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PAS FORUM
PAKISTAN AGRICULTURAL SCIENTISTS FORUM

NATIONAL AGRICULTURE AND FOOD SECURITY IN PAKISTAN

Policy Monograph

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Executive Summary

The agriculture sector contributes 19.3% to national GDP, provides livelihood to 59.5% of rural population, has 58% share in total exports and 38.5% in total labor force. This reflects strong contribution of the sector to the national economy. Food security, which is directly related to the performance of agricultural sector, holds great significance in the 5th largest populated country of the world. Food security also plays a significant role in achieving Sustainable Development Goals (SDGs) as most of them are directly or indirectly linked to agriculture sector. Moreover, CPEC has enhanced the importance of food security while creating opportunities for equipping the sector with advanced technology. However, the sector is facing a lot of issues such as low agricultural yield, unsustainable farming methods and poor marketing systems for commodities. Add to it the issue of deteriorating economic condition of farmers which is primarily influenced by ill policies. This in turn has resulted in further deteriorating the growth of the sector in the past few years.

Keeping in view the increasing importance of agricultural sector and rising concerns about food security, Institute of Policy Studies (IPS), Islamabad and Pakistan Agricultural Scientists Forum (PAS Forum) jointly conducted a policy dialogue on national agriculture and food security in Pakistan. This monograph is a compilation of the proceedings of the seminar.

Pakistan is 33rd largest country of the world in terms of its land area and 28% of its total land is used for crop cultivation. Most of the agricultural land is irrigated through five main rivers and therefore it is prone to heavy floods. The agriculture sector is prominently diverse as it boasts 11 different types of crops, five kinds of pulses, 32 types of vegetables, 30 kinds of fruits and various types of indigenous breeds of livestock. Pakistan ranks among the top ten countries for the production of cotton, sugarcane, wheat, buffalo, goat, sheep and milk.

While Pakistan has improved its position in the Global Hunger Index (GHI) during the last decade, it is still experiencing threat of low quality of agricultural produce due to a lesser amount of nutrients in the soil. The depletion of soil and introduction of new crop varieties having low density of micronutrients is resulting in malnutrition in children under the age of five, a weak and physically impaired young population, which is an alarming situation for national sustainability.

The biggest challenge for agricultural sector in this overall context is related to production which includes low crop yields due to mismanagement and minimal use of technology. The majority of rural population has small landholdings that result in hindrance in adopting modern farm technology. Besides lack of training and awareness of advanced technological means of agriculture as well as high production and input costs, poor seed quality and dearth of quality water for irrigation are also causing failure in achieving optimum levels of production. Rising post-harvest losses and low livestock and dairy production are also directly related to the production challenge.

The other challenges like marketing issues and climate change are also negatively impacting the agriculture sector. Some of the marketing issues are poor and non-standardized market infrastructure, absence of crop price determining mechanism and more benefits to middlemen. The challenges in the domain of climate change include rise in overall temperature, increase in CO_2 concentration and unpredicted rain and drought spells.

In order to address these challenges, a comprehensive and viable national policy is inevitable, while taking into consideration that agriculture is a provincial subject after the 18th Amendment, and as such incorporating the recommendations of all stakeholders. It should advocate enhancement of agricultural production, less reliance on food imports and exploring more export-related avenues. The policy should be comprehensive enough to address immediate short-term needs, provide guidelines for medium-term plans and lead to a long-term viable vision.

Crop yield is one of the main issues of production challenge and its enhancement needs incorporation of advanced agricultural technology and adoption of progressive farming techniques. But this cannot be achieved until we raise the landholding per farmer and in order to do that a large portion of culturable waste land (7 million hectares of total land) may be allotted

to farmers. Similarly, trained and well-informed farmers adopt technology and strategies that not only increase yield but also create employment. The modern concept of farmer training comprises interactive sessions between progressive farmers and extensionists along with research to sort out issues and devise solutions in a short time.

Agricultural production is also dependent on quality seeds and water. In this regard, a well-managed indigenous seed production system needs to be established that not only fulfills national demand but also ensures seed quality. Similarly, rain water needs to be preserved by building a large number of small water storage dams. This would help in dealing with water shortage and improving water quality for irrigation. Moreover, post-harvest losses, which cost the country billions of rupees, can be curtailed by arranging entrepreneurial training programs that equip local youth with the knowhow to process fruits and vegetables in an advanced manner.

A sector that holds great potential is edible oil production, which is still untapped. Various agricultural regions are highly suitable for oil-rich plants and by giving small incentives to local farmers, the country can save more than $1 billion annually which is spent on import of edible oil.

Strong and efficient working relationship between research, extension, and field is required. Linkages among research institutions and academia are also extremely poor and therefore need to be enhanced. The government is the best institution to engage and lead the different stakeholders towards focused directions and policy should be based on inputs from stakeholders.

United Nations Environment Programme has launched various projects on nitrogen and carbon management that should be endorsed vigorously as a member state. This will provide an opportunity to researchers and managers to gain expertise by getting involved in these projects and will help to devise internationally compatible policy. In the near future, the export of agricultural commodities will be strictly dependent on UN SDGs, therefore enhancing exports, as discussed earlier, is linked to sustainable and environmentally friendly agricultural practices and this is the right time to adopt those suggestions to make our products compatible for the international market.

Though the textile industry is contributing significantly to agricultural exports, attention is required in the domains of food products, fruits, dry fruits, meat and milk. In this regard, governmental subsidies and incentives need to be diverted towards those agricultural sub-sectors that have potential of expansion. China is a huge country and provides an opportunity for food and other agricultural exports under CPEC.

There is a need to enhance the socioeconomic status as well as public health which is directly related to plant, soil, animal and environmental health. Biofortification of staple crops with minerals and other micronutrients can be an economical option to improve public health. Pulses are cheaper but richer source of micronutrients than cereals and are environment friendly as well, which must be promoted at all levels. In addition, increasing milk production will enhance quality because low production leads to high demand which encourages malpractices in order to achieve the required quantity.

1. Introduction

Agriculture is the backbone of the national economy as it contributes 19.3% to GDP. Agriculture provides livelihood to 59.5% of the rural population and a significant share in exports of the country i.e. 58%. Furthermore, 38.5% of the total labor force is linked to agriculture, which reflects a strong engagement of the sector to the economy of Pakistan. Main contributories of the agriculture sector are crops, livestock, fisheries and forestry.

Pakistan, being the 5th largest population (~220 million) of the world with a population growth rate of ~2.0%, the role of agriculture sector holds greater significance in relation to food security (Figure 1). However, Pakistan's agriculture sector is facing a lot of issues such as low crop yield, unsustainable approaches, and poor marketing systems for commodities. The poor economic situation of the farmers is primarily influenced negatively by the national agricultural policies.

The UN introduced 17 Sustainable Development Goals (SDGs) in 2015 intended to be achieved over 15 years (2015-2030). Looking at the list of SDGs, food security and agriculture is directly or indirectly linked with the achievement of these goals. For example, goals of no poverty, zero hunger, clean water and sanitation, responsible consumption and production are directly linked, whereas good health and wellbeing, industry, innovation and infrastructure, climate change, life below water and life on land are also linked with agriculture and food security. Therefore, in order to achieve the goals of sustainable economic growth and society, the role of agriculture and food security holds pivotal position.

Currently relations between China and Pakistan are at a new point due to China-Pakistan Economic Corridor (CPEC). China's increasing role in the economic growth of Pakistan is creating opportunities for the agriculture sector as well. The advanced technology and agriculture research of China are the avenues that need to be explored under CPEC in order to achieve sustainable agricultural production.

In view of the above mentioned aspects, the Institute of Policy Studies (IPS) and Pakistan Agricultural Scientists Forum (PAS Forum) jointly conducted a policy dialogue[1] on national agriculture and food security in Pakistan. The current monograph is the result of the dialogue that aims to address the issues of agriculture sector of Pakistan and attain a sustainable agricultural system by utilizing benefits of CPEC. In addition to this, the study highlights the impact of climate change, urbanization at the cost of agricultural land, and way forward for agriculture sector. Figure 1 below illustrates the share of agriculture sector in economic growth of the country.

[1] It was held at Institute of Policy Studies, Islamabad on January 25, 2020. The speakers included Dr. Muhammad Azeem Khan (Chairman, PARC), Prof. Dr. Amanullah Malik (UAF), Prof. Dr. Anwar Hussain Gilani (VC, UOH) and Khalid Rahman (Executive President, IPS). The speakers emphasized productivity issues, potential and opportunities for agriculture sector in the context of CPEC and misconceptions regarding the Corridor. The discussion also covered issues of food availability, access and stability.

Economic Overview of Pakistani Agriculture

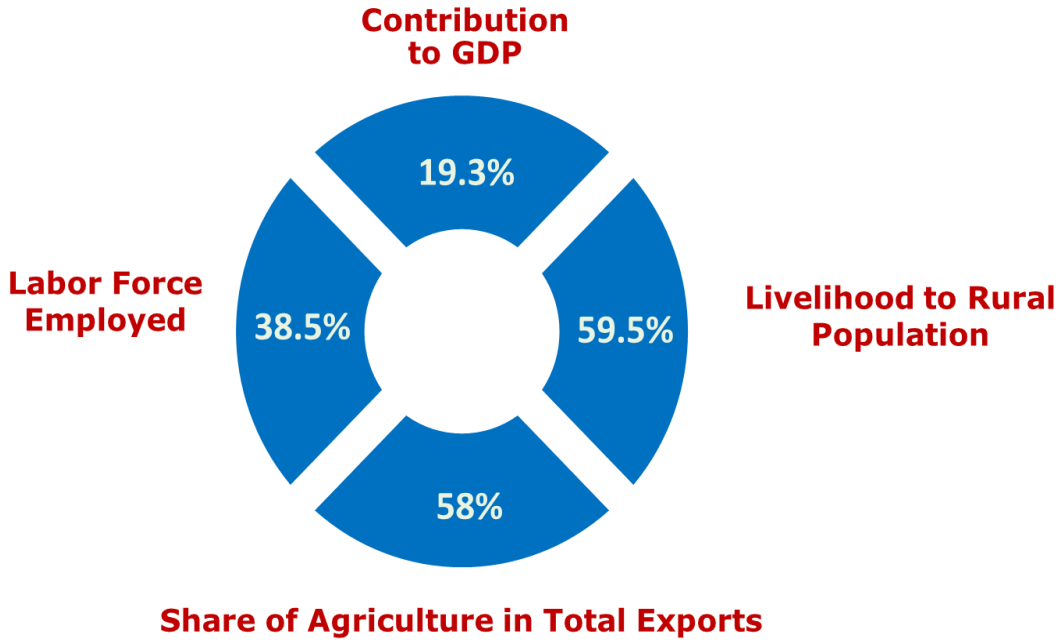


Figure 1: An overview of the role of agriculture sector in the country's economy. ***Data Source: Economic Survey of Pakistan 2018-19.***

The rest of the policy brief is organized into three sections and starts with the status of Pakistan's agriculture sector and policy issues. The third section of the brief highlights the challenges faced by agriculture sector in domains of production, marketing issues and climate change. The fourth section concludes the brief by providing comprehensive policy suggestions for enhancement of agricultural production.

2. Status of Pakistan's Agriculture and National Policy

2.1. Land Utilization and Crop Diversity

Pakistan is the 33rd largest country by area (latitude **30.3753° N**, longitude **69.3451° E)**. Its total land area is 79.6 million hectares out of which 50.8 million hectares is rangeland used for livestock grazing. More than 40% of the rangelands are in the province of Balochistan. About 28% of the total land (22.63 million hectares) is used for crop cultivation and most of this land (69%) is in the province of Punjab. Out of the total cropped area, 22.16 million hectares is cultivated area with 19.32 million hectares used for irrigated agriculture. About 8.37 million hectares is culturable waste, the land that can be cultivated but due to some limitations is not being cultivated (Figure 2). Most of the agriculture is irrigated through five rivers and therefore, majority of the agricultural lands are in the vicinity of these rivers and are prone to heavy floods as have been observed during the last decade. Annually 12 million acre feet of water flows into the Arabian Sea that could be utilized to cultivate 7 million hectares of culturable waste.

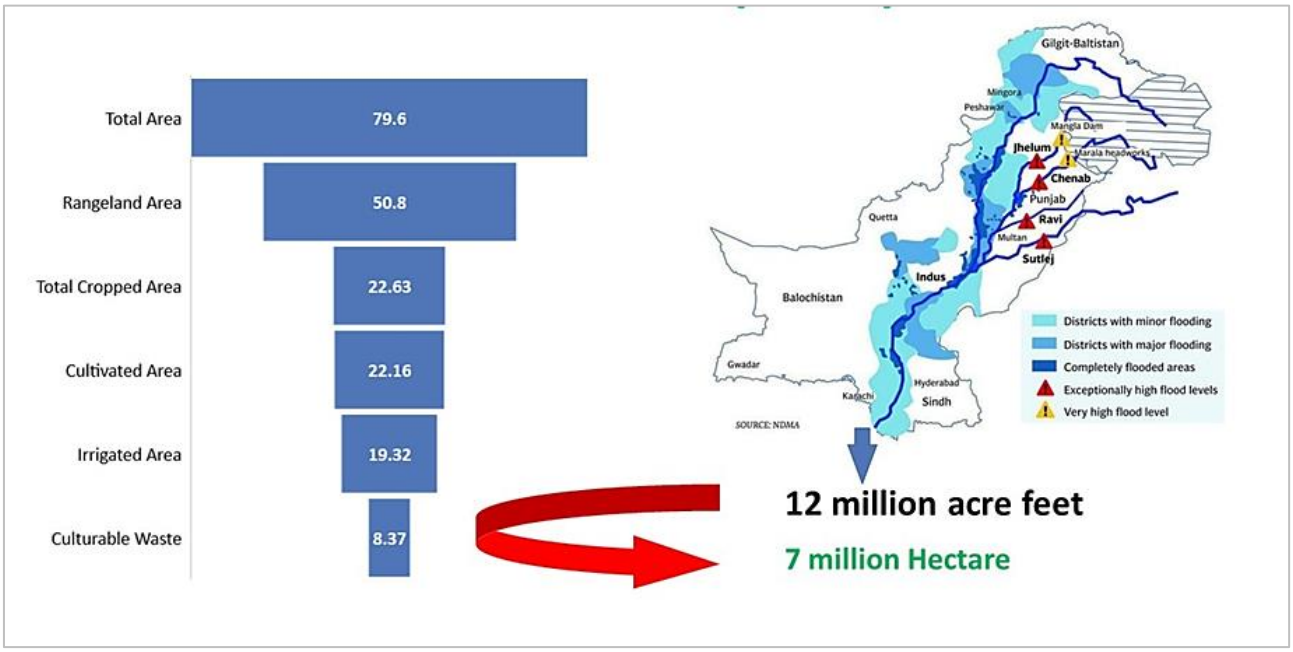


Figure 2: Land utilization of Pakistan in million hectares (left) and Pakistan map showing the geographical location of rivers highlighting the flood-prone areas (right).

Agriculture in Pakistan is very diverse as it includes 11 different crops, 5 kinds of pulses, 32 types of vegetables, 30 kinds of fruits, 5 different buffalo breeds, 31 breeds of sheep, 34 goat breeds and 15 varieties of cows. Pakistan is included in the top 10 agricultural countries of the world and ranked 4th in cotton production, 5th in sugarcane production, 9th in wheat production, 2nd in buffalo production, 3rd in goat production, 9th in sheep production and 5th in milk production (Figure 3). However, it has also become the 5th most populated country after overtaking Brazil and bears a big responsibility to feed such a huge population.

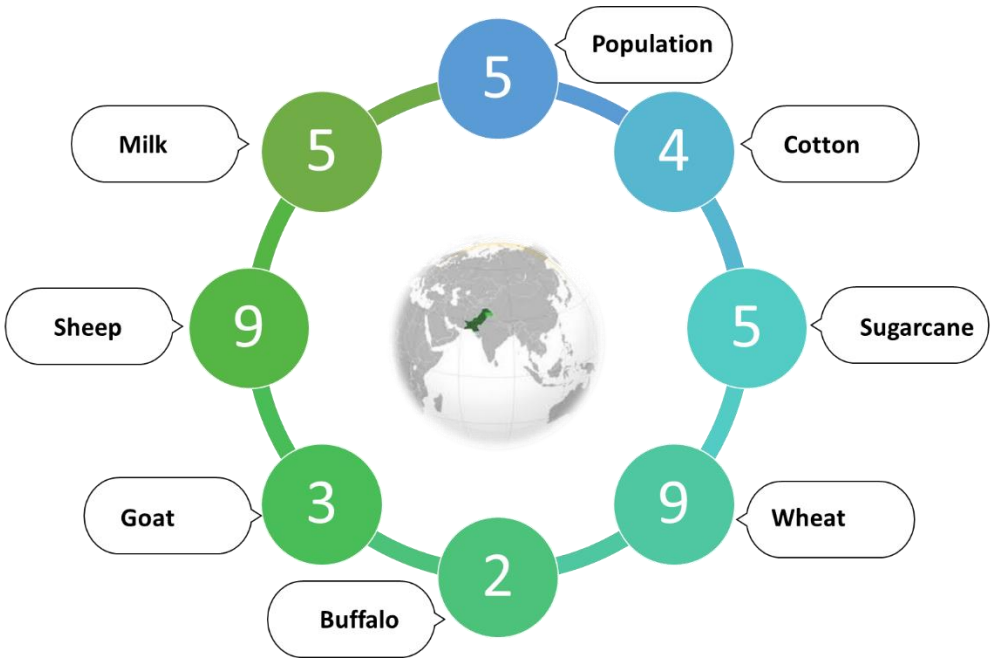


Figure 3: Global top 10 ranking of agricultural products of Pakistan. ***Data Source: FAO***

2.2. Crop Yields and Global Comparison

Pakistan is among the top ten agricultural producers of the world due to more cultivated area, but the average yield per unit is much less compared with global average. Developed countries with modern technologies, better management and consistent policies have high crop yields. In this regard, New Zealand ranks first followed by China for per hectare wheat production. Pakistan's average wheat production is about one-third of New Zealand and half if compared with China, and even less than the world average (Figure 4). A similar situation is seen in almost all other crops. For example, Australia's rice production is fivefold that of Pakistan. The cotton yield of Pakistan is 0.8 tons per hectare, whereas China is getting exactly twice that much, i.e. 1.6 tons per hectare, while Australia is the world leader in per hectare cotton production. Similarly, in sugarcane production Peru is ranked first followed by China whereas Pakistan's production is less than world average. Though maize production in Pakistan has improved, but still only progressive farmers can obtain good yields and the national average yield is still one-third of the world's highest, i.e. New Zealand, and less than the world average. Regardless of various reasons for low productions such as environmental factors and duration of growth, there exists a potential for widening the crop yield.

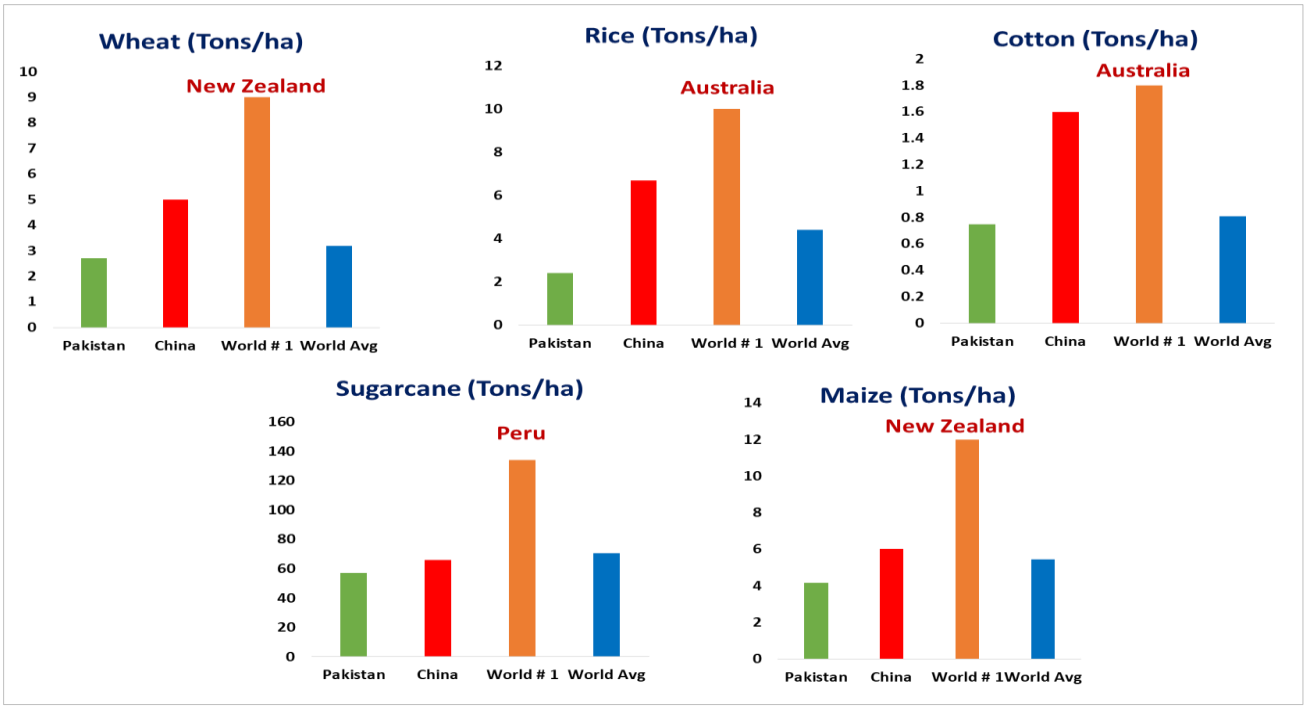


Figure 4: National average yield of five major crops of Pakistan in comparison to world average, neighboring China and the top-most ranking national average. ***Data Source: FAO***

2.3. Livestock and Milk Production

Statistics of the last four years show that the country's livestock population is increasing consistently (Figure 5). Increasing number of cattle, buffaloes and poultry enhanced beef and poultry meat production, however mutton production remained almost stagnant irrespective of the fact that the number of goats and sheep increased. The overall figure of meat production reveals reduction in per head meat production.

The major source of milk production in the country is cattle and buffaloes and a very small quantity is contributed by sheep and goats. Milk production is increasing every year due to various measures and increment in the number of livestock. However, milk production per animal per lactation is very less compared with the world average. Israel is getting maximum milk production per animal per lactation in the world. Pakistan has less than half of the milk production compared with the world average.

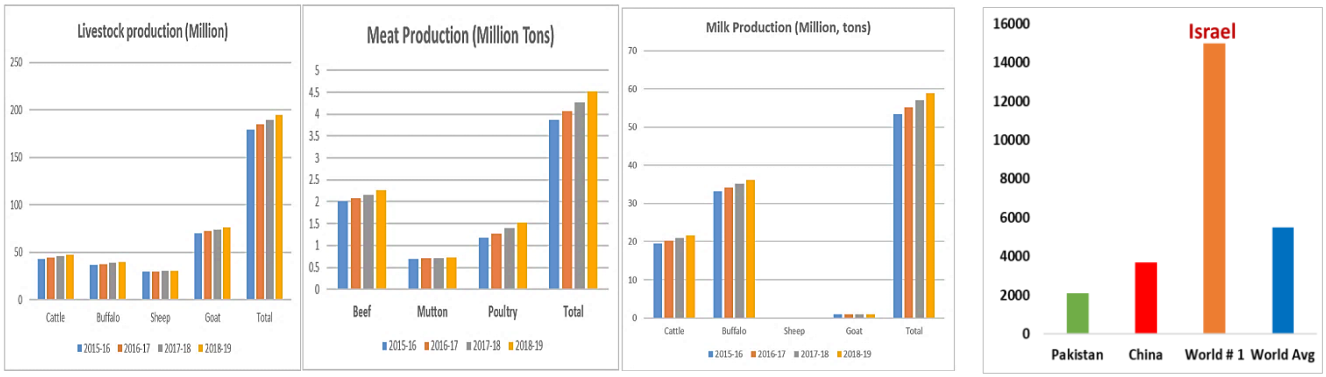


Figure 5: (Left) Livestock, meat and milk production in Pakistan during last four years. (Right) Per head milk production of cattle and buffalo in Pakistan, China, world average and the world No. 1 average (per head) milk producing country (Israel). ***Data Source: Pakistan Economic Survey of Pakistan 2018-19 and FAO***

2.4. Agricultural Growth Percentage (Base 2005-06)

Considering new technologies and interventions, agricultural growth has great importance to fulfill the requirements of a growing population. Data of last seven years reveal that agricultural growth has not been very constant, and even negative for some sectors during a couple of years (Figure 6). These are very frustrating numbers for a country where the contribution of agriculture sector to GDP is around 20%. Crop production is the most affected area and it showed negative growth in the year 2015-16. Forestry and fishing sectors have also followed the overall trend of unstable growth. The livestock sector showed consistency in growth, although very little governmental attention has been given to this sector. However, it has substantial potential of growth when compared with world averages.

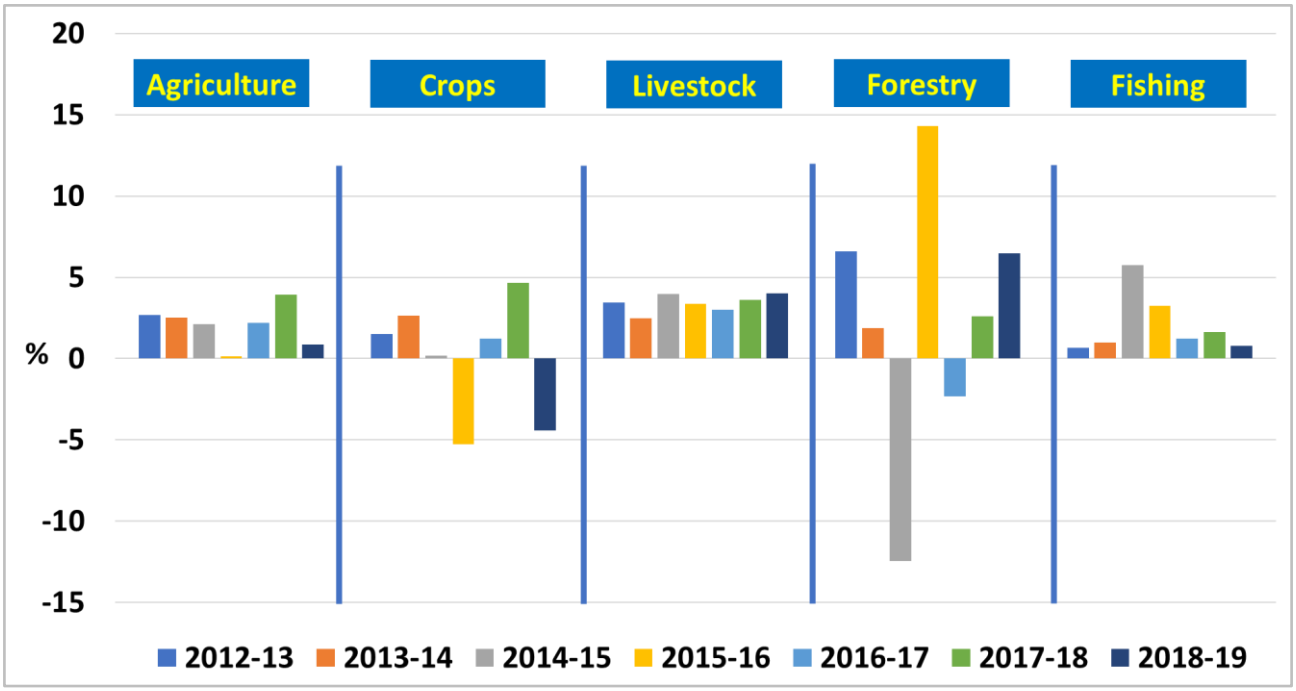


Figure 6: Growth (%) of agriculture and its various segments during last seven years taking 2005-06 as baseline. ***Data Source: Economic Survey of Pakistan 2018-19***

2.5. Malnutrition

The Global Hunger Index (GHI) for Pakistan in 2010 was 35.9 which has come down to 28.5 in 2019 but the situation is still considered to be serious according to the range table given by GHI below in Figure 7. The major threat in future may not be hunger itself but hidden hunger, which is being faced in most parts of the world especially in developing countries. Low quality of agricultural produce due to less nutrients available in the soils is causing micronutrient deficiencies in developing countries. Same is the case in Pakistan where anemic and stunted growth is much higher compared with the rest of the world. The prevalence of malnutrition in children under the age of five is becoming prominent. Among malnourished children more than 40% are stunted in growth, 18% wasted, and about 29% are underweight due to deficiency of some minerals or micronutrients (Figure 7). Also, 10% are overweight due to the surplus of one nutrient and deficiency of another nutrient. These are also undernourished conditions and a form of malnutrition. This is basically occurring due to depletion of the soil and new crop varieties with low micronutrient density in the human-edible parts. So, we are producing a weak and physically impaired young nation, which is an alarming situation for national sustainability.

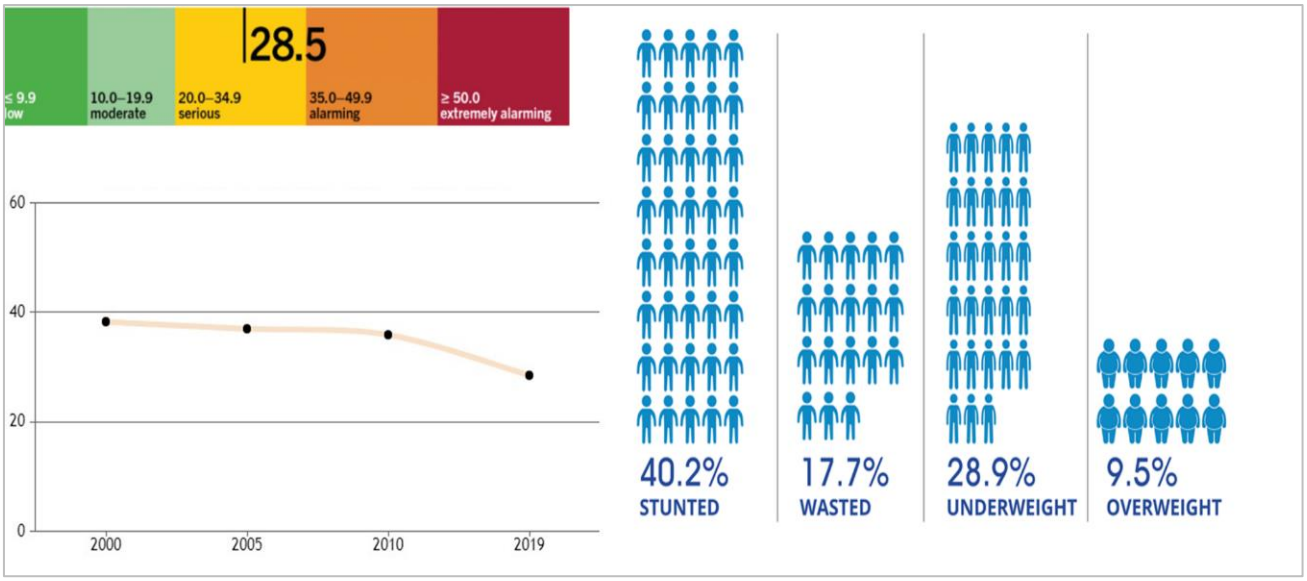


Figure 7: Global Hunger Index (left) and nutritional status of children under the age of five years in Pakistan as per National Nutrition Survey Pakistan 2018 (right). ***Data Source: www.globalhungerindex.org***

3. Current Challenges

There are a number of challenges that have been mentioned at various forums and discussions and mainly classified into three categories. The biggest challenge for agricultural sector in this overall context is related to production, while the other two categories having less weightage are marketing issues and climate change. Below is a detailed discussion about each challenge in order to highlight the crucial issues.

3.1. Challenges Related to Production

3.1.1. Low crop yields

A comparison of progressive farmers' yields and national average yields is shown in Figure 8 to quantify the yield gap. The recorded yield of wheat, cotton, sugarcane (in Sindh and Punjab), maize, and rice of progressive farmers' fields was almost double compared to the national average yield. This shows that the potential to improve crop yield can be achieved by exploiting proper management practices and resources. It has been further highlighted that conventional and progressive farmers located in the same area and having same land characteristics are obtaining different yields of a crop. A yield gap of more than 40% was found in all the above-mentioned crops in the comparison of progressive and national average yields.

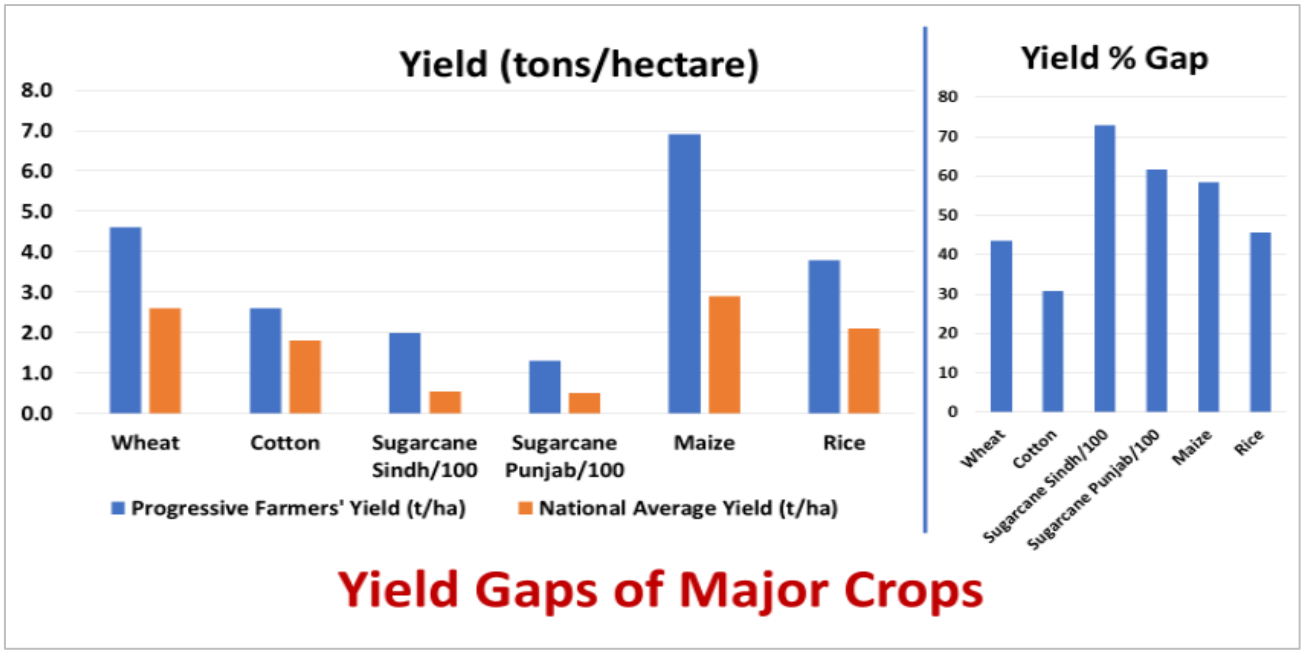


Figure 8: Gaps between progressive farmers' average yields and national average yields of major crops. ***Data Source: Pakistan Economic Survey 2018-19***

3.1.2. Small landholdings

Demographic distribution of Pakistani rural population in Figure 9 depicts that most of the community, i.e. more than 60%, is landless. Whereas around 15% of the rural population owns only 0-3 acres of land, some 7% hold 3-5 acres and about 10% have 5-12.5 acres (Figure 9). The rural population possessing land area of 12.5-25 acres and more than 25 acres is very small. The issue that emerges from these figures is that individual families having very small landholdings face hindrance in adoption of modern technological tools because of liquidity issues. Landholdings above 12.5 acres are considered as sustainable to feed a family under the conventional agricultural system. Even among this class of farmers, many are not able to access advanced technologies required for yield enhancement and farm profitability. While making policies, small landholders must be prioritized keeping in view their larger distribution and contribution to major agricultural production.

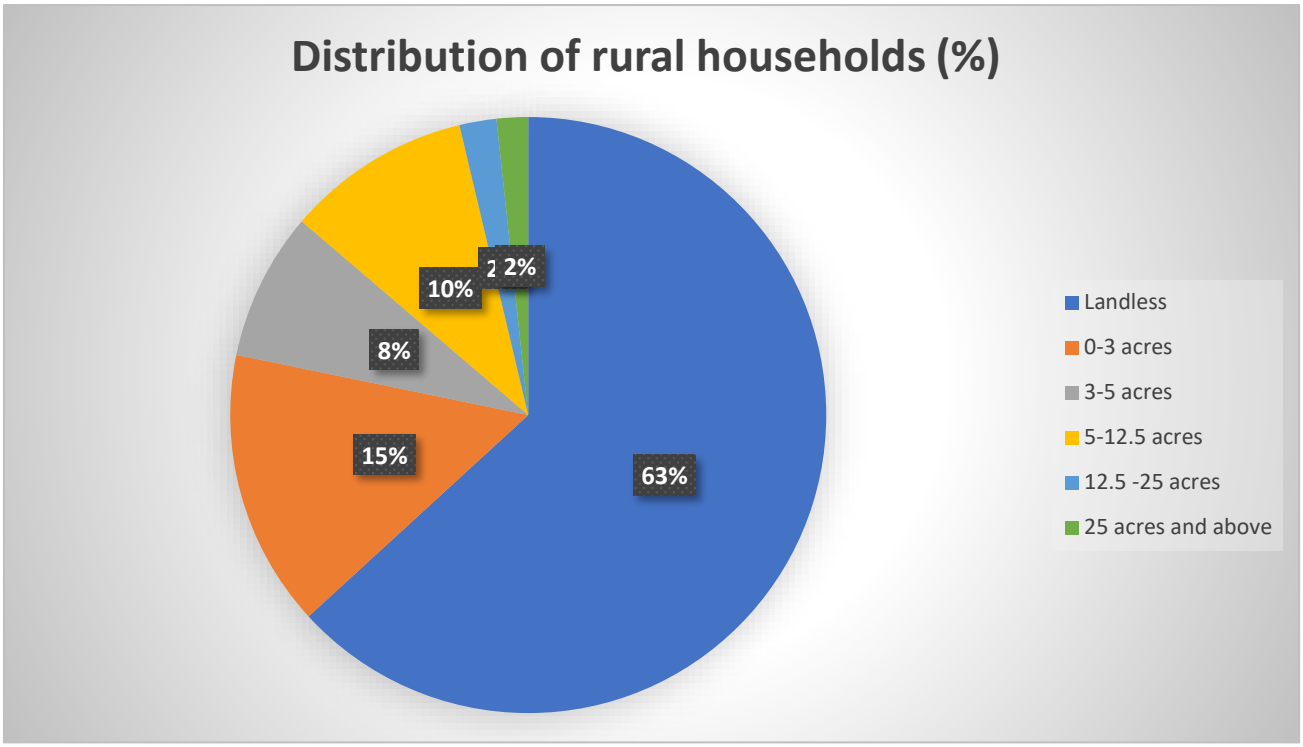


Figure 9: Landholdings of farmers in Pakistan. ***Data Source: Pakistan Bureau of Statistics***

3.1.3. Lack of awareness and training of farmers

Education is a key factor between progressive and conventional farmers for yield response and an efficient extension system can fulfill this objective. Poor extension services result in farmers who are less informed about modern agricultural technologies, quality seeds, and other farming needs. Ultimately this reduces farm productivity. A worrisome issue is that despite availability of contemporary advanced technology our farmers are still not fully aware of agricultural interventions.

3.1.4. High production cost

High relative input cost is another reason for low yields as the prices of seeds, fertilizers and pesticides have increased more rapidly compared to commodity prices. This can be explained better by comparing the relative input cost of wheat with the price of urea fertilizer bag. In 2008, 1.61 bags of urea fertilizer could be purchased by selling 40kg of wheat (Figure 10). In 2015 only 0.68 urea bags could be purchased and in 2019 the situation further worsened to 0.63 urea bags per 40kg of wheat. This shows farmers' capacity to add input to farming is decreasing. Though the prices of commodities have increased but the increment is less compared to the cost of inputs. Similarly, 0.75 bags of DAP fertilizer could be purchased by selling 40kg of wheat in 2008, 0.38 DAP fertilizer bags in 2015 and 0.33 bags in 2019. Adding the cost of pesticides to this calculation makes the situation worse. There are also other input costs such as seeds and pretreatment of seeds, which was not used earlier, and now farmers have to bear extra expenses. Similarly, micronutrients were not needed earlier. However intensive agriculture has exhausted the soil and now about 50% of the land is deficient in one or more micronutrients. Hence farmers have to spend more money on enriching the soil.

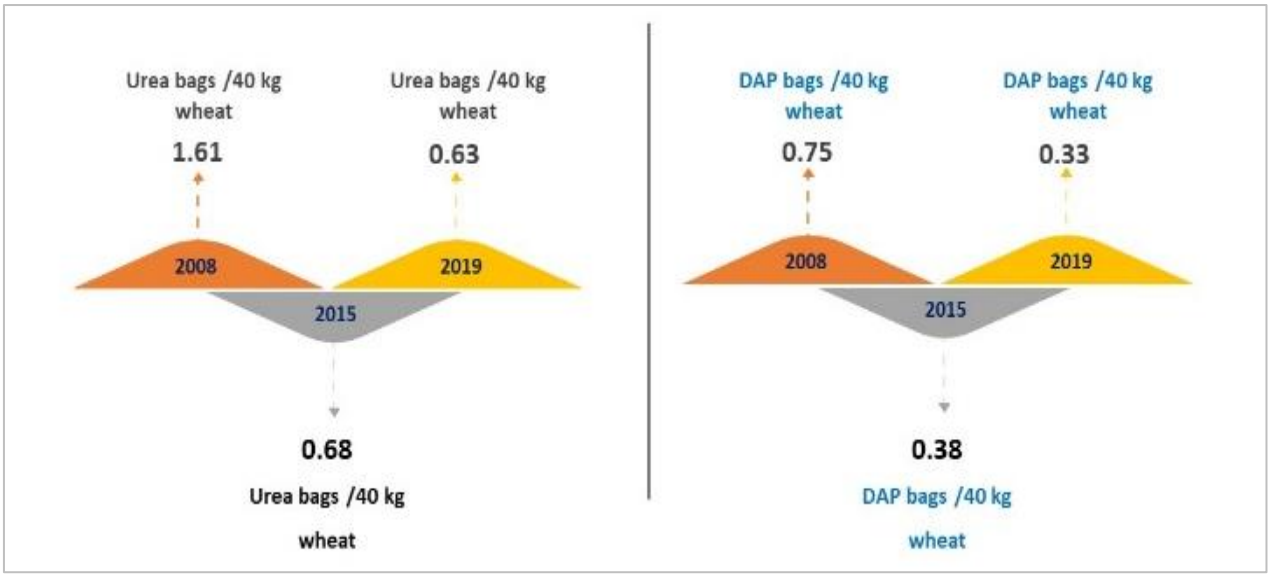


Figure 10: Relative cost of urea and DAP fertilizers with reference to wheat prices in 2008, 2015 and 2019.

3.1.5. Poor seed quality

Availability and quality of seeds is another worth mentioning aspect of low crop yield. Lack of availability of required amount of seeds for most of the crops along with the indigenous seeds stored by farmers without proper measures, results in less than needed supply. Taking wheat as an example, the total seed requirement of the nation is 10,000 metric tons (MT) but the available quantity is only 4,000 MT from all public and private sector seed providers. Similarly, the availability of oilseeds is nine times less compared to requirement and same is the case with potato seeds. As far as cotton is concerned, enough seed is available in the market but its reliability is not guaranteed and farmers are deceived by fake seed providers due to insufficient regulatory checks by the government. For most of the field crops and vegetables, the available seed amounts to only 39% and the remaining need is fulfilled through nonprofessional and nonscientific means, which ultimately lead to low yield and damage to soil and environment (Table 1).

Crop	Area 000 Ha	Total seed Requirement (MT)	Seed Availability (M.T)			
			Public	Private	Imported	Total (L+I)
Wheat	883	1,090,925	55,871	359,452	0	415,322
Cotton	2895	57,205	1,569	64,323	0	65,893
Paddy	2879	42,393	5,211	67,383	9,947	82,541
Maize	1328	32,794	734	2,560	18,901	22,195
Pulses	1185	42,674	672	1,652	0	2,323
Oilseeds	830	10,790	100	378	399	876
Vegetables	280	8,400	109	5,296	5,681	11,085
Fodders	2038	61,140	43	27,714	50,506	78,263
Potato	166	415,000	0	0	4,735	4,735
Total	20,435	1,761,321	64,309 4%	528,756 30%	90,169 5%	683,234 39%

Table 1: Status of availability of seeds of different crops through various sectors in Pakistan. ***Data Source: PARC chairman's presentation at a policy dialogue held at IPS in January 2020***

3.1.6. Low sustainable farming

Due to intensive crop production, the agricultural resources of Pakistan are losing their potential which is resulting to low economic yields. Most of the developed countries have adopted sustainable farming systems that ensure the health of soil, something Pakistan's farming system lacks. The soil is not being provided with enough inputs to retain its quality. Only a few farmers follow restorative agricultural practices, which can further worsen the situation in the future. Comparing globally, Pakistan is at the bottom in crop yield per unit while application of nitrogen is at a very high rate which indicates less response of soil to nitrogen utilization (Figure 11). There are very few organic inputs while balanced and integrated use of fertilizers is rarely practiced throughout the country.

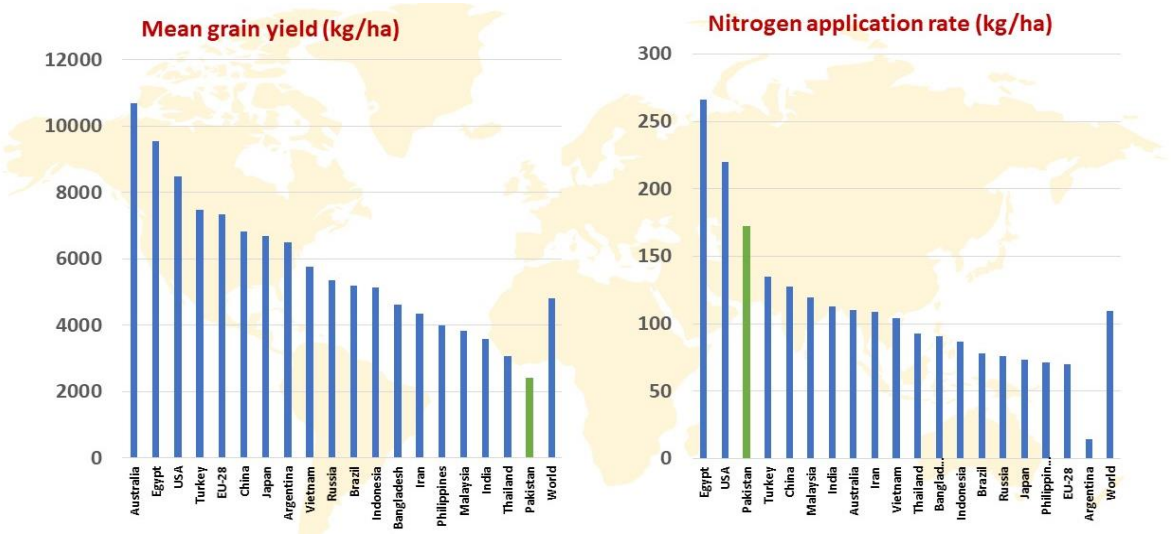


Figure 11: Comparison of mean grain yield (kg/ha) of rice and fertilizer application (kg/ha) in Pakistan and other countries.

3.1.7. Scarcity of quality water

Water scarcity is another aspect that makes low yield in agriculture sector an even more serious threat. Pakistan was very close to the stress line for available water in 1991 and crossed the water scarcity line in 2015. It is forecasted that the country will cross the absolute water scarcity line in 2025. No significant action has been taken by the government to tackle or handle this alarming situation yet. On the other hand, low or poor quality water is deteriorating the soil and crop productivity. Over the last 30 years, installation of tube wells has increased in order to overcome the shortage of water, which results in a plethora of problems such as more fuel consumption (electric plus diesel), lowering of groundwater table and other environmental issues.

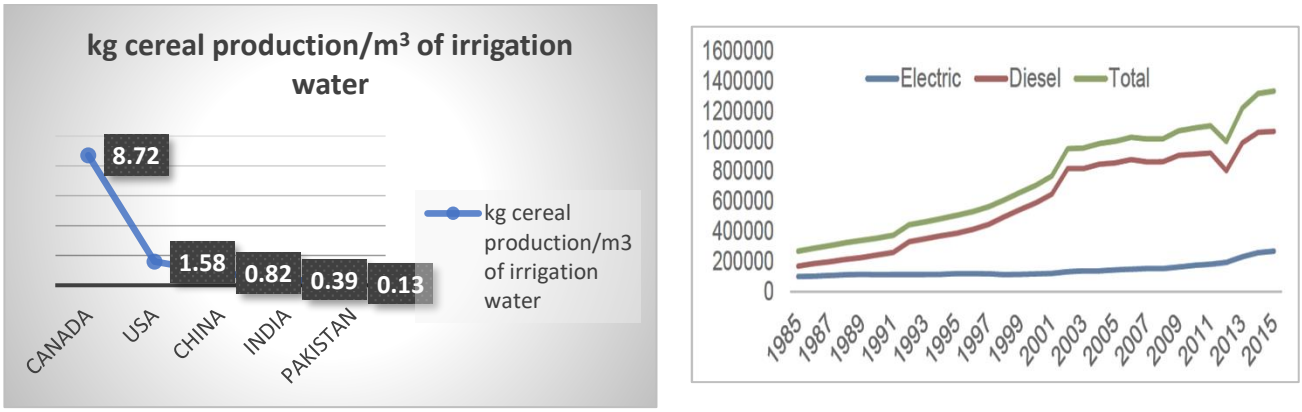


Figure 12: Cereal production kg/m^3 of irrigation water in Pakistan compared with some other countries (left); chronological increase in number of tube wells installed to extract grout water (right). ***Data Source: Water Security Issues 2019: Pakistan Academy of Sciences***

Water productivity (kg of cereal production per m^3 of irrigation water) of national agriculture is very less compared to other countries like Canada, USA, China, and even India. Canada has more water productivity may be due to different climatic conditions. However, the productivity of Pakistan's water is even less than that of India which has similar climatic conditions.

Climate change has also severely affected the water productivity ratio. Due to change in climate and global warming issues, glaciers are melting at an accelerated speed and resulting in more floods. If such water is not stored, then it will cause drought conditions in the near future.

3.1.8. Post-harvest losses

Significant post-harvest losses have been reported for different commodities of the agriculture sector with 53% for fruits and vegetables. The surplus yield of tomato and potato crops goes to waste due to lack of proper storage facilities at grassroot levels. Similarly, grapes and strawberry farmers are also facing issues of post-harvest losses due to less access to market. Losses of cereals are 24% and 10% in the case of food grain. The post-harvest loss mainly happens when there is surplus crop yield and farmers do not get good price for the yield (Figure 13)

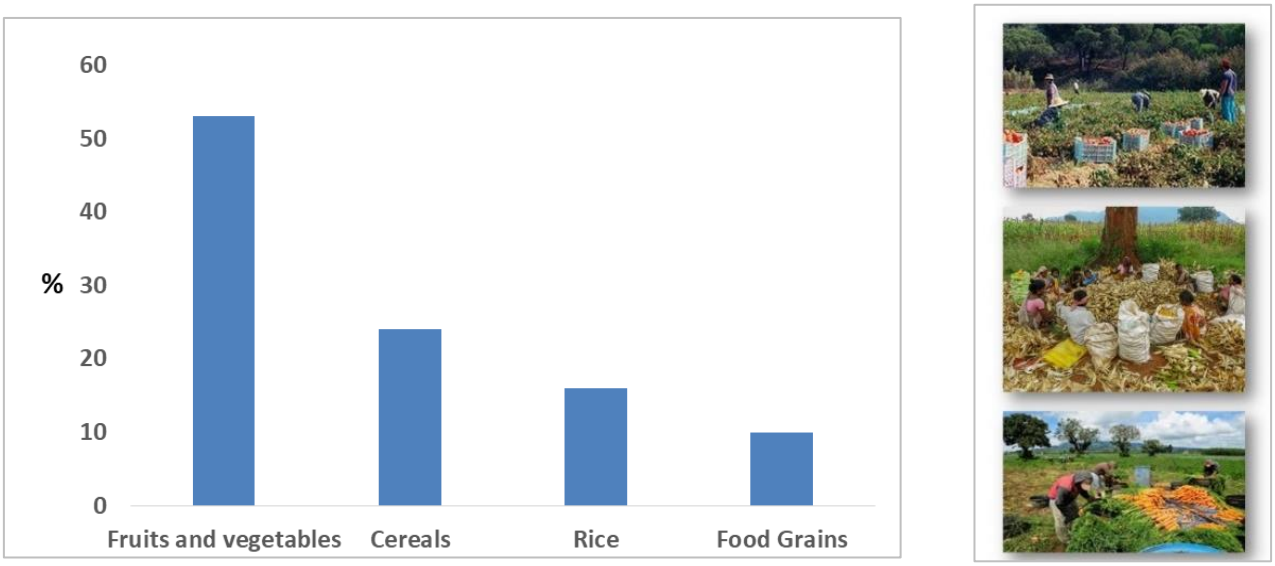


Figure 13: Post-harvest losses of various food commodities in Pakistan. ***The data is extracted from Prof. Dr. Amanullah Malik's lecture in the policy dialogue***

3.1.9. Low livestock and dairy production

The Economic Survey of Pakistan shows that livestock production is among the most sustainable sections of the country's agriculture. Although the government has shown very poor ownership in case of livestock, both in research and extension, increasing demand of livestock and dairy products, perhaps, makes it more sustainable. Various issues of livestock and dairy production include: a) calving interval is wider, b) meat production is very low compared with world average, and c) average milk production per unit is also very low. The poor breeding system, still based on outdated conventional methods, no proper record of milk and meat producers, lack of genomic selection-based breed improvement, and confused government policy for exotic animal breeds undermining the local livestock potential are among the reasons that are contributing to low livestock and dairy production in Pakistan.

Considering the current number of dairy animals, milk production should be sufficient. However, milk yield per head is low and the farmer is not interested in increasing it as the inputs required to improve per head yield are becoming expensive while milk processing companies offer low rates. So only farmers in peri-urban areas give a balanced feed. Most farmers just feed fodder and hay and are happy with their low yields due to the minimal cost. If given a higher price for the milk, every farmer will exploit the maximum potential of their animals by giving them costly balanced feed (*wanda*). Value addition of dairy products is a good option; if the price of milk is low then farmers may get a better price through value addition.

Producing adulterated milk is more lucrative for suppliers as it costs less to prepare because skimmed milk powder is available at low prices. Milk adulteration is carried out to meet requirements of the population and this augments the malnutrition issue.

The sector has never been the government's priority and Punjab government farms are attaining less than the national average. The private sector is certainly doing better and its performance is far better than government farms. However, the government is playing some positive role through its extension department by creating awareness, timely vaccination, etc.

3.2. Challenges Related to Marketing

Poor market infrastructure is also one of the factors responsible for low agricultural yields. There are no standardized markets available for selling commodities due to which farmers are not able to get the right prices of their produce. The marketing margin in normal crops is 8-39%, which is very high, and in vegetables it is 15-37%. It discourages and limits the farmers from investing in upcoming crops leading to decreased yield, on the other hand the middleman gets more benefit than the farmer. Although roads have improved to some extent but are still insufficient for the farmers to access the proper market. The marketing of new crops to diversify crop rotation is also not led by the government. For example, the government has no lucrative policy to motivate the farmer to grow indigenous/local oil crops to fulfill demand and save foreign exchange. The value addition of agricultural products is very low (2-5%) and this is urgently needed to commercialize agriculture in Pakistan (Figure 14). Only commercialization can save agriculture and farmers in the current scenario where the cost of production is high and the profit margin is low. Commercialization and value addition will also attract the farmer's next generation to adopt agriculture as a profession, which is going down drastically.

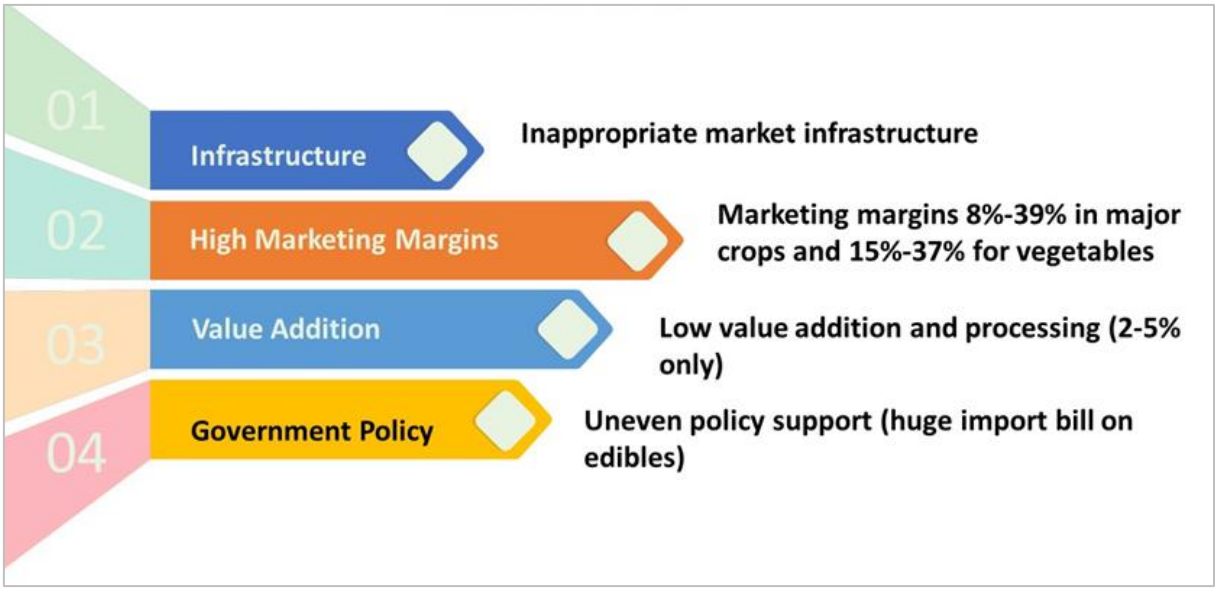


Figure 14: Major challenges related to unsustainable marketing in Pakistan.

3.3. Challenges Related to Climate Change

Although Pakistan is not contributing much towards factors responsible for climate change, nevertheless the country is the 7th most vulnerable to this phenomenon. The rise in temperature, high CO_2 concentration in the atmosphere, and unpredicted rain patterns have changed crop production in Pakistan and globally as well. Climate change is also affecting water availability through unpredicted rain and drought spells and melting of glaciers. Floods due to glacier melting and droughts due to the variability of monsoon are severely affecting crop production and socioeconomic level of farmers. Severely less capacity of water reservoirs is a great threat to Pakistan where more than 90% of agriculture is dependent on canal water.

4. Way Forward to Enhance Agricultural Production

In order to address these challenges, a comprehensive and viable national policy is inevitable, while taking into consideration that agriculture is a provincial subject after the 18th Amendment, and as such incorporating the recommendations of all stakeholders. It should advocate enhancement of agricultural production, less reliance on food imports and exploring more export-related avenues. The policy should be comprehensive enough to address immediate short-term needs, provide guidelines for medium-term plans and lead to a long-term viable vision.

4.1. Enhancing Agricultural Yield

Crop yield is one of the main issues of production challenge and its enhancement needs incorporation of advanced agricultural technology and adoption of progressive farming techniques. But this cannot be achieved until we raise the landholding per farmer and in order to do that a large portion of culturable waste land (7 million hectares of total land) may be allotted to farmers. Similarly, trained and well-informed farmers adopt technology and strategies that not only increase yield but also create employment. The modern concept of farmer training comprises interactive sessions between progressive farmers and extensionists along with research to sort out issues and devise solutions in a short time.

Agricultural production is also dependent on quality seeds and water. In this regard, a well-managed indigenous seed production system needs to be established that not only fulfills national demand but also ensures seed quality. Similarly, rain water needs to be preserved by building a large number of small water storage dams. This would help in dealing with water shortage and improving water quality for irrigation. Moreover, post-harvest losses, which cost the country billions of rupees, need to be curtailed by arranging entrepreneurial training programs that equip local youth with the knowhow to process fruits and vegetables in advanced manner.

4.2. Edible Oil Production

The country's recent import bill of edible oil is $1.63 billion, which is very high considering the deficit budgets of Pakistan (Figure 15). The import bill will continue to increase due to the increasing population if edible oil is not produced locally. A huge amount of foreign exchange has been spent on importing low-quality edible oil for decades although great potential for production of indigenous better-quality edible oil has been emphasized many times in various feasibility reports. The current government has taken steps to promote oilseed crops, however, this initiative could be buried like many others if not properly implemented.

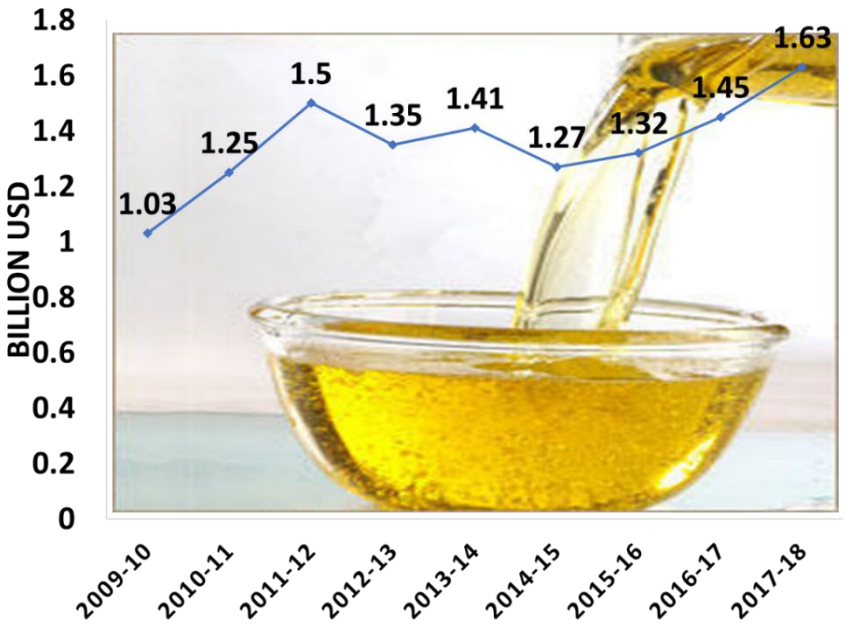


Figure 15: Pakistan's import bill of edible oil during a nine-year time period.

4.3. Local Seed Production

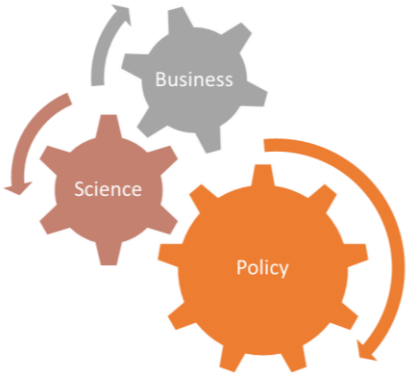
The import bill of seeds of various crops reveals a huge pressure on the annual budget. However, the seeds provided to farmers are much less than demand. Therefore, there is a great opportunity for growth in this business. A huge amount of $171 million is being spent on seed imports (Table 2). Local seed production would not only reduce the import budget but would also boost the farmers' financial status. This is also a value addition of farmers' produce. Local farmers should be trained for hybrid seed production and seeds of new crops make it deep-rooted.

Crop	Quantity (MT)	Value	
		Rs. Million	$ Million
Cereals	4,735	2,106	86
Fodder	50,505	5,185	32
Oilseeds	189	165	1
Potato	4,735	2,106	13
Vegetables	5,681	5,979	37
Total	**90,067**	**27,375**	**171**

Table 2: Estimated import bill of seeds of various crops.

4.4. Linkages Development Between Stakeholders

The lack of linkage between research and practice in the field has remained under discussion since decades, however the status could not change significantly. Research institutions, academia, and extension department do not have institutional linkages and no measures have been taken other than several recommendation reports to enhance such collaboration. Strong and efficient working relationship between research, extension, and field is required. Linkages among research institutions and academia are also extremely poor. If the research is linked with real issues at the field level, things can improve swiftly and trust between the stakeholders can be rebuilt. The government is the best institution to engage and lead the different stakeholders to move



towards pinpointed directions and policy should be based on input by stakeholders.

4.5. Farmer Training

Educated and trained farmers lead to agricultural sustainability. After receiving training, a farmer becomes the trainer of his generations and no further training programs will be needed. The only thing is to

keep him connected with research through extension services. Information dissemination and training are two different things and should not be mixed. A trained farmer is an asset of a society because he is already convinced to adopt the technologies and strategies required due to changing scenarios. In case of the extension department, whether government or private sector advisory services, there is a mistrust between farmers and extensionist. The probable reason is that they just provide information to the farmers and are done with their duties. Less educated farmers (most of the farmers) are not sharp enough to pick up the technical points easily which makes the exercise unfruitful and thus ends up with mistrust. If 2-3 farmers from each village can be trained, they can work for the whole community in a practical way and there will be less mistrust. In this way investment on massive extension services can be saved and will lead agriculture towards industrialization where farmers will be able to calculate the profit and decide about their possible interventions.

There is a modern concept of farmers training with interactive sessions between progressive farmers, extensionists, and research to sort out issues and to devise the solutions in much less time. Such training programs are being conducted in various countries successfully and can be used as a guide for the farmer training programs in Pakistan.

4.6. Nutrient Enriched Food Production

Food insecurity is a global issue with more severity in developing and poor countries. It is not a matter of hunger only, but micronutrient malnutrition and obesity are even worse than hunger. There is a need to enhance the socioeconomic status as well as public health which is directly related to plant, soil, animal, and environmental health. More than 800 million people are affected by hunger and about 1 billion waste food in the form of overeating. The judicious use of food and other natural resources is a global concern and it is very necessary to adopt a national standard.

Most of Pakistan's population has a middle-class family background and a major portion of their daily food is staple grains (wheat and rice). Biofortification of staple crops with minerals and other micronutrients can be an economical option to improve public health. Wheat zinc biofortification has already been started in Pakistan and mass level trials are going on under UK-funded projects with the active involvement of local collaborators. Various experimental tests have also been conducted and information has been published. If the government leads from the front, the impact of biofortification can be widespread throughout the country. In India, various staple crops like wheat, rice, pulses, and millet are being biofortified and trials are at various stages. Food diversification is the need of time to provide balanced food. Pulses are cheaper but richer source of micronutrients than cereals and are environment friendly as well, which must be promoted at all levels. It will also help to improve soil health and provide an opportunity to people to use pulses instead of meat.

Milk is a basic food item for the children of all societal levels. The quality of milk available in Pakistan is very poor and improving its standard can especially raise the nutritional level of children. Increasing milk production will enhance the quality because low production leads to high demand which encourages malpractices to fulfill the requirement.

In the recent past, *jamun* (black plum), *baeri* and *lasora*, which are full of nutrients, were very common at public places in villages. These were free sources of various micronutrients and vitamins for the poor and rich people. The government should also promote these types of fruit trees under its Billion Tree Tsunami campaign.

4.7. Enhancing Agricultural Exports

Textile industry contributes 58% to the country's exports but other sectors like fruits and vegetables, food products, and animal industries collectively contribute only 23-25%. There is a dire need to promote agriculture-based industries and the government should take measures to make it more fruitful to contribute to the country's economy and the farmers' financial well-being. It can easily be achieved by value addition of milk, meat, dry fruits, etc. Subsidies and expertise can be provided to farmers to attract them towards value addition. Small industrialists and exporters should also be encouraged administratively as well as financially by reducing taxes. It will promote local products, reduce imports, and enhance exports, thus reducing pressure on the national economy. This is also important for providing a stable market for farmers' commodities which will further enhance the per unit yields.

China's per capita income is increasing which in turn is boosting demand for more food imports due to improving living standards and luxurious lifestyles. It is becoming a gigantic international food import market owing to high population numbers, and Pakistan has a great opportunity to capture this market in the current political and geographical scenarios. China imports about 70% of its required products from Brazil, the United States, Association of Southeast Asian Nations (ASEAN), European Union, and Australia. The value of these imports amounts to about $1800 billion each year while the share of Pakistan is less than $1.5 billion.

Exports to China, as well as other countries via China-Pakistan Economic Corridor (CPEC), can be raised by improving yield as well as the quality of agricultural products. There is an export-import gap of about $13 billion which should be narrowed. The CPEC travels mostly along Pakistan's rivers where most of the agricultural commodities are produced. As such the CPEC provides a lot of opportunities to grow various crops along its route and export to China and other connected countries (Figure 16).

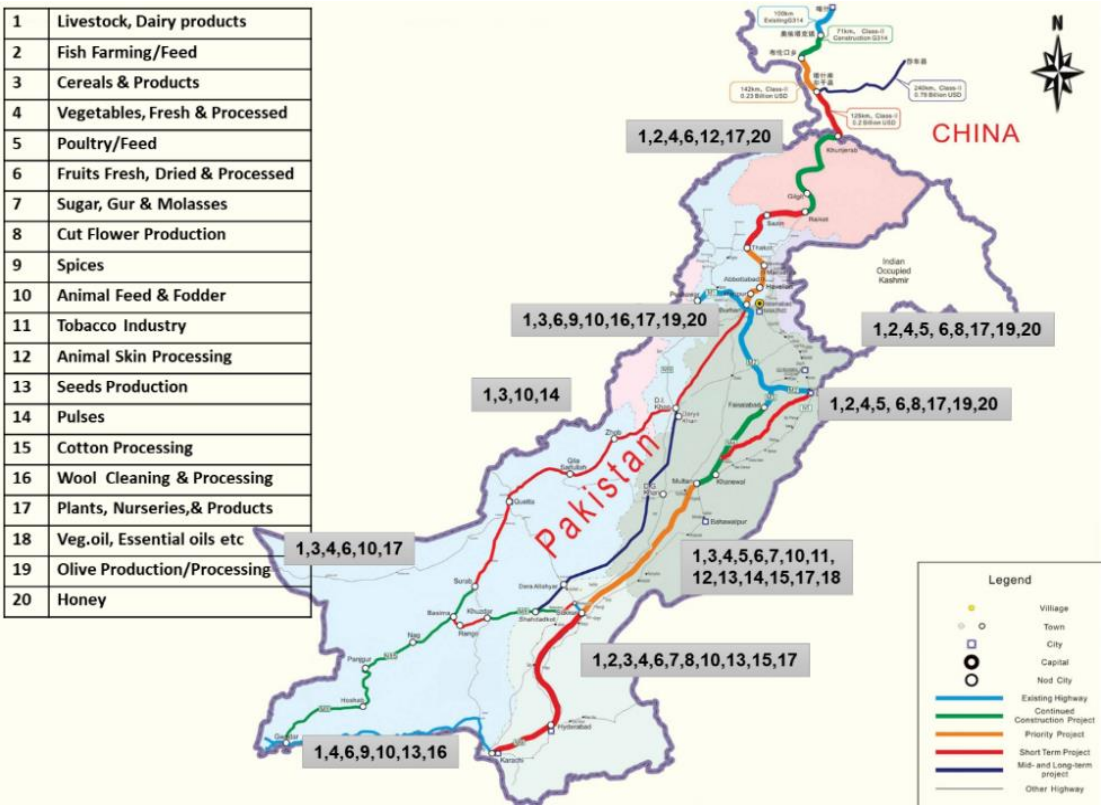


Figure 16: Agricultural commodities in different agro-ecologies along China-Pakistan Economic Corridor (CPEC). **The data has been taken from the presentation by the PARC chairman at the dialogue**

4.8. Global Engagement to Achieve UN SDGs

It is a reality that developing countries are not the major contributors to emission of greenhouse gases directly. However, developments made by rich countries are also utilized by developing nations which emphasizes that the whole globe is like a home and preventive and regenerative measures should be supported by every part of the world. United Nations Environment Programme has launched various projects on nitrogen and carbon management which should be endorsed from the frontline as a member state. It will provide an opportunity to researchers and managers to gain expertise by getting involved in those projects and will help to devise internationally compatible policy. The developed countries are major financial contributors to such regenerative innovations for the global environment to compensate for their contribution to environmental degradations. In the near future, the export of agricultural commodities will be strictly dependent on UN SDGs, therefore, enhancing imports, as discussed earlier, is linked with sustainable and environmentally friendly agricultural practices and this is the right time to adopt those suggestions to make our products compatible with the international market.

Figure 17: Seventeen Sustainable Development Goals presented in the UN General Assembly in 2015 and adopted for 2030 Agenda for Sustainable Development.

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