The Bulletin

Issue: 10

Impact of Climate Change on Agriculture Sector

In our quarterly newsletter, we not only highlight our achievements but highlight the global and local issues that need attention. We highlight the importance of financial sector and how it can help the society in overcoming the challenges.

In this newsletter we are highlighting the current issue of climate change and its impact on the agriculture sector. We have talked about the possible alternate ways of coping up with climate change issues and how farmers can grow using advanced technology and help from financial sector.

We welcome your feedback. Our hope with this newsletter is to build a community of engaged readers interested in sincere discourse about the challenges and opportunities we face as a sector, the disruptions (technological or otherwise) required to serve our customers better and build an inclusive Pakistan.

Yours sincerely,
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Global Agriculture Landscape

In 2023, agriculture maintained its status as one of the largest land users globally, utilizing approximately 40% of the world's land area. This encompasses land for crop cultivation as well as pasture and grazing land for livestock. The substantial land footprint of agriculture highlights its crucial role in both food production and ecosystem management.

The agriculture sector continues to be a significant contributor to the global economy, though the extent varies by region. In 2023, agriculture contributed approximately 3-4% to the global GDP, representing trillions of dollars in economic output annually. This contribution encompasses not only the value of agricultural production but also related industries such as agribusiness, food processing, and agricultural inputs, emphasizing the sector's multifaceted economic impact.

About 25% of the world's workforce, or over 1.3 billion individuals, were involved in agricultural activities in 2023. This includes farmers, farm laborers, and those employed in related sectors such as forestry, fisheries, and livestock production. The sector plays a vital role in providing employment and income opportunities, particularly in developing countries and rural areas with limited alternative livelihood options.

Agriculture in 2024 is a turning point in terms of creativity, sustainability and adaptability. There will be a lot of opportunities as well as challenges that will impact the future of food product and supply. Globally, agriculture sector is in transition; from introduction of new advanced technologies to address matters like environmental changes and changes in the consumer preferences. This has overall impact on the production of food.

Sustainable farming practices have never been of utmost important till now when sustainability is the only option left to fulfil demand of food. Forward thinking methods are to be used to cope with the environmental challenges like water scarcity, drought, and extreme weathers.

Advancement in Agriculture Sector

Sustainability Imperatives

Globally, modern agriculture is operating under the concept of long term sustainability and that can give guarantee or confidence about food production, social wellbeing and being environment friendly. Precision farming is gaining popularity as it minimizes the input waste and maximizes efficiency without negatively impacting the environment.

Technology Integration

For smart farming solution, globally it is gaining importance that digital technology will bring innovation and efficiency in agriculture sector too. Artificial intelligence will be the main driver. Pilot studies have also been done and the positive results have encouraged farmers to move towards digital transformation. Notably, precision farming technologies have shown significant benefits, with North American farmers witnessing a 4% increase in productivity and notable improvements in fertilizer application efficiency by 7% and pesticide reduction by 9%. With the help of it, farmers will be able to make informed decisions based on the market insights on different inputs.

Urban Agriculture

It has been realized at global level that in order to meet the food demand and food security, it is important to go for urban farming too. With this initiative, consumers in urban areas will get fresh vegetables and fruits. This is also helpful for the environment in urban areas, as where there will be greenery, the right quantity of carbon dioxide will be generated.

Policy and Regulation

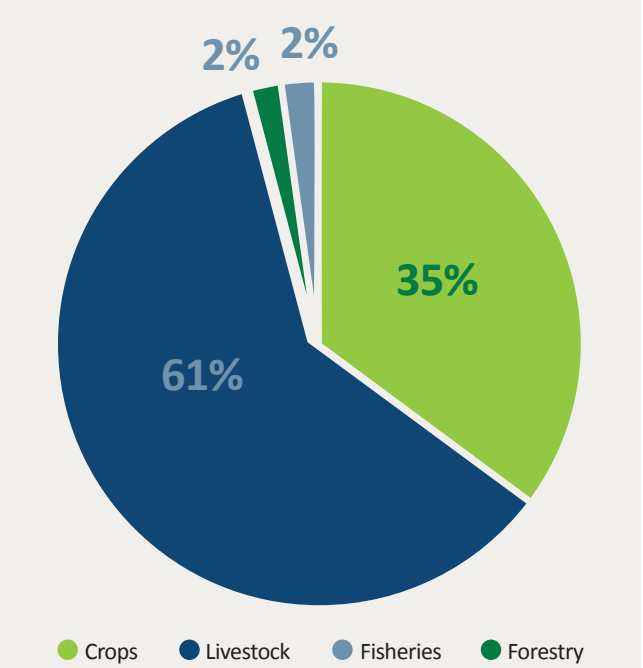
Government laws and regulations play an important role in creating the future of any sector. Similarly, for agriculture policy makers need to offer the foundation for growth and assist sustainable agriculture. Rewards and incentives are introduced for the farmers who will go with renewable energy and follow policies to make the environment clean.

Pakistan Agriculture Overview

Pakistan's agriculture sector continues to be a significant contributor to the economy w.r.t. workforce and GDP of the country. Agriculture sector accounts for 23% GDP and approx. 40% employment to the labor force across rural and urban. Around 10 million are females which makes it around 70% of the employed labor force. It is primarily the source of livelihood for millions of rural households particularly in Punjab and Sindh. About 70% exports of Pakistan are directly or indirectly derived from this sector. The agricultural land of Pakistan (47%) is higher than the global average i.e. 38%.

Agriculture in Pakistan comprises of crops, livestock, fisheries and forestry. Major contribution to GDP is via crops and livestock.

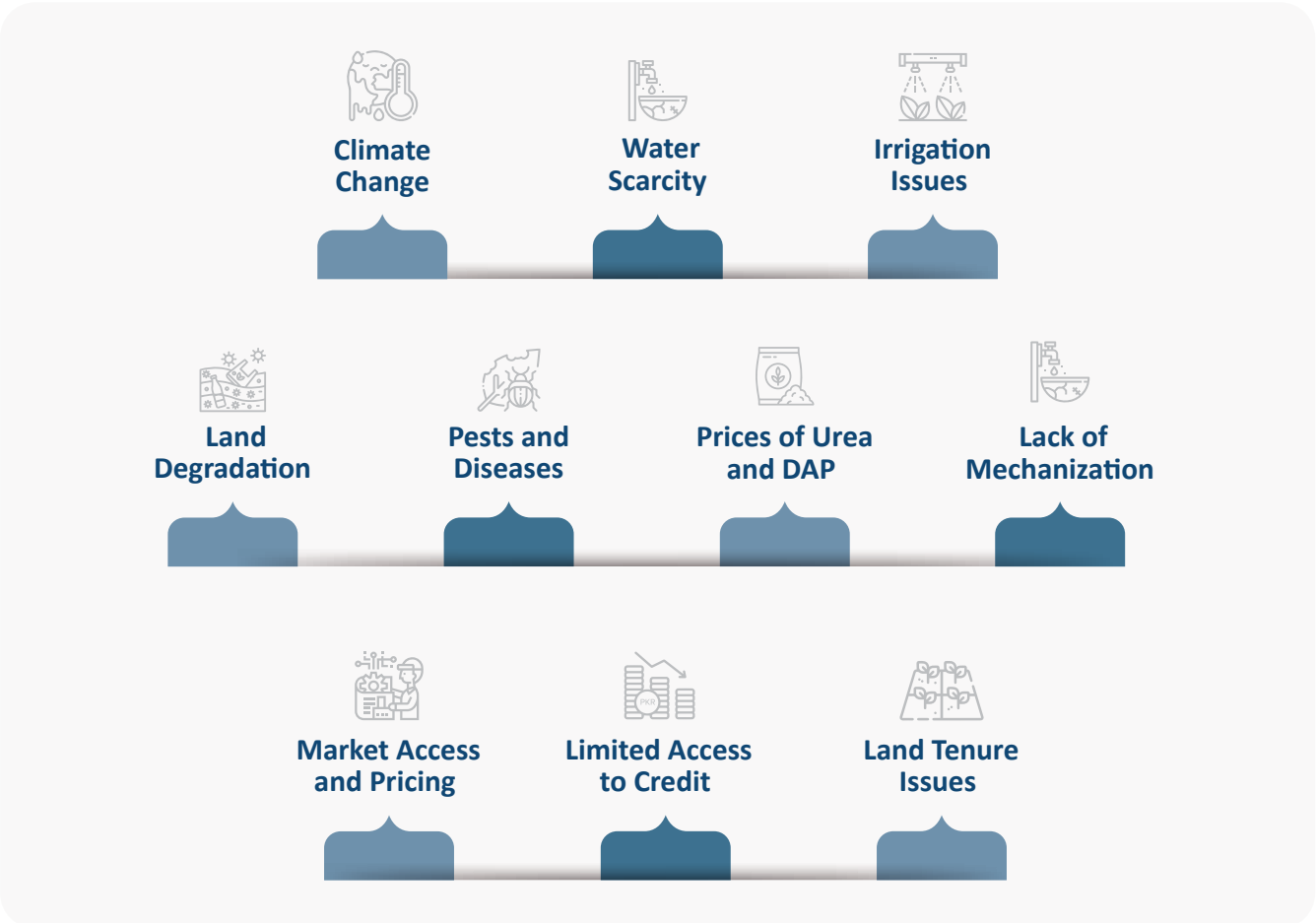
Although Pakistan is considered to be amongst major agricultural countries, it still lags behind the international standards and benchmark with respect to crops yield. It is amongst the top ten producers of wheat, cotton, and sugarcane. However, sub category of agriculture i.e. livestock has emerged as an independent contributor to the GDP. More than eight million households are involved in livestock.



Source: Economic Survey of Pakistan

Challenges Faced by Farmers in Pakistan

Farmers across Pakistan face several challenges and due to these challenges, their livelihoods and agricultural productivity are getting impacted. Following are a few major issues:



Climate Change & Its Impact on Agriculture Sector

Climate pays a significant role in the growth or decline of crop production. 60% of the population of Pakistan is directly or indirectly reliant upon rain-fed agriculture that depends upon predictable weather patterns. Global climatic change affects our agriculture and Pakistan is experiencing devastating environmental issues such as air pollution, deforestation, water scarcity and climate change. Pakistan produces wheat, rice, cotton, sugarcane, and maize and these crops are affected by climate change.

Changing climate is amongst the biggest threats to all. It is not only impacting human life, but also the economy of the country as floods, famines, droughts and cyclones have increased. In countries like Pakistan, the impact is usually many folds as it reduces the agricultural productivity, water availability and variability of climatic events. The sixth most populous country in the world, with a population growth rate of approximately 2% per year, Pakistan is ranked fifth on the most vulnerable countries in the world on the Global Climate Risk Index for 2020. Due to global warming, glaciers are melting and are causing flooding on yearly basis. In the past few years, Pakistan has been experiencing intense monsoon rains and due to lack of reservoirs, most of the rain water gets wasted. In 2022, almost one third of Pakistan had been affected, when nearly 33 million lives were affected and displaced due to devastating floods. This not only washed away homes, but roads and crops too which created deadly havoc across the country.

According to the National Disaster Management Authority, between June and September 2022, at least 1208 people were killed, a third of which were children, and 6082 people injured, with numbers increasing as the rain continued. Over 1 million houses had been damaged, with 436,307 completely destroyed and almost 736,242 partially damaged. Livelihoods are also being heavily impacted as 173 shops were destroyed and more than 733,488 livestock – a critical source of sustenance and livelihoods for many families – had died. Over 2 million acres of crops and orchards were impacted, including 304,475 acres in Baluchistan, 178,186 acres in Punjab, and 1.54 million acres in Sindh.

Farmers in agriculture sector do not get enough water in time, but then there are times when the water is not required and it rains so heavily that it destroys the crops. In the aftermath of the 2010 floods, one fifth of the country's land area was submerged, damaging the economy, infrastructure and livelihoods, with 90 million people left food insecure (World Bank). Additionally, every year the Sindh and Baluchistan provinces, also face severe heat waves which not only limit agricultural activity but also result in considerable death tolls.

The table illustrates a concerning trend in surface water availability, with a significant decrease observed in 2022-23 compared to the average system usage. This decline, particularly pronounced during the Kharif period, indicates challenges in irrigation and water resource management for agriculture. The reduced water availability can disrupt irrigation schedules, impacting crop growth and yield. Climate change-induced factors such as erratic rainfall patterns and glacier melt contribute to the long-term water scarcity concerns, posing significant challenges for sustainable agricultural practices.

Actual Surface Water Availability

Period	Kharif	Rabi	Total	(Million Acre Feet) % increase/decrease over the average system usage (103.5 MAF)
Average system usage	67.1	36.4	103.5	-
2015-16	65.5	32.9	98.4	-4.9
2016-17	71.4	29.7	101.1	-2.3
2017-18	70	24.2	94.2	-9
2018-19	59.6	24.8	84.4	-18.5
2019-20	65.2	29.2	94.4	-8.8
2020-21	65.1	31.2	96.3	-7
2021-22	65.1	27.4	92.5	-10.6
2022-23	43.3	29.4	72.7	-29.8

Source: Indus River System Authority

The production and yield of key crops, including cotton, sugarcane, rice, maize, and wheat, have witnessed fluctuations over the years. In 2022-23, notable declines in crop production and yield are evident, particularly for cotton and rice. The decrease in yield can be attributed to various factors such as erratic rainfall, extreme temperatures, and water scarcity, all exacerbated by climate change. Reduced crop yields not only affect farmers' incomes but also contribute to food insecurity and economic instability in rural communities. It underscores the urgent need for adaptive agricultural strategies and resilient crop varieties to mitigate the adverse effects of climate change on crop productivity.

P: Provisional *Thousand bales						(Area: 000 Hectare; Production: 000 Tones; Yield: Kg/Ha)
Year		**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Cotton	Area	2,373	2,517	2,079	1,937	2,144
	Change (%)	-	6.1	-17.4	-6.8	10.7
	Production*	9,861	9,148	7,064	8,329	4,910
	Change (%)	-	-7.2	-22.8	17.9	-41.0
	Yield	**707**	**618**	**578**	**731**	**390**
	Change (%)	-	-12.6	-6.5	26.5	-46.6
Sugarcane	Area	1,102	1,040	1,165	1,260	1,319
	Change (%)	-	-5.6	12.0	8.2	4.7
	Production	67,174	66,380	81,009	88,651	91,111
	Change (%)	-	-1.2	22.0	9.4	2.8
	Yield	**60,956**	**63,841**	**69,534**	**70,341**	**69,085**
	Change (%)	-	4.7	8.9	1.2	-1.8
Rice	Area	2,810	3,034	3,335	3,537	2,976
	Change (%)	-	8.0	9.9	6.1	-15.9
	Production	7,202	7,414	8,420	9,323	7,322
	Change (%)	-	2.9	13.6	10.7	-21.5
	Yield	**2,563**	**2,444**	**2,525**	**2,635**	**2,460**
	Change (%)	-	-4.6	3.3	4.4	-6.6
Maize	Area	1,374	1,404	1,418	1,653	1,720
	Change (%)	-	2.2	1.0	16.6	4.1
	Production*	6,826	7,883	8,940	9,525	10,183
	Change (%)	-	15.5	13.4	6.5	6.9
	Yield	4,968	5,614	6,305	5,764	5,922
	Change (%)	-	13.0	12.3	-8.6	2.7
Wheat	Area	8,678	8,805	9,168	8,977	9,043
	Change (%)	-	1.5	4.1	-2.1	0.7
	Production	24,349	25,248	27,464	26,208	27,634
	Change (%)	-	3.7	8.8	-4.6	5.4
	Yield	2,806	2,868	2,996	2,920	3,056
	Change (%)	-	2.2	4.5	-2.5	4.7

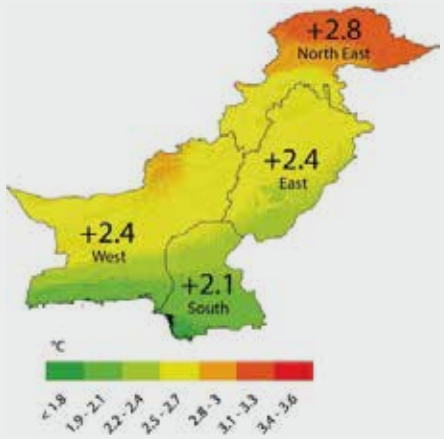
Source: Pakistan Bureau of Statistics

Future Climate Projection

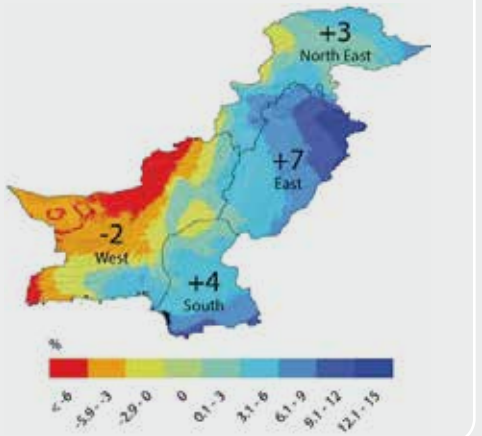
Projections suggest that by 2060, Pakistan may experience a rise in mean temperature ranging from 1.4°C to 3.7°C, surpassing the expected global average. The northern regions of the country could potentially face even higher temperatures compared to the southern areas. Additionally, temperatures are anticipated to increase more significantly during winter than in summer. However, projections for changes in precipitation are less certain due to considerable model uncertainties specific to the region.

Projected change in Temperature and Precipitation in Pakistan by 2050

Changes in annual mean temperature (°C)



Changes in total precipitation (%)



Pakistan Agriculture Sector Under New Government

Agriculture sector is experiencing positive growth as compared to last year. Under Prime Minister Youth Business & Agriculture Loan Scheme the government has disbursed Rs. 66,267 million till December, 2023 to 107,813 beneficiaries for business.

With the new stable government in Pakistan, the agriculture outlook seems promising. Sowing target of wheat has surpassed. The target was 8.99 million hectares whereas the actual sowing was done on area of 9.16 million hectares. Tractor production and sales have shown incredible positive growth results in FY2024 i.e. 68% and 67% respectively. Credit disbursement increased by 34.7%. DAP increased by 15% as compared to last year. However, urea didn't increase. It has decreased by almost 4.2%.

Main reasons of this achievement is availability of quality seeds in time, fertilizers, credit availability and disbursement and improvement in overall system. This shows a promising picture that the production target will be achieved or exceed in comparison to last year. However, this will entirely depend on the climate changes especially at the time of maturity.

How to Cope with Climate Change Challenges

Use of Heat Tolerant Seeds

Heat-tolerant seeds help farmers adapt to changing climatic conditions, including increased temperatures and heatwaves, which can negatively impact crop growth, development, and yield. By reducing the negative impacts of heat stress on crop growth and development, heat-tolerant seeds contribute to yield stability, ensuring more consistent and reliable harvests even in hotter environments. Farmers should use diversified seeds and include more resilient and climate adaptive varieties. This will help reducing the risk associated with climate variability and reduce vulnerability to extreme weather events.

Water management

Use of Drip Irrigation System to Avoid Wastage of Water

Laser leveling is another technique for effective water management. Due to uneven field design and surface, water resources are lost. In return germination is inconsistent and the growth of crop is uneven. This technique will allow the farmer to make the field even and there will be uniformity in the field.

Soil Conservation

Practices such as conservation tillage, cover cropping and agroforestry can help improve health of soil, reduce erosion and enhance soil carbon sequestration.

Crop Rotation and Intercropping

It can help improve soil fertility, pest and disease management and efficient use of the resources. Hence it will increase the resilience of agricultural systems to climate variability. Implementing crop rotation with leguminous crops can enhance soil fertility and reduce the reliance on external inputs. Legumes have the ability to fix atmospheric nitrogen, enriching the soil with this essential nutrient for subsequent crops.

Adoption of Climate Smart Technologies

Investing in climate-smart agricultural technologies such as drought-resistant seeds, weather forecasting tools, precision agriculture, and renewable energy can help farmers adapt to changing climate conditions and reduce greenhouse gas emissions.

Use of Drought Tolerant Varieties

Drought-resistant seeds help farmers mitigate the impacts of climate change, including increased frequency and intensity of drought events. By enabling crops to survive and produce yields even under drought conditions, these seeds contribute to food security by ensuring stable harvests. Drought-resistant seeds promote sustainable agriculture by reducing water use and minimizing the need for irrigation, thereby conserving water resources and preserving soil health.

Integration of Organic Fertilizers

The integration of organic fertilizers into agricultural systems offers numerous benefits, including improved soil health, increased nutrient availability, and reduced environmental impacts.

U Microfinance Bank's Perspective on Climate Change and its Impact

Climate change has played a pivotal role. A majority of the customers of microfinance banks are from rural areas and involved in agriculture sector. It has never been a smooth process to get loan repayment from farmers within the time as farmers are also dependent on the income from crop production and selling it to the right market.

In the past few years, climate change has impacted farmers widely. Due to excessive rain and unavailability of disaster management plan, crops got damaged before harvesting. In some cases, when there was a need of watering the land, there was no rain. Not every farmer has moved to solar system to get tube wells running. With increased prices of diesel, farmers had to plan and water the crops/land. Recently heat wave has increased and it has negatively impacted the crops production.

People are not well educated and they are still using old ways of harvesting. Due to climate change, sowing and harvesting dates have also changed. With the change in crop production cycle, it has impacted the repayment schedule of customers. Those who have adopted new technology are somehow managing to repay in due time.

Financial institutions are already playing a major role in the growth of agriculture sector by giving loans to small and medium-scale farmers so that they could easily and timely purchase seeds, fertilizers, pesticides, modern agricultural machinery & tools, and additional agricultural land.

However, the financial institutions should collaborate with the industry experts like Syngenta, Bayer, Jaffer Agro, etc., in educating the farmers. Industry experts can organize seminars, field visits and give demonstrations to the farmers of how advanced technology can help in saving water, coping with the climate change and increasing the profit margins. At the same time, financial institutions' representative can explain that how they will be covered financially.

Encourage the farmers to use modern and efficient techniques by offering term financing for medium to long term credit needs-each activity can be broken down in small parts like construction of ponds, watercourses, small dams etc. for installation of drip system, purchase of equipment/machinery etc. This can be done in collaboration with Syngenta, Bayer, Jaffer Agro. etc.

The available potential in agriculture sector needs to be explored for economic growth, job creation and encouraging country's exports. For this purpose, synchronization of programs, reforming of institutions and encouraging public-private partnership, simplification of laws and investment reforms is the need of the hour.