted rainfall pattern coupled with extreme events like flash floods and storm. This never seen before phenomena would be a threat to mankind in all sphere of life if no appropriate actions are taken. As elaborated in the Fourth Assessment Report (AR4) of IPCC (2007), the average temperature of the globe has risen to 0. 6°C between the year 1901 to 2000 and will projected to increase more by 1. 8-3. 4 °C by the end of this century.

1. 2 Agriculture among the various sector of the economy of Pakistan is considered to be the most fragile sector to the unexpected changes in the climate that not only affect the amount of its production and quality but also put pressure on the availability of natural resources needed for the development of agriculture sector. Concurrently, wheat being an important agricultural industry for the economy of Pakistan is not spared from the effects of climate change. As a matter of concern, it is fundamental for all associates of the industry together with policy and decision makers to work out an adaptation strategy on how to overcome the negative impact of climate change and continue to remain a competitive sector. Successful and effective adaptation measures will need both strategic and tactical approach that based on best practices to cope with the adverse effect of climate

change. Furthermore, an efficient screening and monitoring will also be needed in order to have better evaluation of the adapted practices that whether they are effective in controlling and minimizing the unfortunate impact of climate change.

1. 3 The rise in temperature, unpredicted rainfall coupled with the increase intensity of extreme events such as drought and stress all have significant impact on the wheat industry in Pakistan. High Rainfall results in flood, waterlogged condition and hail damage that negatively affect the wheat production. As a consequence, infestation of insect, pest and diseases outbreaks and result in severe damage and in some cases even complete crop loss. Similarly, increase in temperature also negatively affects the yield of the wheat and cause major economic loss in Pakistan. As reported by Rasul *et al.* (2011) the rise in temperature greatly reduced the wheat yield in Pakistan particularly at sowing time and grain filling period. Furthermore, Rawson and Macpherson (2000) also reported that wheat crop destroyed faster in waterlogged conditions and as a consequence seedlings of wheat die within two days and thus resulted in low yield. Apart from the low yield other identified impact of climate change on wheat industry is decrease in GDP, decrease in foreign exchange, effect policy making, penalties by buyer; for unable to supply the required amount of wheat grains, difficulty in transportation, outspread of insect and pest, affect the livelihood of the farmers and as consequence disturb the economy of the country. Many potential adaption measures such as crop management practices, new varieties, crop rotation and water management are used in wheat industry in Pakistan. However, these practices need to be customized, improve or

incorporated in different ways to cope with the adverse effect of climate change.

2. 0Adaptation plan

Appropriate adaptation plan is required in the wheat industry to minimize and prevent the damage caused by the adverse effect of climate change and increase the production and yield of the crop. Well planned and early adaptation strategies will not only save cost of production and cultivation techniques but in long term save millions of lives that depend on agriculture sector for their livelihood and employment. The adaptation strategies are needed at all levels of administration like local, regional and national. Therefore the objective of this paper is to set up an adaptation and mitigation plan for wheat industry in Pakistan to eradicate or minimize the challenges caused by high temperature, unpredicted rainfall and extreme weather condition.

2. 1Government involvement

Pakistan is signatory to 15 Multilateral Environmental Agreements which is mainly related to climate change, biodiversity and rehabilitation. On the basis of its international commitments, Pakistan established a number of policies, projects and framework to reduce the environmental hazards such as National Disaster management Authority, Global Change Impact Study Centre and Task Force on Climate Change. However, the country is still in the hunt for further international assistance and support (khan *et al* . 2013). The government of Pakistan together with all the agencies involved should focus on capacity building, circulation of funds and technology, research for <https://assignbuster.com/agricultural-climate-adaptation-pakistan-wheat-industry/>

agriculture development, institution and framework and therefore, develop effective adaptation strategies and policies to reduce the vulnerability of wheat industry regarding changes in climate.

2. 2New breeding program

2. 2. 1As describe earlier, temperature and rainfall both has devastating effect on wheat grain yield in Pakistan. Successful and productive plant breeding program is needed to be adapted to enhance the production and yield. The temperature is projected to increase in the northern areas of Pakistan coupled with high rainfall, in such area slow maturing cultivars having greater heat requirement should be planted that have positive effect on the photosynthetic activity of wheat. However, the region with the high temperature and decrease rainfall (arid and semi arid plains of Pakistan) the wheat cultivars having early flowering characteristics with wide row spacing should be sown as this will allow grain formation in cooler part of the year (Van Ittersum *et al.* 2003). Moreover, seed with good crop establishment, early hybrid vigour, responsive to increase in carbon dioxide concentration and ability to retain flower in windy and hot climate is needed to be planted (Richards 2002). Iqbal *et al.* (2009) also reported that crop varieties resistant to high temperature and of short duration should be planted in order to minimize the adverse impact of high temperature.

2. 2. 2 High temperature is expected to reduce the risk of frost and increase the grain yield. Therefore, wheat should be sown earlier so that plant can set up the grain formation in the cooler period when there is low risk of frost (Howden *et al.* 1999). Iqbal *et al.* (2009) also reported that alternative

sowing dates should be used to avoid the adverse impact of high temperature on the crop at the time of sowing or other sensitive growth stages.

2. 1. 3 The climate change favours the infestation of insect, pest and diseases which lowered the yield of the crop. The best measure is to use integrated pest management strategy and Area Wide Management that is the coordination of the farmers and the policy makers of the entire areas. Furthermore, the use of genetically modified crop resistant to pest and disease should be introduced and cultural practices need to be modified such as mixed cropping and crop rotation to reduce the spread of disease (Stokes & Howden 2008). Pakistan Agricultural research and development sector is focusing on all these strategies and development of new varieties of wheat to reduce the risk of climate change.

2. 3 Crop rotation and management

Various crop management practices can be used to reduce the risk of the wheat crop to environmental hazards. Such as in case of heavy rainfall the growers need to adapt the zero tillage practices so as to have greater infiltration. Avoid compaction of the soil by farm, machines, human and livestock traffic (Easterling *et al*, 2007). However, in poor rainfall areas of Pakistan wide rows and skip row planting should be practiced to increase the yield and stability of the wheat. Hammer *et al*. (1996) reported that the timing, variety of the crop and rate of fertilizer application should be based on the seasonal rainfall and available soil moisture and nutrient content of

the soil. Furthermore, use of modern agriculture technology like laser land levelling and crop diversification should also be included into consideration.

2. 4 Milling quality

2. 4. 1 Wheat grain contain high level of protein content such as durum wheat but increasing level of carbon dioxide in the atmosphere negatively affect protein content and hence reduce its flour quality. However, the reduction depend on the choice of cultivar selected and amount of nitrogen fertiliser applied (Rogers *et al*, 1998). To maintain the nitrogen content of the wheat grain, increase use of leguminous crop or increase use of nitrogen fertilizer need to be adopted (Hayman and Alston 1999). The growers should continuously monitor the nitrogen content of the paddock and should be well aware of the nitrogen management in the cropping system. Furthermore, nitrogen leaching, poor crop vigour, high rainfall during grain filling all contribute to decrease in protein content of the grain. Appropriate breeding program and effective policies is needed to enhance the quality of the harvest.

2. 4. 2 During the past 60 years there has been tremendous increase in flour mills in Pakistan. Starting with 19 flour mills, currently, 915 mills are working in Pakistan. It is therefore proposed that instead of having too many flour mills, only few huge mills should be accomplished which will positively affect the economy of the country.

2. 5 Land and Water resource Management

2. 5. 1 Water is enormously important for agriculture sector of Pakistan and its economy, which depends on the scarce natural resources. The agricultural sector of Pakistan mainly depends on Indus river system (IRS) for 90% of its irrigation (Piracha and Majeed 2011). However, this natural resource is getting scarce with the time and proper water management practices should be reformed under the prevalence of climate change. According to Sayed (2008), the National Water Policy of the country has made a transparent and rational institutional framework policy to meet the demands of the twenty first century. Moreover, the Integrated Water Management Approach is also implemented based that is based on the utilization of both surface and ground water. The author also mentions that reallocation of water at the provincial level by balancing water availability to cropping system is one of the important task of the National Water Policy. Furthermore, according to Iqbal *et al.* (2009) present irrigation system of Pakistan need be customised to maximise the water use efficiency and appropriate irrigation technology should be used. Furthermore, the author also mentions that alteration in row spacing and the use of drought tolerant varieties need to be used to minimize the loss of water. The construction of small dams and checks on the Indus River and its tributaries would increase storage of water and decrease the severity of floods.

2. 5. 2 The unpredicted rainfall, rise in temperature and carbon dioxide concentration negatively affect the composition of soil. The loss of nutrient such as phosphorus and nitrogen through surface runoff and leaching negatively affect the growth of the wheat. As reported by Hayman and Alston 1999 proper amount of nitrogen fertilizer should be added to the

paddock in order to have good crop establishment. Moreover, proper soil management practices should be adopted to minimise the risk of surface runoff and leaching.

2. 6Transport infrastructure

Hike in temperature as well as increase intensity and frequency of extreme events such as heavy rain, snowfall and flood have substantial impact on the transport infrastructure of Pakistan and cause severe destruction of railways, roads, shipping and airports. Effective adaptation measures should be taken to increase the resilience of infrastructure and this could be done by two ways. The first one is to construct the new infrastructure according to the magnitude and sensitivity of the particular area to the present and future predicted climate. Secondly the existing infrastructure should be made more resistant to changing climate by retrofitting and continues monitoring and maintenance.

2. 7Seasonal weather forecast

As reported by Iqbal *et al.* (2009) the advance seasonal forecast is one of the best options to take appropriate adaptive measures. Furthermore, Crimp *et al.* (2006) also elaborated that “ using climate information (seasonal forecast) in conjunction with system analysis producer can significantly reduce various risks”. On the basis of weather forecast, farmers need to adopt different operations. Such as if forecast is about the drier weather the farmers need to apply split application of some of nitrogen fertilizer to ensure good planting, and also maximize no till area. But if the forecast is about wetter season then farmers should sow the wheat earlier and apply <https://assignbuster.com/agricultural-climate-adaptation-pakistan-wheat-industry/>

fungicide to minimize the effect of leaf disease of wheat (Meinke and Hochman, 2000).

2. 8 Disaster risk reduction

Unpredicted pattern of monsoon rain and melting of glacier due to rise in temperature increase the level of water in the Indus Delta of Pakistan and subsequently these phenomena result in flooding. Effective strategic plan is required to maintain the continuous and balance water flow in the river and to meet the future demands of the society. As reported by sheikh *et al.* (2008) expansion of the natural reservoir capacity is needed in order to decrease the risk of flooding and drought and to address the consequent decrease in the river flow after all glacier have been melted. Moreover, the authors also mention that the reservoir should also be expanded in order provide the minimum water flow to the sea to prevent the intrusion of the water into the Indus delta region and to meet the future needs of the water.

2. 9 Economy and Financial institution

2. 9. 1 As stated earlier, Pakistan economy largely depends on agriculture sector and wheat is the main staple crop of the country. The decrease in yield and quality of wheat has negative impact on the economy of Pakistan. In order to minimise the burden on the economy of Pakistan, development of new policies and appropriate measures to be implemented that could help in eradicating the hazards and catching the positive effects of climate.

2. 9. 2 Loan policies of financial institution can greatly limit the option for the growers to adjust farm management practices in light of change. These

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financial institutions may have to change their policies according to the needs of the farmer and predicted changes in the environment. Moreover, they should support and educate the farmers about onward selling and play constructive role the industry.

3. 0Barriers to adaptation strategies

3. 1 Pakistan being an agriculture country is extremely vulnerable to climate change. However, Pakistan does not have the proper monitoring and screening system for the prediction of extreme events like flood, storm or changes in the climate that makes the development of short term adaptation strategies and mitigation measures immensely difficult. Although several weather station are working in different parts of the countries, but still due to the diverse topography some significant region are left uncovered (Climate Risk Adaptation Profile 2011). Moreover, the existing findings proposed that Karakorum glacier are expanding but these finding are based on the restrictive information of glacier snouts and suggest that loss of mass in Karakorum glacier reduce the quality and availability of water. As reported by to Sheik *et al.* (2008), there is a lack of current knowledge and evaluation techniques on the effect of climate change on the Hindu Kush region and lack of understanding and model assessment of glacier melting pattern and flow of water in Indus River. All these need to be address in order to have better evaluation of the problem. Moreover, the Hunza river basin has no meteorological station that severely constraint the utilization of Model River flows under climate change.

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