INDO-PAK KASHMIR RELATIONS ON THE EVE OF AGTECH IN THE AGRICULTURE SECTOR OF PAKISTAN

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Abstract

Indo-Pak relations throughout the seventy-five years of co-existence have been no less than a roller coaster ride. Scholars have attributed this peculiar and toxic romance to various factors among them Kashmir stands out in it being the jugular vein of Pakistan as all three western rivers, on which Pakistan's agriculture sector solely depends, flow from the Indian administered Kashmir. India is using this to their advantage by planning to construct hydropower dams on the western river, likely affect Pakistan's agriculture sector, all while publically proclaiming "Blood and water cannot flow together"

Countries around the world have started introducing Agtech like Water Conserving Technologies (WCTs) in their agriculture sector in the face of growing water demand and water security. These WCTs not only use less water but also increase the overall yield of the crop. This study is an interdisciplinary endeavour which intends to link the impact of introduction of WCTs in the agriculture sector with the Indo-Pak relations in the context of Kashmir. The Secondary data was collected by searching through key words and reviewing the literature and was analysed through meta-analysis. The study concludes that introduction of AgTech in the agriculture sector of Pakistan has the potential to bring India and Pakistan closer in the context of Kashmir.

Key words: Kashmir, AgTech, Water Politics, Indo-Pak relations, WCTs.

Introduction

According to Muhammad Atiq Ur Rehman Tariq, the primary source of water in Pakistan is the Indus River system, which is mainly fed by rainfall, glacier melt, and snowmelt. (Muhammad Atiq Ur Rehman Tariq, 2012). The majority of rainfall in the region comes from summer monsoons (FRENKEN K. , 2011)estimates that around 300 million people rely on this water supply in Pakistan. However, the Indus River Basin is a region of high water stress and has become a source of conflict between Pakistan, India, and Afghanistan over water rights, (Wescoat, Halvorsonfa, & Musta, 2000)

We are witnessing an increase in hostility between the two countries recently. The recent studies show that there are two factors which are causing it. First, Both India and Pakistan, as per the World bank report, due to its high population and population growth are on their way to become water-deficient countries. The present water availability cannot cater for the needs of India and Pakistan (Kishwar Munir, 2021)Secondly, use of water as a tool to push the lower riparian state on the back foot for security reasons and use it as a diplomatic tool, historically, has its own benefits for the upper riparian states. For instance, Haile Selassie of Utopia exploited its upper riparian states' status in the Nile River Basin for the country's territorial interests in Eritrea on which Egypt had put up claim. The moment Haile declared its interest in the Blue Nile project, Egypt revoked its claim (Erlich, 2002) In quite the same fashion India blocked the water soon after independence and demanded that Pakistan pay for the water as they hold property rights of the water. (Bhatti, 2020)The tussle would give way to the Indus Water treaty later in 1960.

The Indus Basin Water Treaty (IBWT) allocated the exclusive rights of the Ravi, Beas, and Sutlej rivers to India, while the Chenab, Jhelum, and Indus rivers were given to Pakistan, along with some non-consumptive use rights for India on the Western Rivers. Despite three wars between India and Pakistan, the treaty has remained intact. However, Pakistan has raised objections on legal grounds to the construction of Kishanganga and Ratle dams, and India's leadership has taken a hawkish stance, threatening to exploit its upper riparian status. In 2016, following a terrorist attack, Indian Prime Minister Modi threatened to revoke the Indus Water Treaty, stating that "blood and water cannot flow together." (Mirza, 2011)During a meeting, PM Modi decided to respond to Pakistan through water and fully utilize the potential of the western rivers (Kishwar Munir, 2021). Since then, India has continuously made statements at the highest level, threatening to cut off water to Pakistan. While many of these statements may be politically motivated, they do have an impact on the bilateral relationship.

Just like other unresolved issues in the world which act as wrecking balls every now and then to the contemporary world's loud claims and goals of global peace and harmony, Kashmir too has grabbed the attention of many researchers, scholars and authors. Kashmir is considered the only major hurdle and flashpoint stopping the two nuclear Asian giants Pakistan and India in having a better relation. Pakistan calls Kashmir its jugular vein for all three western rivers that flows into Pakistan on which stands the agriculture sector of the country have its inception

point over there. Since the western rivers flow through Indian Occupied Kashmir currently and considering the fact that there are some technological loopholes in the Indus water treaty, which we will discuss in detail in the following, a dam or two, such as Wullar dam, may cause a great deal of damage to Pakistan's agriculture sector which not only contributes 20% in the GDP of the country but also employs almost 47% of the country's work force directly (Ali, 2005).

Agriculture Technology, AgTech, is the introduction of technology in the agriculture sector. It has many applications and types but as per the study demand it has been confined to Water Conserving Technologies, WCTs, only. WCTs are unique in their application as it not only decreases the water usage but also increases the overall yield of the crop unto which it is applied. Research indicates that in the short term, it is possible to conserve up to 47 million acre-feet (MAF) of water by implementing various measures in the tertiary irrigation system, such as improving irrigation application efficiency and lining watercourses (Muhammad Adnan Shahid, 2022)The literature studied under the pretext of WCTs and AgTech provided a detailed account of the introduction of Technology in agriculture and their impact on the agricultural output. Those studies were focused at finding the impact of WCTs on the water consumption and the overall crop yield only. However, there lies a very sharp and clear gap in linking AgTech, specifically Water Conservation Technologies, and its effects, with the Indo-Pak Relations.

Since Agriculture is heavily associated with the economic performance of the agrarian countries historically, such countries, then give importance to the economic factors dearly while formulating their foreign policy or establishing relations with other countries. AgTech, thus, can play a very important role for such agriculture based countries, in both the economy and thence in the establishment of relations with other countries through its water conserving technologies, WCTs.

The study intends to play an interlinking role for different disciplines i.e. linking IR with Environmental Sciences and IT which hasn't been done so far so dearly in the context of linking it with Indo-Pak relations. The study provides a window to the future relations of Pakistan and India if AgTech is introduced on a larger scale in the agriculture sector of Pakistan. It is important to note that the study covers Pakistan's perspective only and does not hold in account the Indian perspective on the application of AgTech in its agriculture sector or its effect on the relations with Pakistan with respect to Kashmir. The study also is limited in its scope of confining the Pak-India Relations to Kashmir only and does not include other areas of mutual interest/concern to the varying parties.

Literature Review

The Kashmir conflict is a long-standing and unresolved issue that has gained the attention of numerous scholars, researchers, and authors. Many books and articles have been written about the conflict, and this literature review provides an overview of some significant works, with a particular focus on the role of Kashmir in Pakistan's agriculture sector.

Pakistan is a country that experiences extreme dryness, but despite this, it has a very high rate of water consumption, ranking fourth in the world. The main source of water supply for Pakistan is the Indus River system (Muhammad Atiq Ur Rehman Tariq, 2012), which comprises six major tributaries including the Indus itself, the Sutlej, Jhelum, Chenab, Ravi, and Beas. These rivers get their water from rainfall, snowmelt and glacier melt with monsoons being the primary source of rainfall. The Indus Basin is responsible for providing water to approximately 300 million people, (FRENKEN K. , 2011) but it has become a region of severe conflict between India and Pakistan due to the scarcity of water resources. (Wescoat, Halvorsonfa, & Musta, 2000)

India and Pakistan share their primary water resources, but soon after Pakistan's establishment, India stopped the flow of water from the Sutlej River to West Punjab, jeopardizing Pakistan's agricultural sector. (FRENKEN K. , 2011) To resolve their water-related issues, the two nations negotiated and signed the Indus Basin Water Treaty (IBWT) in 1960 (Farooq, 2010). Under the treaty, India was given exclusive rights to three Eastern Rivers (the Ravi, the Beas, and the Sutlej), while Pakistan was granted access to the other three Western Rivers (the Chenab, the Jhelum, and the Indus). India was also given specific non-consumptive use rights on the Western Rivers as they flow through the Indian-administered Kashmir. Despite three wars between India and Pakistan, the treaty has remained in place until now.

For over half a century, competition over river resources between India and Pakistan has led to interstate conflicts (Jasparro, 2006). The source of tensions between the two nations stems from an upstream-downstream power structure that was established when the India-Pakistan border intersected several tributaries of the river. In particular, dam developments in Indian-administered territory have sparked reactions from Pakistan (Diplomacy, Climate Diplomacy, 2019).

Pakistan is currently addressing disputes over the Kishanganga and Ratle dams through legal channels in accordance with treaty regulations. However, India's leadership is taking a more aggressive approach, using its position as an upper riparian to make threats. In 2016, after a terrorist attack, Prime Minister Modi threatened to withdraw from the Indus Water Treaty and held a meeting to explore using water as a response. During the meeting, the potential of the western rivers was considered. (Kishwar Munir, 2021) Since then, India has repeatedly issued statements at the highest levels, threatening to cut off water to Pakistan. While some of these statements may be politically motivated, they undoubtedly affect the two nations' bilateral relations.

Pakistan is an agrarian economy with an agriculture sector employing 43.5% of the labour force and contributing 20% to the economy. Pakistan, a country of 220 million and fourth in world in terms of water usage, gets its water from a source, single, the Indus River system (Diplomacy, Climate Diplomacy, 2019)It's also crucial to note that Pakistan is a country that primarily depends on agriculture for its GDP. The economy is having agriculture perform a

variety of roles It contributes only between 60 and 70 percent of exports, 42 percent of the entire workforce, and 23 percent of Pakistan's national GDP. About 68 percent of residents in rural places rely on agriculture either directly or indirectly for their livelihood making it the primary source of revenue and employment.

Pakistan's extensive canal network, which is mainly fed by the Indus River System, is critical for the country's agriculture (Ali, 2005) The Indus Basin, which supports around 300 million people in both Pakistan and India, is also vital for food production to feed their large populations (FRENKEN K. , 2011) However, due to water scarcity, the Indus River Basin has become a loci of intense rivalry and conflict for India and Pakistan. (Jr, 2000)

The economy of several nations has been greatly affected by technology during the recent decades. The skilled population would use and have been using technology to advance economic and social advancement. Because of the complex relationship between the economy, society, environment, and technological information, dealing with technological innovation calls for a comprehensive approach and necessitates skillful communication. Up until now, the conundrum of poor nations' ongoing underdevelopment has been their inability to fully integrate technology into every aspect of daily life Such as Third world countries and for a variety of reasons, emerging nations are demonstrating their advancement in science and technology (Miah, 2012).

The least developed nations (LDCs), like Pakistan, heavily rely on agriculture for their economy. (Shafique, 2017)The importance of technological development is key in economic sectors as it has a significant impact on the agriculture industry hence on the country's economy. Particularly those nations where the farming industry accounts for a sizable amount of their GDP the expansion of the agricultural industry has the ability to change an economy's mode from one that is based on agriculture to one that is based on industry (Olsson, 2000)In terms of technological advancement, the most important event in Pakistan agriculture sector history called Green revolution, occurred in Ayub regime 1960's which transformed the agriculture sector through the introduction of HYV seeds, fertiliser packages, Tube wells, land reforms and Rural sector in the process forming the watershed between the new and the old Pakistan (Zaidi S. A., 2015) New technology made possible the rapid growth of Agricultural sector as elite farmers started employing these technologies and strategies which altered the production of the agriculture sector positively. Education amongst Farmers is also determining factor which make the revolution successful, Revolution in chemical technology and mechanical technology increase the better farming and coping new technologies by farmers also increase the capabilities of farmers (Zaidi S. A., 2015).

Pakistan's current water scarcity underscores the importance of ensuring both water and food security. As per available data, Pakistan's per capita water availability is below 1000 m, which is considered a critical threshold for water scarcity by international standards. It is anticipated that only 800 m of water will be available in Pakistan by 2025. This highlights the urgent need for water security measures in the country (Hamid, 2013). The World Bank reported that

Although water is abundant in Pakistan, the sixth most populated nation in the world, water availability per person is rather low. Compared to most other nations, water usage is high and agricultural outputs are poor. In Pakistan, the country will face a 32 percent water crisis in 2025, which would decrease food output by 70 million tons. The utilisation of Pakistan's water resources including both quantity and quality, and subsequent food production is the least effective in Asia. The really poor water yield for wheat which is 0.5 kg/m3, as opposed to 1.0 kg/m3 in India and 1.5 kg/m3 in California, serves as an illustration of this subpar performance (Bank A. D., 2004).

Precision Land Levelling (PLL), Raised Bed Planting (RBP), and various types of High-Efficiency Irrigation Systems (HEISs) are among the RCTs that have demonstrated promise for their potential to boost productivity and water productivity while minimising water application wastage. All of these methods not only save water but also boost crop yields by giving crops a healthier environment to flourish with regular water distribution. However, there could be a variety of socioeconomic, environmental, and technological challenges that obstruct any of these RCTs from being successfully promoted and adopted in a given area (Shahid, 2022)

Methodology

The research demanded that it be carried out in the lines of Qualitative research methods so as to have selective data collected via searching by keywords within the established framework. As the study is aimed at giving insights and an in-depth understanding of the problem stated which is abstract in its claim so there is no need of getting to quantitative methods as qualitative research methods have the tools to explain, explore and then analyse the already existing data and from it derive new knowledge. We did not feel the need to use questionnaires or generate primary and new data at the moment but it is quite possible that another quantitative research be taken to test the claims of this study. There were two approaches followed in line with qualitative methods of this study.

Descriptive approach: By this approach, the current advancements being made in Agriculture Technology (AgTech) and its effects on Pakistan economy and the relationship of India and Pakistan is elaborated in detail and penned down.

Meta-analytical approach: A separate analysis was done at top of the two analysis already done before i.e. AgTech, its effects on agriculture and the Indo-Pak relations in the retrospect of Kashmir. Meta-analysis was carried out by analysing and linking both the earlier analysis with interpretation following suit.

Pakistan's Agriculture Sector:

Pakistan is currently an agrarian economy with agriculture contributing almost 20% in the GDP and employs almost half of the workforce. (Ali, 2005)The least developed nations (LDCs), like

Pakistan, heavily rely on agriculture for their economy. Our way of life and entrepreneurial spirit are crucially merged in the key industry of agriculture. It plays a variety of roles in the economy of any country, playing a crucial part in the industrial revolution, ensuring food security, reducing poverty, and fostering economic progress, particularly in emerging nations. Pakistan's irrigation system is among the largest in the world, which has enabled the country to become a leading producer of rice, wheat, cotton, sugarcane, mangoes, dates, and oranges. Major crops such as wheat, cotton, rice, and sugarcane contribute 6.5 percent to the country's GDP, while minor crops make up only 2.3 percent. Forestry and fishing contribute 0.4 percent and 0.2 percent, respectively, to the GDP. However, Pakistan is facing significant pressure on its water supplies due to population growth and increased demand for agricultural output (Shafique, 2017). Indus River as it is the main source of water for its domestic, agricultural and industrial use. Agricultural sector uses the majority of its water resources, while only a relatively tiny quantity is made available for home and industrial usage (Shafique, 2017).

The agriculture sector contributes between 60 and 70 percent of exports, 42 percent of the entire workforce, and 23 percent of Pakistan's national GDP. About 68 percent of residents in rural places depend on agriculture either directly or indirectly for their livelihood. The primary source of revenue and employment in Pakistan's economy is agriculture.

Agriculture Technology

Technological development has a significant impact on agriculture, which further, has an impact on a country's economy, particularly those nations where the farming industry accounts for a sizable amount of their GDP. The expansion of the agricultural industry has the ability to change an economy's mode, from one that is based on agriculture, to one that is based on industry (Olsson, 2000).

The economy of several nations has been greatly affected by technology during the recent decades. Up until now, the conundrum of poor nations' ongoing underdevelopment has been their inability to fully integrate technology into every aspect of daily life. For a variety of reasons, emerging nations are demonstrating their advancement in science and technology (Miah, 2012).

As agricultural output rises, the economy eventually becomes more industrialized, which enables it to take on an increasing number of workers (Cohen, 1995) The key to boosting the efficiency of the agriculture industry, which ultimately has a beneficial long-term impact on any country's economic growth, is technological advancement in the industry (Grabowsk, 2006).

The most important event in Pakistan agriculture sector history called Green revolution, which occurred in Ayub regime 1960's transformed the agriculture sector through the introduction of HYV seeds, fertiliser packages, Tube wells, land reforms and Rural sector, which formed the watershed between the new and the old Pakistan (Zaidi S. A., 2015) Since we have limited

ourselves to the technologies in agriculture related to water conservation, we will be pondering upon WCTs which are divided into three categories. Each one has a different way of application and has different results with different corps. They are in the following:

a) Precision Land Levelling (PLL):

By improving the effectiveness of other related inputs, precision land levelling acts as an accelerator and demonstrates its significance as a technology. This is the cause that LASER land levelling has demonstrated success in Pakistan and many other countries. In this context, a 2008 research by the Agriculture Department identified a series of benefits of laser field levelling, including a 25–32% reduction in irrigation time and an 11–33% increase in productivity. Farmers were found to be persuaded that fields levelled by LASER provided good crop stand, constant moisture availability, and improved fertiliser utilisation efficiency, eventually leading to benefits of water savings and yield gains. According to effect evaluation, the use of LASER land levelling raised the percentage of irrigated land from 34.5 percent to 42 percent while decreasing the amount of farmland that could be utilised for cultivation by 2.10 percent (Management, 2022)In order to understand how wheat production and water usage efficiency reacted under PLL, Jat Conducted a research. According to the findings, bed planting with PLL yielded 16.6% higher wheat and used 50% less irrigation water than conventional techniques (traditional land levelling with flat planting) (M.L. Jat, 2011)

b) Raised Bed Planting (RBP):

Raised bed planting is an advanced method of surface irrigation whereby water is sprayed exclusively in the furrows, effectively saving water. Comparing this method to traditional surface irrigation offers several benefits. Wheat seeded in beds lodged less. According to Sayre, boosting the final crop production. Other studies have demonstrated improved fertiliser utilisation, reduced weed infestation, and acceptable irrigation water conservation (by almost 35 to 45 percent) under bed planting, leading to increased water productivity. Even with the use of less seed, improved yields have also been documented (Shahid, 2022)

c) High- Efficiency Irrigation Systems (HEISs)

Pressurised drip irrigation called High-Efficiency Irrigation Systems (HEISs) have been proven to be the most successful way to handle various problems with agricultural yield and water wastage. Drip, conventional sprinkler, bubbler, rain-gun are central change direction are a few examples of HEISs that utilise pipes to distribute water to the points of application from the source. The most productive HEIS method for applying water, fertiliser, and nutrients sustainably is drip irrigation. Increasing agricultural production is made possible by the consistent amount of water and nutrients that a plant requires all across the crop period under drip irrigation. As a result, it has emerged as the most desired invention since it improves irrigation productivity by up to 95% while optimising the usage of water and nutrients. However, the high initial cost and complexity of operation and care of all types of HEIS are persistent problems. Despite the fact that the strategies are not very new and their advantages have been researched and published over the previous 30–40 years, these issues make their

widespread adoption problematic. When compared to furrow irrigation, drip irrigation should be used to optimise water usage efficiency while retaining adequate yields (Sammis, 1980)**.**

To examine the performance of the system of single-lined and multi-lined drip irrigation with two water flow rates namely 4 L/h and 8 L/h, for crop growth El-Rahman performed a field experiment in Egypt. With low evaporation rate, i.e., 4L/h, multi-lined drip irrigation boosted wheat's biological yield (straw yield and grain yield). 2087 mc of water were utilised in total for the wheat. Different grains (Giza 69, Sakha 8, and Giza 7) had acceptable results and water utilisation efficiencies of 2085 kg, 2120 kg, and 2145 kg, correspondingly, and 1.13 kg/m3, 1.20 kg/mc, and 1.17 kg/mc, including both **(** (El-Rahman, 1980)**).**

Table: The improvement of water saved, increase in yield, and productivity of water under PLL

Sr.	**Water Saved (%)**	**Increase in yield (%)**	**Productivity of water (%)**	**Comments**	**Citation/ References**
1	46.8%	35.3%	75.4%	Crop sown with bed planting under PLL	(S.H. Johnson, 1977)
2	30%	-			(I. Abdullaev, 2007)
3	25–32%	11–13%	10–44%		(OFWM, n.d.)
4	50%	16.6%	33.2%	Wheat sown with PLL under bed planting	**(** (M. jat, 2009)
5	Rice: 12–14% Wheat: 10–13%	-	7.4%	The collected data is of rice-wheat system of Indian Punjab	(Jat, et al., 2009)

6	24%	4.25%	39%		(Kaur, Singh, Garg, Singh, & Singh, 2012)

Table: Water saved, increase in the overall yield, and improvement of water productivity after the application of Raised Bed planting.

Sr.	Water Saved (%)	Increase in yield (%)	Water Productivity Increase (%)	Comments	Citations/ References
1	40–50%	11.23% - lodged field 16.20% - no lodged field	22–28% - lodged field 32–34% - no lodged field	Research conducted at T.T. Singh on wheat	(Ahmad & Mahmood, Impact of Raised Bed Technology on Water Productivity and Lodging of Wheat, 2005)
2	An average of 40–45% for wheat and maize, both.	10–15% - wheat 10–25% - maize		A three consecutive seasons Research conducted at T.T. Singh	(Ahmad, Saleem, & Shahid, On Farm Research and Extension Activities at Toba Tek Singh under Technology Transfer Program of University of Agriculture Faisalabad, 2007)
3	48.26% - wheat 30.15% - rice 39.2% average	21.44% - wheat 32.67% - rice 27% average	117% for wheat 108% for rice 112.5% as average	A Multi seasonal study conducted at Punjab, Pakistan – Multiple sites	(Ahmad, Arshad, & Shahid, Raised Bed Technology for Crop Water Productivity of Maize and Cotton, 2011)

4	32.26% - maize 30–40% % - cotton	18.75% - maize 11% - cotton 14.9% - average		A Multi seasonal study conducted at Punjab, Pakistan – Multiple sites	(Ahmad, Shahid, & Anjum, Impact of Raised Bed Technology to Improve Irrigation Efficiency and Enhance Water Productivity in Rice-Wheat Cropping System, 2011)

Table: Water saving, yield increase, and water productivity improvement under high-efficiency irrigation systems.

S.N	Water Saved (%)	Increase in Yield (%)	Water Productivity improvement (%)	Comments	Citations/ References
1	44%	53%	120%	Study conducted on tomato's crop under drip irrigation with mulch	(Shrivastava, Parikh, Sawani, & Raman, 1994)
2	26%	32%	123%	study conducted on cotton	(Aujla, Thind, & Buttar, 2005)
3	26–29%	16%	55–61%	Study conducted on cane under drip irrigation in contrast to flat sowing	(Singandhupe, Bankar, Anand, & Patil, 2008)

4	40%	39%	131%	Multi-seasonal study conducted on wheat under drip irrigation in contrast to under flat sowing	(Bakhsh, Chauhdary, & Ahmad, 2008)

Water Politics

The intensity of conflict over water between Pakistan and India is increasing with time. One of the main reasons behind this is the alarming increase in water scarcity coupled with population increase. Climate change, melting of glaciers which brings with it a great amount of mud with them which is continuously decreasing the water capacity of the IRB on both sides. (Chaturvedi, 2018)

Table: Indo-Pak Water availability chart

Water availability	Pakistan (cubic feet)	Population	India (cubic feet)	Population
1960	5000 cubic feet	50 million	6000	165 million
2016	1500 cubic feet	200 million	1600	1268 millions

Source: (Kishwar Munir, 2021)

Without a doubt, water is an essential resource for human existence, economic growth, and ecological equilibrium in the natural world. Scarcity of water, in particular, influences a huge spectrum of realms, from health to human rights, environment, economy, culture, politics, as well as many more aspects of human existence that are rarely affected by other natural resources. Given that "every living thing consists of water," water has the power to determine life and death.

According to the United Nations definition, a country is labeled as water scarce when the per capita water availability drops below 850 cubic meters. Currently, Pakistan's per capita water availability is below 1000 cubic meters, which is close to the water scarcity threshold. As per international standards, a country is declared water scarce if its per capita water availability falls below 850 cubic meters. If Pakistan's water availability continues to decrease at the current rate, it is predicted to fall below 850 cubic meters, reaching 800 cubic meters by 2025 (Hamid, 2013).

Pakistan population currently is estimated at 229 million and it is expected to get up to 338 million by 2050 (United Nations) This 2.1% annual increase is a very big challenge for the agriculture sector in terms of producing food for the population and in tackling the growing

food security. Even at present, despite its impressive and expanding agricultural output, the nation struggles with extremely high levels of food insecurity with over 48% of the population, as per the World Food Program, experienced food insecurity in 2017. (Shafique, 2017) Beside Food the country also faces water scarcity and will face a 32 percent water crisis in 2025, which would decrease food output by 70 million tons (Bank A. D., 2004).

After the implementation of the IWT, an irrigation system was established which supplies an average of 139 MAF of fresh water per year to Pakistan. However, about 30 MAF of this water is wasted and flows into the sea without being utilized due to inadequate storage capacity in the country. Pakistan's storage capacity is only 30 days, which is significantly lower compared to other countries such as Egypt, which has a storage capacity of 1000 days, and India, which has a storage capacity of 220 days (Qamar, September 2005).

When a situation arises where the supply of resources does not meet the demands of both upper and lower riparian countries, it becomes apparent that competition for control of the water supply will arise, potentially leading to hostility and even a water war (Gleick, 1993). In such situations, countries may resort to using water as a tool to intimidate their rivals, as this tactic has been used in the past as a security policy to influence adversaries. Such conflicts have often led to dispute resolution through battle. Additionally, water scarcity can severely impact a country's energy and food security, and with water resources becoming increasingly depleted, there is a real risk of conflict in the future. (M. Idress, 2017)

The word “water politics" was first used by Elhance (1997). He pointed out that interstate conflict and cooperation over international water resources are systematically analysed via the lens of water (hydro) politics. According to a geopolitical risk advice and consultancy company called Water Politics Limited, water shortage might cause violence or political instability in a number of different regions. Some of which are the Indus River Basin (IRB), Nile River Basin (NRB) etc. Importantly, water politics/hydro politics has the capacity to lead to violence not just between states but also within states for limited water supplies. 62% of people's livelihoods in Pakistan are dependent on the agriculture industry, employing 43.7% of the country's population directly. Given that the majority of the population will be experiencing food insecurity, the growing population poses difficulties for the agricultural sector as it has to to produce more food for the rising population's need. Food insecurity concerns are putting pressure on the agriculture industry, and if some sustainable solutions are not embraced, the problem might get worse soon. Anya Groner of the Atlantic cites evidence of previous disputes over water. These include the unrest that broke out in Cape Town, South Africa, in 2012 as a result of unequal water resource distribution. **(** (Meissner, 2001)

More than 84 percent of Pakistan's farmland is located in arid to semi-arid climate zones, where agriculture is entirely dependent on irrigation water. These farmlands are responsible for generating 90% of nations food supplies (Division, n.d.). This irrigation water primarily comes from the Indus River Basin (IRB), specifically the western rivers that flow through Indian-administered Kashmir. If India builds large hydroelectric dams on the western rivers, Pakistan's

agriculture could suffer significantly, losing up to a month's worth of river flow, which could potentially ruin an entire planting season (Qamar, September 2005). For example, the Wullar barrage, if utilized by India, has the potential to disrupt Pakistan's triple canal projects (Upper Jhelum Canal, Upper Chenab Canal, and Lower Bari Doab Canal), and India could use this to intimidate Pakistan (Kishwar Munir, 2021). The loud and threatening statement of Modi ``Blood and water cannot flow together" still lingers in the air contributing to the dark clouds over the two countries' relations.

If one has to ask why India, the upper riparian state in the context under discussion, is doing all this, what are the prospects and what is in it for India then it can be understood by considering two factors. Firstly, India, as per the World bank report, due to its high population and population growth is on its way to become a water-deficient country. (Kishwar Munir, 2021) The present water availability cannot cater for the needs of India. While addressing the rally in Haryana Narendra Modi, PM of India, promised the farmers that his government will stop the water flow and divert it to the state to cater for the local needs (Kishwar Munir, 2021). Secondly, use of water as a tool to further the ulterior motives of the country and to push Pakistan backwards for security reasons and use it as a diplomatic tool has its own benefits for the upper riparian state. For instance, Haile Selassie of Utopia exploited its upper riparian states' status in the Nile River Basin for the country's territorial interests in Eritrea on which Egypt has put up a claim. The moment Haile declared its interest in the Blue Nile project, a dam construction project, Egypt revoked its claim on Eritrea (Erlich, 2002).

One of the most important facts to keep in consideration in the above context is the fact that the three western rivers, predominately the Indus river on which Pakistan relies heavily for its irrigation, flows through the region of Kashmir. Kashmir hence has very important strategic importance for Pakistan. All the water politics and the intimidation carried out thus far and to come has its basis in Kashmir. Being the base through which this trans-boundary river flow is happening Kashmir hence has become a flash point between the two countries. Both countries may put forward moral stances and grease their horns, use slippery tongue or accuse each other of human rights abuses on either side of the Kashmir but it is very easily inferred from the aforementioned data that what happens to the strategic resources of Kashmir holds more importance to both sides than what happens to the people living with in the territory. These countries are using these people as a disguise to further their ulterior motives.

Findings & Discussion

History demonstrates that times of strong or weak agricultural production typically correspond with phases of positive or negative performance of the national economy because the agriculture sector serves as a means of raw materials for the construction sector and a significant market for its output. As agricultural output rises, the economy eventually becomes more industrialised, which enables it to take on an increasing number of workers.

We live in the 21st century, a century also referred to as the century of innovation. Technology and science have been bringing to the table wonders in all fields of life. It has made things possible which were not even possible through the faculty of reasoning. Some of these have found their way into the agriculture sector too where they are called AgTech. (Cohen, 1995). The key to boosting the efficiency of the agriculture industry, which ultimately has a beneficial long-term impact on any country's economic growth, is technological advancement in the industry (Grabowsk, 2006)The agricultural firm's growth engine, like that of all other aspects of the economy, is technological advancement, particularly in emerging countries (Otsuka, 2019).

In situations such as the one drawn above WCTs prove itself to be no less than a miracle and a ray of hope which can play an important role in mending the broken ties. Different studies done in this regard has shown that PLL causes a 47% water saving and up to 35% increase in yield, RBP is reported to be saving water up to 47% and increasing yield of the agricultural products by 10-33%, similarly, an 80% water saving and 53% yield increase is reported with HEISs (Muhammad Adnan Shahid, 2022) . So, by introducing WCTs Pakistan can; Without going all out and using much of financial resources and getting the result very late by materialising bigger projects like dams, barrages, or improvement of canals; save almost 47 MAF which is almost equal to the sum of the current domestic, agriculture and industrial sector consumption combined.

The saved and extra water can be then used to expand and grow the agriculture sector to put the economy on the right footing. Despite the fact that the country's agriculture has lost a lot of ground in terms of GDP over time caused by the Structural Adjustment Processes (SAPs) of IMF, still in force, the Fund's overall performance has a considerable impact on the health of the whole economy. Therefore, for Pakistan's economy to grow quickly and to reduce poverty, there must be a larger and more consistent expansion in agricultural production. As shown by a number of economic experts such as, S.A Naqvi and Mellor. Pakistan's agriculture needs to grow at a rate of more than 5% in order to secure quick national income growth, macroeconomic stability, effective utilisation of a growing workforce, better distributive justice, and a decline in rural poverty. (Ali, 2005) The 47MAF saved through WCTs can play its part here.

Conclusion:

Considering the grave nature of water and food security and the scarcity of water due to climate change and increase in population, a conflict with the neighbouring higher riparian state India is writing on the wall for the lower riparian state Pakistan. In situations such as this WCTs have proven itself as a ray of hope and fresh breath of air for Pakistan and India alike. The confrontation can be lessened to a formidable degree if these technologies are applied because not only will the fear of increasing water security and scarcity vanish but also we can expect to see a very big decrease in the threatening tone of the rival state/s. We can also infer from the data given above that WCTs can bring the two sides together to work closely in solving the

conundrum of Kashmir since Pakistan will not be facing water shortage and introduction of WCTs will give them important time to buy which they can cash in for mending the broken relations. We aren't implying that AgTech individually will bring a complete change in the foreign policy of both countries with respect to Kashmir but that it has the capacity to be a significant factor in the matter and it can play a very big role in bringing the two arch-rivals together on positive terms.

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