Review Article

Understanding CPEC's Role in Agriculture Sector Development in Pakistan: Issues and Opportunities

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Abstract | This study attempts to identify major problems related to the agriculture sector in Pakistan and focusing on China Pakistan Economic Corridor's (CPEC) role in addressing these issues. The agriculture sector is playing a major role in the economic development of Pakistan and this sector has greatly sustained rural livelihood. There are three various stages for the successful execution of the projects under the umbrella of CPEC. The agriculture sector would be directly or indirectly benefited from these projects, currently ongoing under CPEC. Over the last several decades the country's agriculture sector has severely been affected, and the crisis in energy might be the prime reason responsible for this downfall. In order to achieve the objectives of the study, a comprehensive literature survey has been conducted. Scores of problems have been identified that has greatly affected the agriculture sector such as water deficiency, climate changes, long duration load shedding, traditional farming practices, poor extension services, high prices of fertilizers, land insecurity, etc. The outcomes of this study showed that the successful completion of CPEC related projects in the energy sector and infrastructure development will boost the agricultural output, provide job opportunities and poverty eradication.

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Introduction

Globally, 3 billion people live in rural areas out of which some 2.5 billion people totally rely on agriculture for their livelihood (Ahmad *et al.*, 2020). Agriculture is a key source of income for majority of the population living in non-urban areas of the country. Agricultural is indispensable to economic enhancement and advancement in Pakistan. Since the independence of Pakistan in 1947, country's economy mainly dependent on agriculture. Agriculture sector is still contributing nearly 18.9% to GDP and about 42.3% to total employment in Pakistan (Ashfaq and Jan, 2019). It also provides raw materials to Pakistan's industries, mainly textile industry, and the main industrial sub-sector of the economy. The rest of 67.3% population residing in non-urban areas depends directly or indirectly on agriculture sector for their livelihood. In addition, it also plays a noteworthy role in the export of the country, about 64% of the total exports are chiefly based on agricultural raw materials (GOP, 2014).

There are two major cropping seasons in Pakistan. "Kharif" season starts from April-June and ends in October-December. "Rabi" season begins from October-December and ends in Aril-June. Wheat contribution in agriculture sector is about 10% and

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it share in GDP is 2.2%. Followed by rice, which shares in agriculture, is approximately 3.1% and 0.7% in GDP. Pakistan produces high quality rice which is famous across the globe. Cotton is a cash crop and its contribution in GDP is 1.4%. The share of sugarcane in agriculture is about 3.4% and 0.7% in GDP. The contribution of minor crops in agriculture is 11.6%. Minor crops include pulses, barley, mustard, oil seeds, bajra, jawar and gram etc (Usman, 2016). Livestock is another significant element in this sector. It provides milk, meat and yogurt to the community (Usman, 2016). Agriculture is strongly associated with food security, rural advancement, poverty mitigation and is a way to accomplish magnanimous objectives. The agriculture sector, nonetheless, confronts a number of significant and vital challenges (Sheikh *et al*., 2005).

Over the last few decades the country has seen an unprecedented growth in population. In 1947, Pakistan had a population of 32.5 million, as it reached to 207.8 million in 2017 (GoP, 2017). It is projected to the mark of 234 million by 2025 and 357 million by 2050 (United Nation, 2005). This sharp increase in population is affecting agricultural land by conversion to building housing units on the available productive farmland (Abdullah, *et al*., 2015). As an outcome, the demand for food will augment with the same pace as the increase in population. This growing demand in food has to meet by boosting yield per unit area. As land is fixed and reducing with the passage of time, hence preference should be given to preserve each parcel of land to fulfill the increasing food demand of growing population (Jan *et al*., 2008). Land fragmentation is one of the major issues facing by the developing countries with no exception to Pakistan which is affecting yield per unit area (Abdullah *et al*., 2015; Jan *et al*., 2008). Apart from this, the causes for low yield include lack of enough information accessible to the farmers on the use of recent technology, research techniques and improved farming practices. Furthermore, weak agricultural extension approaches are being implemented which are based on outdated techniques of educating farmers together with inadequate financial availability to the major part of small farmers (Jan, 2007).

Globally arable land in 2016 was around 0.19 ha per capita and is projected to further decline to 0.15 by 2050. Whereas in Pakistan, the situation is highly alarming, it was about 1.5ha per capita in 2016 and is expected to further dwindle to 0.06 ha by 2050 (Sheikh *et al*., 2005; Trading Economic, 2020). Pakistan is mainly an arid country with approximately 80% of its agricultural land are present in the arid and semiarid areas. At present, Pakistan found itself among the list of most arid states with an average annual rainfall lower than 240 mm. The provinces of Punjab and Sindh receive around 60% of rainfall during the monsoon period (July to September) whereas Balochistan and the Northern Mountains usually get most of its rain from western depression in winter season (October to March). Monsoon, western depression and melting of glaciers provide enough water to the rivers that flow in Pakistan (Jan, 2020).

Development of regional and global strategic movements across the globe in the current century has led to geo-economical and geo-strategic partnership between states. Countries determined their interest by reorganizing their policies. Nations around the world are trying their level best to enhance collaboration among one another in multifaceted fields. Among these fields are industrial ventures, infrastructure development programs, defense, trade and commerce, and other related areas of the economy. China Pakistan Economic Corridor (CPEC) is one of the live examples of this collaboration (Noor *et al*., 2008). China intends to invest around $60 billion to modernize the infrastructure of Pakistan (Chaudhary, 2017). Moreover, implementations of these mega projects, Pakistan would achieve more importance not only on regional level but also in the world. Presently, Pakistan and China together are working to initiate mega projects favorable for the interest of both nations. Pakistan will become economically stable with the successful execution of China-Pakistan Economic Corridor plan (Iqbal, 2015).

These mega projects will be executed in three different stages under China Pakistan Economic Corridor. These include short-term, mid-term and long-terms programs, which are predicted to be completed during the time period starting from 2014 to 2030 (Ahmad, 2020; Kamran *et al*., 2020). The projected construction cost for these mega projects is over 46 billion dollars. It includes networks of railways, highways, transport, pipelines, oil, gas and energy (Figures 1 and 2). Agriculture is considered the as backbone in the economy of developing countries. In the rural area it is only main source of income and employment. The agriculture sector in Pakistan is always playing a significant role in the economy

but since the last few decades, its growth rate is on a declining trend (Kamran *et al.*, 2020). Agriculture sector would be a direct or indirect beneficiary of China Pakistan Economic Corridor (Jawad and Rana, 2013). China Pakistan Economic Corridor would open new avenues of collaboration in the agriculture sector, which would help in the transfer of technology relating to fertilizer, seeds, pesticides and agrochemicals. The literature survey discloses that there is a positive association between agricultural growth and infrastructure development. This study makes an attempt to identify the problems faced by agriculture sector in Pakistan, and furthermore to examine the role of China Pakistan Economic Corridor (CPEC) in addressing these issues.

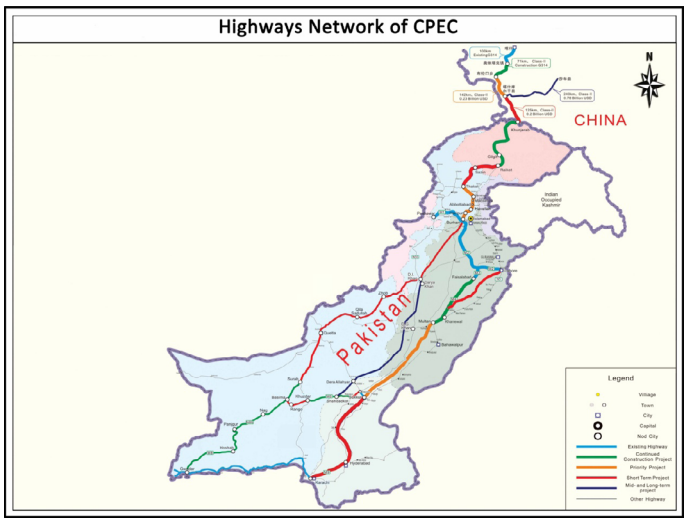

Figure 1: *Highways Network of CPEC.*
Source: China Pakistan Economic Corridor M/o Planning, Development and Special Initiatives.

Materials and Methods

As this is a review paper, therefore a large number of research papers and reports have been reviewed to examine the expected impact of CPEC projects on agriculture sector of Pakistan. This study also covers the impacts of infrastructure on agricultural growth and trade development. For this purpose, the available literature has also been reviewed. The already existing reviewed studies in this research article revealed that enhanced infrastructure show a strong bond between infrastructure and agriculture. Data on agricultural and China Pakistan Economic Corridor infrastructural developmental indicators were gathered from various secondary sources including website of China Pakistan Economic Corridor Ministry of Planning, Development and Special Initiatives, research articles, reports, business magazines, internet, thesis, books, reports and newspapers, to examine the importance of China Pakistan Economic Corridor from agricultural point of view. For identifying the problems faced by agriculture sector in Pakistan, scores of studies have been cited in the study. Furthermore, in the light of past and contemporary literature the role of CPEC in resolving these issues has been discussed in-depth.

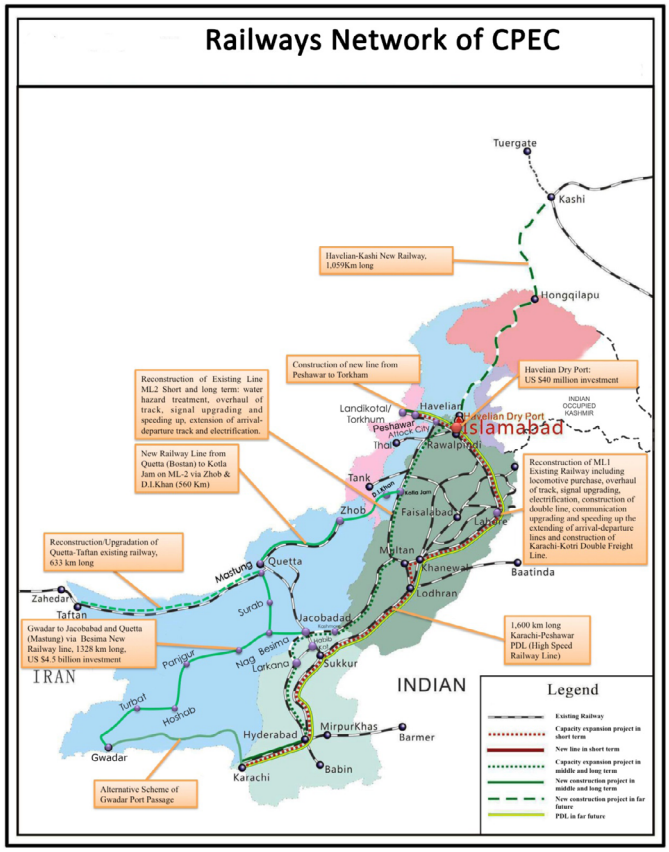

Figure 2: *Railways Network of CPEC.*
Source: *China Pakistan Economic Corridor M/o Planning, Development and Special Initiatives.*

Results and Discussion

Agriculture in Pakistan is facing a number of serious issues and challenges that have significantly affected agriculture and eventually the economy. Scores of studies have been carried out to identify the major constraints to agriculture sector. Among these some examples are studies of Sadaf *et al.* (2005), Obaa *et al.* (2005), Barnarda and Calitz (2011) and Alam and Naqvi (2003). Among the major constraints to production by smallholder farmers include water deficiency, poor extension services, use of expired insecticides, power shortages, absence of land reforms, availability of quality seeds, high prices of fertilizers, traditional farming techniques, smuggling of agricultural products, indirect entrance of farmer to the main market, non utilization of cultivable waste

land, reduction of forests, dependency on rainwater and lack of cooperation between modern research and extension.

Major agricultural issues in Pakistan

In this section the identified problems affecting agriculture sector in Pakistan will be discussed in depth.

Water deficiency: Agriculture in the country predominantly relies on irrigation both from surface and groundwater resources. The problem faced by Pakistan in agriculture sector is not different comparing to the other arid and semi-arid countries. Inadequate supply of water at the crucial time of crop growth is a major issue faced by the farmers. Poor water management, in-equitable water distribution within the canal and widening gap between water demand and supply are grave issues for agriculture in the country (Bhatti *et al*., 2009). Availability of water in the country is already beneath the scarcity level of 1000 m^3/person and climate change may further deteriorate the exiting situation (Qureshi and Ashraf, 2019). Pakistan a few years back, once known as a water-surplus country, presently, is among the water-scarce countries in the world. With the rapid declining of contemporary storage capacities and lack of additional storage facilities, the shortage of water will lead to severe food crises in the future and will seriously affect the national economy. The problem is immensely sensitive, demanding collective and long-terms initiatives to address effectively with water scarcity encountering various segments and region of the society.

Conventional or traditional farming practices: Inadequate contemporary farming practices and use of technology coupled with illiteracy, high costs and impracticality in case of small landholdings (Dwivedy, 2011) resulting in low production per unit area. Agriculture sector in Pakistan still portrays a traditional image of farming practices. A large number of people are leaving agriculture and opt for another occupation. Those who are still engaged in farming do not intend to use up to date agricultural techniques. Thus, put their livelihood at a serious risk and will force many other farmers to quit farming. Furthermore, this could substantially jeopardize the country's overall agricultural growth and sustainability.

Poor extension services: Agricultural extension is among the main driving factors accountable to boost agricultural yield by delivering the contemporary technologies to the farmers, to fulfill the mounting food demand of the growing population and eventually enhancing the national economy. The main objective of agricultural extension services is to assist farmers in adopting the latest farming technologies and improved management practices (Subedi and Garforth, 1996; Ali and Rahut, 2013). A number of studies revealed that agricultural extension services in the past were not somewhat effective due to the lack of sufficient information to educate the farmers (Rogers, 1987; Prinsley *et al*., 1994). A study carried by Maalouf *et al*. (1991) figured out most of the Asian farmers has no get in touch with the agricultural extension services. Antholt (1994) has identified a number of factors responsible for poor farming extension services including lack of financial resources, unqualified staff and inadequate planning. Generally agricultural extension services have completely failed to fulfill the particular site demands and issues faced by the farmers (Ahmad, 1999). The above case studies are true for Pakistan (Sofranko *et al*., 1998; Ahmad *et al*., 2000).

High price of fertilizers: Fertilizers subsidies play a significant role in boosting the average yield and productivity (Druilhe and Hurle, 2012; Khan *et al*., 2010). Subsidy is inevitable to maintain the fertilizer prices low and affordable by smallholder farmers (Eboh *et al*., 2006). Experts in agriculture sector have put emphasized on the significance of fertilizer use in enhancing agricultural production, highlighting the impressive outcomes on experimental fields and enormous differences in crop yield around the world with different levels of fertilizers use (Robert and Gollin, 2003). The use of fertilizers in Pakistan has seen a remarkable increase over the last five decades. Farmers have become more reliant on fertilizers for their agricultural yield that they have left with no other option but the balance utilization of fertilizer.

Long duration load shedding: Load shedding has various grave implications on the agriculture sector. Load shedding severely affects agricultural production, household income and food security level. Ali *et al*. (2019) conducted a study on the effects of Pakistan's energy crises on farm household. They found that decrease in load shedding would increase the crop yield, household income and reduce poverty. All the developing countries around the world that

enormously rely on agriculture would hugely take advantage from sufficient and low priced energy. Pakistan, nevertheless, is suffering from an inadequate supply of electricity as a result of its growing demands due to unprecedented increase in population and industrial development and agriculture (Ali *et al*., 2016). The hikes in energy price and continual load shedding have severely affected the pace and growth of economic development of the country.

Absence of land reforms: Land reforms generally include the expropriation of lands in private possession for relocation to the former landless workers and tenants. Agrarian reforms taken by China, Taiwan and Korea in the beginning encouraged a more impartial allotment of resources and income. This ultimately has improved the local market, increased employment opportunities in both industrial and agriculture sectors and boosting profitability in manufacturing (Dorner and Thiesenhusen, 1990; Malope and Batisani, 2008). Due to lack of land reforms and policies in Pakistan, the incentives and subsidies offer by the government are only benefited the landlords while harmed many poor households. Moreover, approximately 45% of the total land in Pakistan in occupied by only 2% of household.

Lacking quality seeds: Absence of good quality seed has a considerable impact on the germination as well as the overall vigor of the plant (Barnarda and Calitz, 2011). The low productivity is accredited to small yielding varieties, mismanagement practices and under-supply of quality seed including other factors (Aheisibwe *et al*., 2015). Aheisibwe *et al*. (2015) figure out that in Uganda found that most of the farmers were using home saved seed from the earlier harvests and conventional ware markets, having low quality and this ultimately is severely affecting the overall production. Similarly, in Pakistan due to limited supply of certified seed, poor management, lack of guidance by local seed distributors and poor quality seed, the yield per unit area is considerably low.

Limited access of farmer to the main market: The intervention of middlemen is among the main obstacles in enhancing the socioeconomic condition of poor farmers. Also, middlemen intervention increases prices for consumers. A study of Oguoma *et al*. (2010) on the implications of middlemen's in the supply chain of agricultural products. They pointed out that farmers come across high production costs in the efforts to amplify the yield but in return getting extremely low price of their products from the middlemen. However, the real profit goes to the middlemen, who buy up the farm products at comparatively low costs, and trade it at exceeding high prices.

Smuggling of agricultural products: Smuggling of agricultural products has considerably increased over time and has severely affected the agriculture sector. Among crops rice and wheat while urea among fertilizers is smuggled across Pak-Afghan border. During the year 2019, the price surge more than 30 percent within six months, betrays the soundness of our entire wheat economy. It is an obvious example of the lack of cooperation among federal and provincial governments (Dawn, 2019).

Disease outbreaks: Disease outbreaks can cause a severe economic detriment. Households that rely on livestock; those losses may lead to significant decline in household earnings (Solomon, 1990). Pakistan is among the top milk producing countries across the globe with its 42 million tons (Ferrari, 2012). Buffaloes and cows are the key animals producing milk, with around 62 percent milk produced by buffaloes and nearly 34 percent by cows. Per annum production of milk from buffaloes has shown a remarkable growth as it reached to 21.1 million tons from 14.9 million tones. Similarly, milk produced from cows record a gradual increase as it jumped to 9.4 million tons in 2006 from 7.4 million tons in 1996 (Ferrari, 2012).

Non utilization of cultivable wasteland: Pakistan total arable land is about 33.63 million hectares and out of this total some 8.22 million hectares is under cultivable wasteland. The growth rate of bringing cultivable wasteland to farmland has remained quite low in the last couple of decades, even for some years it remained negative (Khan and Hye, 2010). With the rapid pace of urbanization and industrialization most of fertile agricultural land is converting to built-up areas influencing urban landscape, quality of life and natural environmental (Wu *et al*., 2006) and food security issues (Thompson and Prokopy, 2009).

lacking modern harvest technologies

The post harvest losses are the main factors that determine the final yield of a country. Post-harvest loss in terms of value and consumers quality attribute can occur at any stage during harvest and consumption.

Losses may be intensify by poor harvesting techniques and post-harvest handling procedures, infrastructure, distribution, sales and marketing polices (World Bank *et al*., 2011). Similarly, Pakistan is also confronting significant post-harvest losses due to lack of advanced storage facilities, poor infrastructure, limited number of processing units and slow transportation.

Absence of organized crop insurance policy: Due to lack of organized crop insurance policy in the country, in case of natural disaster such as flood, droughts and desertification, fire, disease outbreak and insect attack etc. Any loss during the natural calamity there is no such insurance plan to help the poor farmers. If the losses of these small land holders are high, this consequently affects the overall agriculture in the country.

Role of CPEC in addressing these problems

China Pakistan Economic Corridor is one of the major economic projects across the globe in which not only Pakistan and China will get benefits but the whole regions directly or indirectly as well. Agricultural sector which is contributing about 18.9 percent in the GDP of Pakistan could get the direct or indirect benefit from China Pakistan Economic Corridor by mean of development of forward and backward nexus (Economic Survey of Pakistan, 2017). China Pakistan Economic Corridor is a network of infrastructure development programs that can boost Pakistan agriculture sector. A number of studies have been carried out to study the relationship between developed infrastructure and growth in agriculture sector. These studies include that of Murgai *et al*. (2001), Evenson and Gollin (2003), Saleth *et al*. (2003), Fan *et al*. (2004), Shah and Singh (2004) and Kamran *et al*. (2020). Furthermore, provision of electricity to the rural area increases irrigated areas, enhances irrigation facilities and ultimately increases crop production (Vaidyanathan *et al*., 1994; Shah and Singh, 2006). A study carried out by Datt and Ravallion (1998) on farm productivity and rural poverty in India. They pointed out that states with advance infrastructure achieved higher level of agricultural output than those states with low infrastructure development. All the above mentioned studies revealed that lack of developed infrastructure is one of major barrier in agricultural growth and development. CPEC would play a significant role in uplifting of Pakistan agricultural industry. CPEC will go through different ecological zones of Pakistan, therefore, it will bring phenomenal change in agricultural yield which would ameliorate the provision of agricultural merchandise in the regions.

Table 1: *CPEC-energy priority projects.*

Sr.	Project name	MW	Cost (US$ M)
1	Sahiwal 2x660 MW Coal-fired, Power Plant, Punjab	1320	1912.2
2	Coal- fired Power Plants 2x660 MW at Port Qasim Karachi	1320	1912.2
3	HUBCO coal power plant, Hub Balochistan	1320	1912.2
4	Thar Mine Mouth Oracle Power Plant and Surface Mine	1320	
5	Engro Thar 2x330 MW coal-fired, Thar, Sindh Surface mine in block ll of Thar Coal field, 3.8 metric tons per annum (mtpa), Thar, Sindh	660	99.4 630
6	Quaid-e-Azam 1000 MW solar park, Bahawalpur, Punjab	1000	1301
7	Suki Kinari Hydro Power Station, Naran, Khyber Pakhtunkhwa	870	1707
8	Karot Hydropower Station	720	1698.26
9	HUBCO Thar Coal Power Project (Thar Energy)	330	497.70
10	Gwadar Coal/LNG/Oil Power Project, Gwader	300	542.32
12	UEP Wind Farm, Jhimpir, Sindh	99	250
13	Hydro China Dawood Wind Farm (Gharo, Thatta) Sindh	49.5	112.65
14	Sachal Wind Farm (Jhimpir, Thatta, Sindh)	49.5	134
15	SSRL Thar coal block 1–6.5 metric ton per annum (mpta) Thar, Sindh	1320	1912.12
16	Matiari to Lahore transmission Line		1658
17	Three Gorges Second and Third Wind Power Project	100	150

Source: *China Pakistan Economic Corridor M/o Planning, Development and Special Initiatives.*

Pakistan's energy sector: In China Pakistan Economic Corridor the main focus is given to energy sector. Approximately $33 billion is allocated for electricity generation through natural resources such as solar, nuclear power reactors, wind, coal and hydro energy which will add more 10400 megawatts of energy in power system of Pakistan (Tables 1 and 2) (Ali *et al*., 2018). About $2.5 billion will be spent on the construction of pipelines for transporting LNG (Liquefied natural gas) from Iran to Pakistan (Nawab Shah and Gwadar). Under CPEC about 15 energy projects will be completed and these will generate some 11,110 MW. These projects will increase to 13180 MW to the national grid by 2022 and will decrease the energy crises. Furthermore, government has already started the construction work on Diamer-Bhasha Dam which is one of the biggest dam in the history of the country. This dam will be built on Indus River in Gilgit-Baltisan. The project after completion will provide low cost electricity, water for irrigation and create jobs. The dam is being constructed with financial support of China. It is important to mention that due to energy crises Pakistan GDP has shrunk by nearly 2.5%. With the completion of these mega projects the energy crises will be solved and GDP of the country will advance in the forward direction.

Table 2: *CPEC-energy actively promoted projects.*

Sr.	Project Name	MW	Estimated cost (US$ M)
18	Kohala Hydel Project AjK	1100	2364.5
19	Cacho Wind Power Project	50	
20	Western Energy (Pvt.) Ltd Wind Power Project	50	
21	Azad Pattan Hydel Project, AJK	701	1650

Source: *China Pakistan Economic Corridor M/o Planning, Development and Special Initiatives.*

Infrastructure for transport: The second most important component of China Pakistan Economic Corridor is to build and upgrade Pakistan's transportation network (Figure 1). Some $12 billion is allocated to enhance transportation including railway and highways networks (Tables 3). Pakistan's agricultural growth is continuously declining but as noted by Kamran *et al*. (2020) in his work on the impact of CPEC on agriculture sector of Pakistan, they figured out that a positive correlation exists between infrastructure development and agricultural production. Lahore will be linked with Karachi by motorway beside this the main cities will be connected though highways and road networks that will ultimately boost Pakistan's GDP.

Table 3: *CPEC-potential energy actively projects.*

Sr.	Project Name	MW	Estimated Cost (US$ M)
22	Phander Hydropower Station	80	
23	Gilgit KIU Hydropower	100	

Source: *China Pakistan Economic Corridor M/o Planning, Development and Special Initiatives.*

Agro-technology: In the area of agro-technology, Pakistan needs modern infrastructure, conservation and protection and water resources utilization and disease prevention. Nevertheless, China can employ its expertise to boost Pakistan's irrigation and agricultural system and to standardize the country's post-harvest handling techniques, up to date modern storage facilities, increase the number of processing units and transportation of agricultural products including sales and marketing. The transformation of out-dated traditional infrastructure in Pakistan would consequently enhance the agricultural production or yield (Hilali, 2019). Therefore, Pakistan is taking assistance from China to ameliorate drip irrigation technology for water capacity, livestock breeding, crop farming, forestry and food growing.

Crop insurance policy for small landholders: The government should introduce crop insurance policy to support these poor farmers or smallholders to improve or enhance their socioeconomic conditions. According to this policy the government must provides seeds, fertilizers and pesticides on subsidize rates to the small landholders.

Control of smuggling agricultural products: The government needs to take strict measures to stop the smuggling of agricultural products across the border. The measures include the interventions of border forces and security check posts along the border.

Utilization of cultivable wasteland: Cultivable wasteland covers some 8.2 million hectares of land in the country. The government needs to make policy to bring this huge amount of wasteland under plough. In 2012, the government was planning to give the cultivable wasteland to unemployed graduates, 50 acres each, on lease basis initially for a time period of five years. However, the land has not been allotted to these graduates till now. This will not only create

job opportunities for about 80 thousand agriculture graduates but also enhance agricultural production (Dawn, 2012).

Conclusions and Recommendations

The current study highlights the problems confronted by Pakistan in agriculture sector and the impact of CPEC's in addressing these problems. The analysis figured out that agriculture sector is one of the main sectors in boosting the economy of Pakistan as it provides employment opportunities in the rural areas. agriculture sector is playing a major role in the economy of Pakistan but since the last few decades its growth rate is moving in a descending direction. The economy which was in a declining position has seen a remarkable improvement with the announcement of China Pakistan Economic Corridor. Problems that are affecting agricultural production including water deficiency, long duration load shedding, traditional farming practices, poor extension services, high prices of fertilizers, lack of land reforms, indirect access of farmer to the main market, disease outbreaks, lack of modern post harvest technologies The outcome of this paper shows a positive relationship between agriculture output and infrastructure (Kamran *et al*. 2020), energy, agro-technology and improved irrigation facilities. With the successful completion of these mega projects such as energy and infrastructure development under CPEC will enhance the agricultural production and trade, provides more job opportunities and therefore decline the level poverty.

Novelty Statement

This study makes an attempt to identify the problems faced by agriculture sector and the role of CPEC's in addressing these issues.

Author's Contribution

Pukhtoon Yar: Designed the work, acquisition of data, analysis and writing and revised the manuscript.
Salman Khan: Data analysis and helped in preparing the initial manuscript.
Du Ying: Reviewed the literature and help in editing the manuscript
Muhammad Israr: Helped in provision of data and interpretation of data

Conflict of interest

The authors have declared no conflict of interest.

References

Abdullah., D. Zhou, S.A. Khan, K. Jebran and A. Ali. 2015. Agricultural credit in Pakistan: Past trends and future prospects. J. Appl. Environ. Biol. Sci., 5(11): 178-188.

Ahmad, M., A.P. Davidson and T. Ali. 2000. Effectiveness of public and private sectors extension: Implications for Pakistani farmers. Paper at 16th Annual Conference of AIAEE held at Arlington, VA.

Ahmad, M. 1999. A comparative analysis of the effectiveness of agricultural extension work by public and private sectors in Punjab, Pakistan. PhD thesis. University of New England, Armidale NSW.

Ahmad, I.M., L. Oxley and H. Ma. 2020. What makes farmers exit farming: A case study of Sindh Province, Pakistan. Sustainability, 12(8): 3160. https://doi.org/10.3390/su12083160

Ahmad, M. 2020. Developing a competitive agriculture and Agro-based Industry under CPEC. In: Syed J., Ying YH. (eds) China's Belt and Road Initiative in a Global Context. Palgrave Macmillan Asian Business Series. Palgrave Macmillian, Cham. https://doi.org/10.1007/978-3-030-18959-4_10

Aheisibwe, A.R., A. Barekye, P. Namugga and A.A. Byarugaba. 2015. Challenges and opportunities for quality seed potato availability and production in Uganda. Uganda J. Agric. Sci., 16(2): 149-159. https://doi.org/10.4314/ujas.v16i2.1

Ashfaq, M. and I. Jan. 2019. Effects of climate change on productivity of maize crop in Khyber Pakhtunkhwa. Sarhad J. Agric.,35(3): 925-932. https://doi.org/10.17582/journal.sja/2019/35.3.925.932

Antholt, C.H. 1994. Getting ready for twenty-first century: Technical change and institutional modernization in agriculture. world bank technical paper No. 217. Washington D.C. World Bank. https://doi.org/10.1596/0-8213-2510-8

Alam, S.M., and M.H. Naqvi. 2003. Pakistan Agriculture. The gap between supply and demand of agricultural products is widening day by day. NIA, Tando-Jam, Pakistan.

Ali, A., and D.B. Rahut. 2013. Impact of Agricultural extension services on technology adoption and crops yield: Empirical evidence from Pakistan. Asian J. Agric. Rural Dev., 3(11): 801-813.

Ali, A., D.B. Rahut and B. Behera. 2016. Factors influencing farmers adoption of energy-based water pumps and impacts on crops productivity and household income in Pakistan. Renew. Sustain. Energy Rev., 54: 48-57. https://doi.org/10.1016/j.rser.2015.09.073

Ali, A., D.B. Rahut and M. Imtiaz. 2019. Effects of Pakistan's energy crises on farm households. Utilities Policy. pp. 59. https://doi.org/10.1016/j.jup.2019.100930

Ali, A., J. Shang and U. Saif. 2018. Socio-economic impact of CPEC on agricultural productivity of Pakistan: A principal component analysis. Int. J. Food Agric. Econ., 6(3): 47-57.

Barnard, A., and F.J. Calitz. 2011. The effect of poor quality seed and various levels of grading factors on germination, emergence and yield of wheat. S. Afr. J. Plant Soil, 28(1): 56-59. https://doi.org/10.1080/02571862.2011.10640009

Bhatti, A.M., P. Suttinon and S. Nasu. 2009. Agriculture water demand management in Pakistan: A review and perspective. Soc. Soc. Manage. Syst., 9(172): 1-7.

Chaudhary, D.R., 2017. China-Pakistan-Economic Corridor Fuels Fear of Social Upheaval. (Online) Economic Times Bureau. Available at: http://energy.economictimes.indiatimes.com/news/power/china-pakistan-economic-corridor-fuels-fears-of-social-upheaval/58568559 [Accessed 21, July, 2020]

Fan, S., S. Jitsuchon, and J. Methakunnavut. 2004. The importance of public investment for reducing rural poverty in middle income countries: The case of Thailand. DSGD Discussion Paper No.7, International Food Policy Research Institute.

Datt, G. and M. Ravallion. 1998. Farm productivity and rural poverty in India. J. Dev. Stud., 34(4): 62-85. https://doi.org/10.1080/00220389808422529

Dawn. 2019. A crushing wheat crises. https://www.dawn.com/news/1516010 (Accessed on June 8, 2020).

Dawn. 2012. Cultivable wasteland for agricultural graduates. https://www.dawn.com/2012/01/15/cultivable-waste-land-for-agriculture-graduates/ Accessed on 28 July 2020.

Druilhe, Z., and J.B. Hurle. 2012. Fertilizer Subsidies in Sub-Saharan Africa. ESA Working Paper No. 12-04.

Dorner, P., and W.C. Thiesenhusen. 1990. Selected land reforms in east and Southeast Asia: Their Origins and Impacts. Asian-Pac. Econ. Lit., 4(1): 65-95. https://doi.org/10.1111/j.1467-8411.1990.tb00025.x

Dwivedy, N. 2011. Challenges faced by the agricultural sector in developing countries with special reference to India. Int. J. Rural Stud., 18(2).

Economic Survey of Pakistan, 2017-18. Ministry of Finance, Government of Pakistan. Retrieved from http://www.finance.gov.pk/survey/chapters_18/02-Agriculture.pdf

Eboh, E.C., O.C. Ujah and E.C. Amaechina. 2006. Do government fertilizers subsidies benefit rural farmers in Nigeria? Making sense out of existing data. PMMA Network Session Paper. Addis Ababa, Ethiopia.

Evenson, R.E. and D. Gollin. 2003. Assessing the impact of the green revolution: 1960 to 2000. Science, 300: 758-762. https://doi.org/10.1126/science.1078710

Fan, S., S. Jitsuchon and J. Methakunnavut. 2004. The importance of public investment for reducing rural poverty in middle income countries: The case of Thailand. DSGD Discussion Paper No.7, International Food Policy Research Institute.

Ferrari, G., L. Tasciotti, E. Khan and A. Kiani. 2012. Foot and mouth disease and its effect on milk yield: An economic analysis on livestock holders in Pakistan. Transboundary and Emerging Diseases. https://doi.org/10.1111/tbed.12072

Government of Pakistan (GOP). 2005. Economic Survey 2004-05. Finance Division. Economic Advisors' Wing, Islamabad.

Government of Pakistan (GOP). 2014. Finance Ministry, Economic Survey of Pakistan.

Government of Pakistan (GOP). 2017. Provincial summary results of 6th population and housing census 2017 Islamabad: Pakistan bureau of statistics.

Hilali, A.Z. 2019. China-Pakistan Economic Corridor (CPEC): A multi- dimensional plan 2017-2030 and its characteristics. South Asian Studies. Res. J. S. Asian Stud., 34(2): 649-666.

Hussain, I. and M.A. Hanjra. 2003. Does irrigation water matter for rural poverty alleviation? Evidence from South and South-East Asia. Water Policy, 5(5- 6): 429-442. https://doi.org/10.2166/wp.2003.0027

Iqbal, A. 2015. Chinese investments dwarf American package: US media. The Dawn. Islamabad.

Jan, I., H. Khan and M. Jalaludding. 2008. Analysis of agricultural extension system: A discrepancy between providers and recipients of the extension services empirical evidence from North-west Pakistan. Sarhad J. Agric., 24(2).

Jan, I. 2007. Institutional changes in agricultural support services in rural Northwest Pakistan. Socioeconomic Studies on Rural Development. Vol 140. Wissenchaftsverlag Vauk Kiel KG, Germany.

Jan, I. 2020. Socio-economic determinants of farmers' adoption of rainwater harvesting systems in semi-arid regions of Pakistan. J. Agric. Sci. Tech., 22(2): 377-387.

Jawad and F. Rana. 2013. CPEC: Internal significance and challenges www.stratagem.pk/strategic-pulse/cpec-interanl-significance-and-challenges

Johnson, M.P. 2001. Environmental impacts of urban sprawl: A survey of the literature and proposed research agenda. Environ. Plann., 33: 717-735. https://doi.org/10.1068/a3327

Kamran, A., N.A. Syed, S.A. RizviB. Ameen and S.N. Ali. 2020. Impact of China-Pakistan Economic Corridor (CPEC) on Agricultural Sector of Pakistan. Int. Conf. Manage. Sci. Eng. Manage. Springer, Cham. pp. 538-549. https://doi.org/10.1007/978-3-030-49889-4_42

Khan, H.G.A., A. Ahmad and A. Siraj. 2010. Impact of rising prices of fertilizers on crops production in Pakistan. Glob. J. Res. Manage. Bus. Res.,

Khan, R.E.A. and Q.M.A. Hye. 2010. Agricultural land expansion in Pakistan: An empirical analysis. In 2010 EABR and ETLC Conference Proceedings.

Obaa, B., J. Mutimba and A.R. Sermana. 2005. Prioritizing farmers' extension needs in a publicly-funded contract system of extension: A case study from Mukono District, Uganda. Agric. Ext. Network. Network Paper No. 147.

Oguoma, O.N., V.I. Nkwocha and I.I. Ibeawuchi. 2010. Implications of middlemen in the supply chain of agricultural products. J. Agric. Soc. Res., 10(2). https://doi.org/10.4314/jasr.v10i2.67575

Malope, P. and N. Batisani. 2008. Land Reforms that exclude the poor: The case of Botswana. Dev. Southern Afr., 25(4): 383-397. https://doi.org/10.1080/03768350802316179

Maalouf, W.D., R. Adhikarya and T. Contado. 1991. Extension coverage and resources problems: The need for Public-Private Co-operation; in Rivera, W.M., and Gustafson, D.J (eds). Agricultural Extension: Worldwide Institutional Evaluation and Forces for Change. Amsterdam: Elsevier Science.

Murgai, R., M. Ali and D. Byerlee. 2001. Productivity growth and sustainability in post green-revolution agriculture: The case of Indian and Pakistani Punjabs. World Bank Res. Observer., 16(2): 199-218. https://doi.org/10.1093/wbro/16.2.199

Noor, S., S. Shah, M. Ali, S.M. Khan and S.F. Ali. 2008. Pakistan's foreign policy: Quarterly survey: April — June. 2008. Pakistan Horizon. Pak. Inst. Int. Aff., 61(3): 1-9.

Oguoma, O.N., V.I. Nkwocha and I.I. Ibeawuchi. 2010. Implications of middlemen in the supply chain of agricultural products. J. Agric. Soc. Res., 10(2). https://doi.org/10.4314/jasr.v10i2.67575

Prinsley, R., J. Dore, N. Marks, N. McGukian and P. Thompson. 1994. The role of private sector in extension: A working paper. Rural Ind. Res. Dev. Corp. Occas. Pap. Australia. 94(3).

Qureshi, R.H. and H. Ashraf. 2019. Water security issues of agriculture in Pakistan. Pak. Acad. Sci. (PAS), Islamabad, Pakistan.

Robert, E. and D. Gollin. 2003. Assessing the impact of the green revolution, 1960 to 2000. Science, 300(2): 758-762. https://doi.org/10.1126/science.1078710

Rogers, W.L. 1987. The private sector: Its extension systems and public/private co-ordination, in Rivera, W. M., and Schram, S.G. (eds). Agricultural Extension Worldwide: Issues Practices and Emerging Priorities. London: Croom Helm.

Sadaf, S., S. Muhammad and T.E. Lodhi. 2005. Need for agricultural extension services for rural woman in Tehsil Faisalabad-Pakistan. J. Soc. Sci., 1(3): 248-251.

Saleth, M.R., M. Samad, D. Molden and I. Hussain.

2003. Water, poverty and gender: A review of issues and policies. Water Policy, 5(5-6): 385-398. https://doi.org/10.2166/wp.2003.0024

Shah, T. and O.P. Singh. 2004. Irrigation development and rural poverty in Gujarat, India: A Disaggregated Analysis. Water Int., 29(2): 167-177. https://doi.org/10.1080/02508060408691766

Sheikh, B.A., S.A. Sheikh and G.H. Soomro. 2005. Pakistan agricultural in global perspective. Review Paper. Pak. J. Agric. Agric. Eng. Vet. Sci., 21(2): 23-29.

Sofranko, A.J., A. Khan and G. Morgan. 1988. Insight into farmer-extension contacts. Evid. Pak. Agric. Admin. Ext., 30: 293-307. https://doi.org/10.1016/0269-7475(88)90101-8

Solomon, H. 1980. Animal health review Ethiopia 1972-1979. Ministry of agricultural livestock research development department veterinary service division. pp. 275-276.

Subedi, A. and C. Garforth. 1996. Gender, information and communication networks: implications for extension. Eur. J. Agric. Educ. Ext., 3(2): 63-74. https://doi.org/10.1080/13892249685300201

Thompson, A.W. and L.S. Prokopy. 2009. Tracking urban sprawl: Using spatial data to inform farmland preservation policy. Land Use Policy, 26: 194-202. https://doi.org/10.1016/j.landusepol.2008.02.005

Trading Economic. 2020. https://tradingeconomics.com/pakistan/arable-land-hectares-per-person-wb-data.html (accessed on 13/04/2020)

United Nations. 2005. World population prospects: The 2005 revision. The United Nations, Department of Economics and Social Affairs.

Usman, M. 2016. Contribution of agriculture sector in GDP growth rate of Pakistan. J. Glob. Econ., 4(2). https://doi.org/10.4172/2375-4389.1000184

Vaidyanathan, A., A. Krishanakumar, A. Rajagopal and D. Varatharajan. 1994. Impact of irrigation on productivity of land. J. Indian Sch. Polit. Econ., 6(4): 60-145.

World Bank, FAO and NRI. 2011. Missing food: The case of Post-harvest grain losses in Sub-Saharan Africa. Economic Sector Work Report No. 60371-AFR, World Bank, Washington, DC.

Wu, Q., H.Q. Li, R.S. Wang, S. Paulussen, Y. He and M. Wang. 2006. Monitoring and predicting land use change in Beijing using remote sensing and GIS. Lands. Urban Plann., 78(4): 322-333. https://doi.org/10.1016/j.landurbplan.2005.10.002