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LPJAS journal publishes research and reports on all the agricultural sciences fields but not limited to agronomy, soil science, horticulture, plant breeding & genetics, plant pathology, agricultural entomology, plant protection, agribusiness, forestry, range management & wildlife, agricultural economics, agricultural engineering, animal science, environmental science, plant and soil science, agricultural biotech and primary production-related food science etc. Research papers and general agricultural reports, articles covering both basic and advanced levels of research are the first priority.

LPJAS has published its volume 1, issue 1 on January 31, 2021. Online publishing began in July, 2020. Since the year 2020, LPJAS has only been available online as an Open Access journal, provided to the user free of charge. Full texts are available online from July, 2020 on. The salient features of the LPJAS are as follows:

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Climate Change: Experts Warn of Threats to Agriculture in Pakistan

Prof. Dr. Asif Ali, Vice-Chancellor, Muhammad Nawaz Sharif University of Agriculture Multan (MNSUAM)



Multan: Vice Chancellor of MNSUAM Prof. Dr. Asif Ali addressing the International Conference on Climate Smart Agriculture conference.

Speakers at an international conference pointed out on Monday environmental changes posed serious challenges to the agriculture, adding that Pakistan may face a crisis if immediate steps were not taken to cope with climate change. The two-day moot title International Conference on Climate Smart Agriculture was organized by Muhammad Nawaz Sharif University of Agriculture Multan (MNSUAM) and 10 scientists from seven different countries participated in it.

The agricultural scientists presented over 70 research articles during the conference. The proceedings were kicked off by the Punjab Provincial Minister of Agriculture, Irrigation Syed Hussain Jahanian Gardezi. Speaking on this occasion, the minister said that the agriculture in Pakistan was faced with multiple issues. “Especially water scarcity and climate change are two the biggest challenges being faced by our agriculture. The losses caused by these two reasons are huge,” he added.

He hoped that the events like the climate change conference would help the scientists and farmers chalk out their line of action to cope with challenges posed to agriculture by the environmental changes. He hoped that the conference would also pave way for making a better agriculture policy.

The Vice Chancellor of MNSUAM Prof. Dr. Asif Ali said that the varsity was focused on finding out solutions to the problems being faced by the agriculture due to climate change. He added that over 70 research articles would be presented during the conference and recommendations would be presented to policy making institutions, scientists and farmers in light of research. The conference was attended by the representatives from different agricultural institutions, universities, research institutes and students.

Importance of Agriculture in Pakistan's Economy & Development

M. D. University of Agriculture, Faisalabad Pakistan

Introduction: “Agriculture is the of process of cultivation of land or soil for production purpose”. Agriculture plays a very vital role for economy of Pakistan and its development. 48% of labour force is engaged directly with agriculture. So it is the main source of living or income of the major part of economy population. About 70% of population is relates to agriculture directly or indirectly. Agriculture is the major source of food of huge population of Pakistan. Agriculture is also the major source of provision of raw martial to industrial sector of Pakistan. Its contribution towards GDP is about 25% which is higher than contribution of any other sector. Following are the main points of importance of agriculture for Pakistan economy.

Pakistan as developing economy the employment on consistent level has much importance. In this behalf agriculture has much importance because it provides employment directly or indirectly to the public. Employment directly affects the GSP of economy as well as the per capita income. With the increase in per capita income living standard increases, higher hygiene facilities & better education facilities are also increases. All these signs are the factors of economic development. So we can say that agriculture has a great contribution toward economic development by providing the employment.

Food requirement: Population growth rate of Pakistan is increasing rapidly. According to UNDP human development report population growth rate of Pakistan is 2% per year. So with the rapidly increasing population the food requirement is also increasing rapidly. In this behalf agriculture is the only the major sector which is the meeting the increasing requirement of food. It also reduces the import of food from other economies. So we can say that agriculture sector is playing very vital role in development of Pakistan by providing the food for massive population as well as supporting the economic growth.

Contribution in exports: Major exports or cash crops of Pakistan are wheat, rice and cotton. 9.8 billion Bales of cotton are produced per year. Rice crop is produced 4.3 million ton per year. These agricultural commodities are exported to various countries against foreign exchange. This foreign exchange is utilized for the import of industrial or technological equipments such as machinery or automobiles. Further this foreign exchange is utilized to improve the infrastructure of economy or for improving the other sector of economy like education, health and investments.

Raw material for industries: Industries have great importance for the development of any country specially for developing economies like Pakistan. Industries need raw material to produce finish goods. In Pakistan agriculture provides raw material to industries. Cotton is very important agricultural production which is also major export of Pakistan. It is used as raw material in textile industries. The production of these textile industries is exported to various countries against foreign exchange. Live stock is also an agricultural sector. It also plays very important role to export goods by providing the raw material to various industries like sports goods industries and leather industries. So in this way agriculture helps to Pakistan economy and its growth toward development.

Infrastructural development: Infrastructure plays very important role to development of any economy. It is fuel to the economy development. Well organised infrastructure is a key to development because of quick means of transportation of agricultural goods or commodities (raw material or finish goods) and communication. On distribution purpose of agricultural products good and quick means of transportation are required this intends to improve the infrastructure rapidly. So agriculture play important role to the development of transportation for the purpose of distribution of goods.

Increase in GDP level: Agriculture has huge contribution toward GDP of Pakistan economy. it contributes about 25% of total GDP, which is larger than other sectors of Pakistan. Increase in GDP shows the developing progress of the economy. It has played very important role since independence toward GDP of Pakistan. Now agriculture is the 3rd largest sector of contributing to GDP. Live stock and fisheries are the huge sector of agriculture in order to providing the employment. Employment contribute to GDP, it is as with the increase in employment the per capita income will increase which results to increase in GDP rate of the economy.

Decreasing in rural poverty: Agriculture sector has played very important role in order to reduction of rural poverty. Since 1975 to 2000 the GDP growth rate of agriculture was about 4.1% per year. Green revolution technology in irrigation, improved seeds and fertilizers played very vital role to increase the agricultural production which results in increase in GDP. Through this technology farmers with land gain the opportunity to increase their production. So in this way arable lands became cultivated lands and farmers got the market of agricultural products against some return.

Development of banking sector: Agriculture has also contributed a great role toward the development of banking sector. As the government realized the importance of agriculture, it takes steps to improve the productivity of crops by providing the credit facilities to the farmers at low interest rates. With utilizing these credits farmers can produce more and more crops. For this purpose government established the ZTBL and other financial institutes for the provision of credit facilities. So in this way development of banking sector takes place.

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Farm mechanization: Introduction of farm mechanization in agricultural sector had played very effective role in the development of economy. With the use of modern machinery in agricultural lands causes more and high quality production of crops. So the provision of raw material to the industries increases. Due to increase in productivity level the export rate of major export crops is increased which causes foreign exchange and economic development.

Use of Nanotechnology: In agricultural sector use of modern technology like nanotechnology has played very vital role in the development of economy. This technology is used for producing the high yielding variety with high quality products. High quality products results into high rate of return to the farmers and the per capita income of farmer increases. Increase in per capita income shows the growth of economy toward development.

Role of dairy farming: Dairy farming from agricultural sector has also played a great role in economic development. Livestock or dairy farming has huge contribution toward economic growth. The annual protein per capita is 18 kg of meat and 155 liters of milk. This is the highest rate in South Asia. Milk and meat and their by products have a good market. Farmers can receive a good return by producing and providing these products to the market. This process results into increase in per capita income as well as increase in national income of the economy.

Role of textile industries: In economic development textile industries plays very important role. These industries totally depend on agriculture production in raw form. Cotton is the major crop which is used as raw material for these industries for production purpose. Further these products are exported to many economies against foreign exchange. So cotton as raw material from agriculture side contributes toward increase in NI (National Income). Textile industries also provide employment level which increases the per capita income of the person. So we can say that contribution of textile industries in the development of economy has much importance.

Role of sugar industries: Sugar industry is also one of the major sectors of economy which has great importance according to development of economy. This is totally agricultural based industry. Sugar cane is produced on very large scale in many areas of Pakistan. This further supplies to sugar industries for the production of sugar and other by products which has great market. As large scale industries these also helps to provide employment level to the public. This results into increase in per capita income as well as improves living standards.

Rice Export Corporation: Many areas of Pakistan have much importance according to the production of rice crop. In some areas the world most famous rice crop is produced. A huge quantity is exported to many economies against foreign exchange. This foreign exchange is further utilized in import of some other products like modern technology or machinery or this is utilized for the improvement of infrastructure of the economy.

Role of fishery: Fishing industry plays very important role in the development of national economy. With a coastline of 814 km Pakistan has enough resources for that remains to fully development. This is also the major export of Pakistan.

Forestry: About 4% of land is covered with forests in Pakistan. This is the major source of paper, lumber, fuel wood, and latex medicine. It is also used for the purpose of wildlife conservation and ecotourism.

Measure to improve the efficiency of agricultural sector for development of economy: Yield collection problems:

The collection of yield from small farmers is very expensive & difficult process. So it is a great problem of marketing. There should be some easy way for collection of yield from the farmers.

Rough grading Products: Commodities or products which are graded have higher price in the market. In Pakistan mixing of poor & good qualities are common. So grading problems must reduce.

Storage problems: The storage facilities in markets are not enough, seller can not store & wait for a higher price of the product due to lack of warehouses. Because of this some perishable produce suffers loss.

Middleman's role: The middleman takes a big share of farmer crop without doing anything. The farmers borrow the money from them & sell their products at low prices. So this is a big loss to the farmers.

Transportation problems: Our sources of transportation are insufficient, so regular supply of product is not possible to the market. The village are not properly linked to the markets. For proper provision of products to the market their must be sufficient as well as fast means of transportation.

Revenue system: Our farmers have to pay land revenue after the harvesting of each crop, so it forces the farmers to sell their produce at low price.

Market Advisory Committee (MAC): MAC (Market Advisory Committee) at district and tehsil level should be set up to provide technical advice and information to co-operative marketing societies. The officers of co-operative & agriculture department should be the members of the committee.

Market reforms: The government should improve the markets system. Strict rules and laws should be introduced. The prices of agricultural products should be checked by the inspectors in the market.

Pakistan, Year 2020 and Agriculture in Pakistan

By Naeem Abbas Abid, NIPCO House, 4 - Shaharah e Fatima Jinnah, Lahore, Pakistan

According to the Economic Survey 2019-2020, agriculture contributed about 19.3 percent to annual GDP and is by far the largest sector to absorb most labour directly and indirectly. It does not only absorb labour, but this sector is also the largest raw material provider to many industries. However, the question is how this sector performed in 2020—because it was the one of the most challenging years for almost every industry.

2020 was one of the worst years in Pakistan's history vis-a-vis cotton crops. According to the State Bank of Pakistan report, FY20's cotton output fell to 9.1 million bales against 9.8 million bales in FY19 despite a 6.5 percent increase in the area under cultivation. In 2011, Cotton Vision 2015 was launched, aiming to reach a target of 20 million bales in 2015 from 10.6 million bales in 2011. It has been ten years, and instead of achieving the mark in 2015, in 2020, we are even below than where we were in 2011.

This negative growth shows how serious we are about our long-term visions. This negative growth could result from many factors, particularly weather change over the last ten years, decrease in the cotton-growing area, and yield per acre. Our cotton varieties are no more resistant to weather change, which translates to more pest attacks and high input costs, resulting in low yields and fewer profits, respectively. All these factors eventually force farmers to switch to other profitable crops like sugarcane etc. This horrible situation of cotton has not only just affected farmers, but it also has a major impact on the textile industry. It forces the textile sector to import costly raw material. This year, the total import bill for the textile sector is \$11.262 billion.

Wheat is one of the primary crops in Pakistan. It accounts for 8.9 percent value addition in agriculture and 1.6 percent of the total GDP of Pakistan. Although our government officials claim to be self-reliant when it comes to wheat, however, we still had to face wheat shortages in 2020. In the last five months, we have imported over 2 million tons of wheat out of a target of 3 million tons. Not to forget, we imported this wheat at a much higher rate (approximately Rs2500/40kg) as compared to what we paid to our farmers (Rs1350/40kg) for their wheat production. The minimum support price has been increased this year to Rs. 1600/40kg to incentivise farmers to grow more wheat.

All four provinces have announced different MSP for 2021, despite the fact that there is not much difference in production costs across different regions unless it is being grown in rain-fed areas. This price difference could lead to wheat hoarding and smuggling into high wheat price provinces. The increase in MSP is an excellent decision to accommodate the increase in production cost but is this the real long-term solution? There is a need to focus on developing high yield and rust-resistant wheat varieties, which is one of the main reasons behind yield decline.

Paddy and sugarcane also have their ups and downs in 2020. The total acreage for sugarcane production was less this year than last year, resulting in a better price for farmers. Also, reforms have been brought in the purchasing process of sugarcane, which have benefited farmers greatly. In different discussions, I have observed that farmers are pushing other farmers to maintain the same acreage or even decrease the total acreage for next year to fetch better prices.

As far as paddy is concerned, the price went down a lot at the beginning of the season, which impacted farmers' financial position to a greater degree. The price drop's primary factor was the international market's uncertainty because of logistics and transportation challenges due to COVID-19. The rice exporters were not ready to take risks, and therefore, they hedged their risk by buying at a low price. The paddy prices have exhibited an upward trend in December, but it will benefit the stockiest or aarthis who bought the paddy at a low price from farmers. The price increase isn't of much use to farmers at this stage.

In 2020, one other challenge faced by the Pakistani agriculture community was locust attacks. In Pakistan, insects first affected the crops in rural Sindh, where malnutrition is already common, and farmers are in debt. The irony is that instead of taking any steps to control the locust swarms, the local government and federal government kept arguing who was responsible for controlling the spread. When locust swarms spread across the country, the government agencies decided to take action, but it was too little too late. Moreover, the Pakistani government used expired pesticides, which, instead of inhibiting locust growth, aggravated the situation. As usual, farmers took measures on their own, and they used drums, whistles, and aerial firing to disperse locusts.

Last but not least, every agent across the agricultural value chain was the victim of the devastating impact of COVID-19. The main problem was the movement of the food from food basket markets to where it was needed. The pandemic disturbed the food market equilibrium by disrupting the supply chain. It affected both the supply side and the demand side. On the supply side, transportations restrictions, shortage of labour, and farmers' limited access to the market to either get inputs or sell their produce shifted paradigms in agricultural production.

Last but not least, every agent across the agricultural value chain was the victim of the devastating impact of COVID-19. The main problem was the movement of the food from food basket markets to where it was needed. The pandemic disturbed the food market equilibrium by disrupting the supply chain. It affected both the supply side and the demand side. On the supply side, transportations restrictions, shortage of labour, and farmers' limited access to the market to either get inputs or sell their produce shifted paradigms in agricultural production.

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The pandemic mainly hit fruit and vegetable growers and dairy farmers. In the first phase of the pandemic, farm gate milk prices dropped down by 15 percent, which hit the dairy farmers struggling with high production costs and less yield per animal. Because of lockdown and movement restrictions, many dairy farmers and fresh produce growers had no choice but to dump their milk or produce in canals and dumpsites. On the positive side, farmers supported their local communities by distributing food and providing working opportunities to the labour who returned from cities on their farms.

Moving on, it won't be fair to list all the challenges and problems the agriculture sector, mainly farmers, have encountered in 2020 in just one article. I think it's time to learn from our past mistakes and move on to what we can do in 2021 to improve and uplift this sector. We can't change this sector's fate overnight, but one step in the right direction can go a long way. In my opinion, we can start by reviewing our current policies and their impact in the long term. Our policies should not just look at how much economic benefit we would have by implementing such policies, but we should also look at the other side of this story.

One observation could be that have we sought farmers' opinions before making such policies because they are key stakeholders? I think this should be a priority when making policies. In the past, we have observed that there is almost minimal input from the farmers' side, resulting in farmers' frustrations and protests against the policymakers. Otherwise, we might have to face the same situation as our neighbor, India, is facing right now. The Indian government announced farm bills without taking farmers into confidence, and as we know, the farmer's reaction didn't turn out as the Indian government expected. Other noteworthy points while making any policy are considering the climate change impact, global food consumption, and changing global trade patterns.

One other factor which needs serious attention in 2021 is to bridge a gap between research institutes and the farmers' community. Currently, research institutes are working in an isolated zone. There would be hardly anyone in the farmer community who would know what new varieties of different crops our research institutes are producing and how they can benefit farmers. This wide communication gap can be narrowed down by using our Agriculture Extension force.

In developed nations, agriculture extension departments play a significant role in implementing research activities. For example, in the USA, extension agents are part of agriculture universities, not part of the agriculture ministry. Extension agents are closely in touch with farmers; they observe what's going on the ground. They collect data and ultimately convey their observations to research faculty in agriculture universities, which helps universities get their research in the right direction. However, in Pakistan, it's a totally different scenario.

Finally, what else could be done in 2021 is to engage the private sector in the agriculture sector to fill the gaps in the value chain. The value chain is currently robust from crops sowing to crop harvesting, but once the crop is harvested, the value chain starts getting weaker. At this point, there is a strong need for private sector involvement. The private sector should build storage facilities and processing plants at a micro-level. Big conglomerates already have set up processing plants, but how much are they benefiting farmers.

I would say very little because conglomerates operate in an oligopoly market. Just look at the sugar industry; only six-seven big players have all sugar mills and control the sugar industry. There is a need to introduce more players in the market to encourage perfect competition. To uplift the agriculture sector, there is a strong need for processing plants at the village, town, or maybe district level. Being the sector engaging the largest workforce and providing raw material to most manufacturing sectors, more competition and development at a small level will contribute to poverty alleviation and uplift the socio-economic structure of a significant segment of the population.

Shunned Pakistani Fishermen Abandoning Profession

Sulman Ali, NIPCO House, 4 - Shaharah e Fatima Jinnah, Lahore, Pakistan

According to Sindh Fisheries Department 600,000 people in Sindh are linked to this profession. Furthermore, the coastal waters of Sindh are home of 40 species of fish and shellfish and 15 species of shrimps, which make up 60% of Pakistan's fisheries export. One of the most frequently aired news in both Pakistan and India media is the arrest of fishermen of both countries, by the security forces of other state.

Every other day, news channels report that either Pakistan or India has arrested the fishermen for 'crossing the border'. It has become so common that newspapers and channels report it like regular news, but no reaction is observed over this news; from public, civil society or from the authorities. Now, the fishermen in Pakistan are going to face another predicament in the name of development.

In September, the twin islands of Dingi and Bundal, located at the mouth of Korangi Creek in Karachi were taken over by the federal government. The government took over this land under a presidential ordinance. According to the ruling party, the government is planning to develop a city which will 'surpass Dubai'. "The mega project worth \$50 billion will create 150,000 jobs," Sindh Governor Imran Ismail said.

on the other hand, Sindh government has rejected the federal government's takeover of the islands. The provincial government's information minister Nasir Hussain Shah said that Islamabad hasn't shared the development project plans with them. "Don't think of these islands as mere tracts of land, we are linked to them by culture, custom and heritage," he maintained.

There is political tussle ongoing between the Pakistan Tehrik-e-Insaf (PTI) and Pakistan People's Party (PPP), ruling the centre and Sindh respectively. However, in this scenario the fishermen might be the collateral damage. According to Sindh Fisheries Department 600,000 people in Sindh are linked to this profession. Furthermore, the coastal waters of Sindh are home of 40 species of fish and shellfish and 15 species of shrimps, which make up 60% of Pakistan's fisheries export.

Additionally, these islands are one of the oldest fishing points. Fishermen have organized an annual festival on these lands for centuries. One of the organizers and fishermen said that they won't leave their ancestral place. "[They are] occupying the livelihood of fishermen but also a hope for living for them," he said.

Another fisherman said that military guards apprehended him recently, when he tried to go to Dingi Island. "They made me 'murg'ha' [stress position] and if we did not do it they said they would hit us with batons," he added. As per these fishermen, the government authorities and security forces have taken three major points of fishing from them in last two decades.

Commenting on the development, Environmentalist Arif Hassan said: "The islands are part of a delicate ecosystem. Mangrove marshes are nurseries for fish. They are home to migratory birds and also a buffer between the city and the ocean. This buffer has saved Karachi city during many cyclones."

Being arrested remains a constant threat for these fishermen. According to an exchanged list in July 2020, India has arrested 97 fishermen, while Pakistan apprehended 270 Indian fishermen. This underlines the gravity of the menace. In November this year, India released 20 Pakistani fishermen and the scenes of their reuniting were emotional. Some of them were kept in jails for two years, while some spent five years in the Indian jails.

As per reports, some of the minors didn't recognize their fathers. Shah Alam, a fisherman, told media that his son remained in jail for five years. "Now that my son is back, I will make sure that such a situation never arises again. He has to find another means of earning besides fishing," he said. The troubles of these fishermen seem not to end, as on one side there major fishing points are being snatched away by own government, while on the other hand, they have a constant fear of being arrest by the neighboring country.

Essentially, they are being sandwiched from both sides-internally and externally. Thousands of people are linked to this profession, but such policies and circumstances are forcing them to seek new works for their young generations because they don't want their children to be harassed, alienated and apprehended.

Need for Innovation in Agriculture

Nasir Jamal

Pakistan's population is forecast to almost double in the next 30 years. That means we will have another 200 million mouths to feed by 2050. On top of rapid population growth, the changing climate or global warming is bringing new challenges to the nation's food security a total of 21m people in the country are already estimated to be acutely food insecure at present.

Being among the 10 countries affected most by climate change, Pakistan is on track to become the most water-stressed nations in the region by 2040. This will result in significant shortages of surface water availability for irrigation, industry and human consumption. According to the United Nation's Food and Agricultural Organisation (FAO), the number of extreme climate-related disasters have more than doubled since the 1990s with an average of 213 of these events occurring every year from 1990 through 2016, affecting agricultural productivity and causing harvest losses. For example, unusual temperature and humidity during the summer of 2019 had resulted in widespread harvest losses across cotton, rice and maize crops across much of Punjab and Sindh. Leveraging drone technology alone will enable farmers to increase their productivity through improved pest management

Agriculture is the mainstay of Pakistan's economy, accounting for almost a fifth of the economy and 42 per cent of the workforce in 2019. The total cropped area amounts to 23.4m hectares and is primarily worked by smallholders averaging 6.4 acres per farm. Of all arable land, 52pc is irrigated, accounting for more than 90pc of overall agriculture productivity. However, in spite of being a substantial part of the national economy, agriculture productivity is declining, impeding economic growth and causing food security concerns. Faced with these challenges, it is critical that Pakistan starts embracing modern agriculture technology and innovation to protect and enhance the natural resource base while increasing productivity.

Globally, the agriculture sector is at the cusp of a technology revolution. Modern farms and agricultural operations work far differently than those a few decades ago owing to the use of technologies including sensors, devices, machines and information technology. Today agriculture routinely uses sophisticated technologies such as robots, drones, temperature and moisture sensors, advanced gene editing, digital agriculture, etc. These advanced devices and precision agriculture allow businesses to be more profitable, efficient, safer and environmentally friendly. These technologies are ready to fuel the next wave of innovation in agriculture around the world and help farmers meet challenges posed by climate change, water scarcity and the burgeoning population.

The FAO estimates that the Internet of Things (IoT) can help increase agricultural productivity by 70pc by 2050. The technology, when scaled across Pakistan's smallholder geography, can help farmers optimise the use of inputs and scarce resources they have for improved yields and greater profits, says Dr Muhammad Awais, a professor from the Lahore University of Management Sciences. "Similarly, a gene-editing technique using Crispr has untapped potential for greater crop productivity, enhanced nutritional value, reduce food wastage and climate resilience. In Pakistan's context, small farmers are significantly more affected by insufficient information, unpredictable weather changes, soil erosion, yield loss due to pests and insects, and increase in input and cultivation costs. Therefore, technology adoption is even more essential for the transformation of agriculture. The use of high-yield crops resistant to disease, pests and adverse weather conditions can potentially help alleviate poverty, conserve the environment and ensure food security."

Pakistan, unfortunately, has dragged its feet when it comes to embracing new technologies. While other developing economies have embraced innovation in agriculture, we are still rooted in traditional farming. The recent locust attack highlights this widening gap between Pakistan and progressive economies; while the world has shifted to unmanned aerial vehicles to combat these situations, Pakistan hasn't been able to keep up with the pace of modern technology. Even with biotechnology, despite heavy public-sector investment for research and education of the technology, formal commercialisation of biotech crops remains a distant reality due to policy disconnects at various levels of the government.

Dr Yousuf Zafar, former chairman of the Pakistan Agriculture Research Council (PARC), stresses the need for adopting a more sustainable and technologically advanced approach to agriculture. "We must adopt practices involving sustainable use of our natural resources, allowing farmers to grow more with less. Technologies such as laser land levelling, solar-powered high-efficiency irrigation systems, smart water grids and drones need to be promoted for precision agriculture and higher productivity. Leveraging drone technology in agriculture alone will enable farmers to increase their productivity through improved pest management and increased precision owing to their increasing applications, such as aerial mapping, plant health monitoring, soil analysis and weed detection."

Experts argue that the potential of technological advancement in agriculture remains untapped owing to the absence of an overarching legislative and policy framework and an outdated regulatory regime. The changes in technology have far outpaced changes in the regulatory and legislative frameworks, and the regulatory regimes are inefficient and lack adequate resources. This has discouraged private sector investment in research and development and enhanced barriers to entry for new agriculture technologies. Public sector institutions lack financial and technical resources for research and development and are ill-equipped to keep pace with rapidly changing industry landscape, says Dr Zafar.

Moreover, the rate of technology adoption has been slow and lacks innovative approach towards local adaptation with archaic marketing systems and subsidy operations incentivising subsistence farming practices, limiting investment in commercial agriculture due to such value chain distortions. "Sadly, the importance of sustainable agriculture has not been a mainstream theme in the prevailing policy discourse, resulting in overall neglect by policymakers," the former PARC chairman argues.

Indian Tractors at the Indian Gate

**Shahzad Sharjeel, Senior Communication Offucer, International Bank for Reconstruction and Development,
Washington, D.C**

The Indian farmers have been protesting for months now in Delhi's vicinity against legislation they view as anti-farmer and detrimental to the country's agriculture. The protest and the Indian government's response to it is being watched with interest in Pakistan. The mainstream media may not have accorded it much coverage, but its portrayal on social media has a certain 'Modi had it coming' feel to it.

Some songs, mostly in Punjabi, have also started doing the rounds with lyrics bordering on incitement. One song actually offers the 'farmer brothers' to borrow 'equipment' that we on this side of the border have a surplus of. At this point, the visuals of the song cut to a car trunk full of weapons. Not sure if these are just some young artists striking out on their own or if the 'Burnol' brigade is at it again.

While it is alright to feel empathy with the Indian farmers and derive satisfaction at the Indian government's discomfiture, would it not be more useful to learn from their follies and figure out how we in Pakistan can handle the same issues of agriculture 'reform', because it is just a matter of time before we are in a similar quandary?

So, what is it that hundreds of thousands of Indian farmers are protesting against? A legislation introduced by the government. But what is it about? In a nutshell, among other things, the Indian government wants to do away with what is called the 'support price' mechanism. For the uninitiated, all it means is that in order to encourage the farming community to continue to produce essential crops, ie staple food such as wheat or cash crops like cotton and sugarcane, governments, prior to the sowing season, announce a 'support price' at which they guarantee to buy these crops from the farmers.

It would be useful to learn from the follies of the other side. Ideally, this should set the minimum price, and theoretically, the farmer is free to sell it to anyone in the open market at a higher price. However, this is not how it works, and the proponents of the free market deem it as 'interference' with the market mechanism. They would have us believe that we end up paying higher prices for wheat flour or sugar because the 'support price' does not abide by the demand-and-supply rule and is a political gimmick to keep the rural vote bank happy.

It is also argued that if you let the 'self-correcting' market mechanisms work, it would be a win-win situation for everyone. How, you may ask? Well, when you have surplus export, and the world lines up to buy from you because your prices are internationally competitive, sans the support price of course; in a lean year you make up for the shortages by importing from countries at competitive prices because the globalised economy is forcing everyone to play by the same rules of non-interference in the market.

Wish all of this was as simple and true. We have all just recently witnessed how our government first allowed wheat to be exported, only to wake up to the fact that we did not have sufficient stocks to meet our own need and then imported it at a higher price. The same with sugar.

Secondly, let us suppose that the Indian government succeeds in finding some middle ground with its farmers and the country does away with subsidies etc. In a lean year, would we ever consider importing wheat from India because it involves fewer logistics and will be cheaper? The answer is no because they won't play cricket with us until we stop bringing up Kashmir, and we will not buy even the Covid vaccine from them till we have Kashmir — do the two sides care for what the Kash-miris want?

Self-correc-ting markets are supposed to be a win-win for everyone, but some like to not just win but also annihilate. They make a killing when the cabinet approves export and another when it approves imports from the farthest possible destination.

Coming back to the farmers' protest in India and why it is a matter of when not if we will have our very own peasants' uprising across the country, just pick up any loan agreement with any of the IFIs that has to do with agriculture or productivity reforms. We are legally bound to do away with the support price mechanisms and subsidies.

Actually, we are already in violation of many such agreements and the IFIs continue to release loan tranches by misleading their boards who in turn play along to 'contain' the Chinese influence.

The world may one day decide to learn from our prime minister and refuse to be 'blackmailed' and insist we undertake the reforms against which we have taken loans. The farmers would then protest, only the boot will be on the other foot and our -ministers would scamper to find the 'foreign hand'.

The Trouble With Farming

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This past December, I traveled with my family through north central Mississippi and across the river northwestward into south central Arkansas. The portion of the trip that made the deepest impression on me was that which took us through what is called the Mississippi Delta. The Delta stretches for the better part of 100 miles inland on either side of the Mississippi river in this area, though somewhat wider on the Mississippi than the Arkansas side. The land is table fiat, and the road we were on was arrow straight, bending only so much as was necessary to put it through the next town. The road was raised three or four feet above the surrounding countryside, which was fortunate for us. The countryside was flooded by unusually heavy winter rains, and the flooding was enhanced by a blinding rain squall as we drove through one of the more remote regions. When the ground is too full to soak up the water, there is no place handy for it to go.

This is farming country, though it was dormant at this season. More, it is row-crop farming country. Few, if any, cattle or hogs were to be seen, and woodland was rare. Twenty-five or thirty years ago, it was predominantly cotton country. Cotton is still grown extensively—many stalks were still standing, with traces of lint hanging from the empty bolls—but the growing of grains, especially soybeans, has widely supplanted cotton. The Mississippi Delta belongs geographically to a much vaster farming region, extending from Minnesota in the north to Louisiana in the south and from western Ohio in the east to eastern Colorado in the west. It is a vast fertile region, much of it low lying to fiat country with deep soil, well-suited in this age to commercial farming.

It is the Mississippi valley, the low lying area through which the waters which begin in the western Appalachians and the eastern Rockies flow into the Mississippi, and thence to the sea. The region of the valley narrows from north to south as the mountains recede in height and fan out into foothills which channel the water along other courses to the Gulf of Mexico. The Mississippi valley is sometimes called the heartland of America. It is certainly the breadbasket, for most of the grain that feeds America is grown there.

The Mississippi Delta through which I traveled has undergone a major change in the past two or three decades, a change that was very nearly completed by 1970, say. Although vast acreages of land are under cultivation now, the country is sparsely inhabited. Houses are usually located a considerable distance from one another; often, they are separated by a mile, or more, of farmland. Usually, a single family dwelling sits alone, with the mechanical equipment for farming nearby.

An Agricultural Revolution

Twenty-five or thirty years ago it would not have been possible for such a small number of farmers to till these great acreages. This Mississippi Delta was one of the major centers of cotton growing in the United States. Cotton required intensive cultivation—it had to be hoed several times by hand—and many human hands to harvest any considerable amount of it. Two major developments altered these requirements. One was the development of herbicides to get rid of unwanted weeds and grass. The other was the development of a mechanical cotton picker. Along with this, there was increasing use of mechanical planters and fertilizer distributors which could be extended across a wide carrying frame to plant many rows. There also were larger cultivators. The reduction of hands used was further accelerated in the 1960s by the extension of the minimum wage to cover farm laborers.

now sparsely settled by farmers who rely almost exclusively upon heavy equipment to do the work. I looked in vain for relics of these buildings. I noted none. There were reports in the 1960s that they were burned to be rid of them. A similar change or transformation has occurred in farming throughout the United States, though less dramatic than in cotton farming in most instances. Here and there are still enclaves of farming which require intensive human care and human hands and decisions in harvesting, such as in tobacco growing or in the production and harvesting of some fruits and vegetables. By and large, though, the extensive use of machines, the shift away from intensive use of labor, and the cultivation of large acreages by single farm families has been the trend throughout most of American agriculture.

Fewer Farms and Farmers

Statistics tell much of the story in abstract terms. According to census figures, the total number of farms in the United States has declined from 6,102,000 in 1940 to 2,808,000 in 1980. The most drastic decline for any decade was in the 1950s, when the number of farms dropped from 5,388,000 in 1950 to 3,962,000 in 1960. The number of farms appears to have stabilized over the past decade or so.

The total farm population declined from 30,547,000 in 1940 to 8,864,000 in 1980. Again, the largest drop in farm population occurred in the 1950s, when it declined from 23,048,000 in 1950 to 15,635,000 in 1960. The number of hired farm workers (average) in 1920 was 3,391,000; in 1940, 2,679,000; in 1980, 1,303,000. The largest drop in hired farm workers occurred in the 1960s, which coincides with the application of the minimum wage to them. Farms have been increasing in size over the same period, of course, and it might go without saying that they have generally been increasing precipitately in value.

The conclusion to be drawn from these facts is that fewer and fewer people are farming more and more land (per farmer) by the use of more and more equipment. Or, in formal economic terms, there has been a dramatic shift away from labor in the economic mix to land and capital, Cont'd.

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especially capital. Moreover, not only are fewer people farming more land with more equipment, but also they are producing more of many commodities than ever before. For example, here is a description of production in 1981: The corn crop of 8,080,000,000 bushels, or 205 million metric tons (t), was the largest on record and 22% greater than the 1980 crop. All feed grain production . . . was 240 million t, up 21% from . . . 1980. Also the soybean crop of 2,110,000,000 bushels was the second largest crop on record and . . . 18% larger than the 1980 crop. The U. S. wheat crop was a record 2,750,000,000 bushels . . . 377 million bushels more than in 1980.

Cotton production of 14.8 million bales was 33% greater than in 1980. Hay production increased 5% over 1980, while pasture and range conditions were 22% better than in 1980. Due to lower livestock prices during the first half of 1980, the number of hogs raised, the number of cattle fed for beef, and the number of chickens raised were down slightly. (American Annual [Grolier, 1982], p. 78)

The production achieved by American farmers by way of this heady shift to capital is surely little short of being one of the wonders of the modern world. Moreover, the prices of farm products to consumers should generally be reckoned as a bargain, compared to the prices of many other goods in an era of rising prices.

Signs of Distress

But there is a rather large worm in the apple of this farming Eden, which brings us to the subject of this essay, the trouble with farming. Discontent among farmers has been widespread and, perhaps, increasingly strident in recent years. There have been tractorcades to some state capitals and to the national capital, confrontations with sheriffs at foreclosure sales, and dark threats of violence if something is not done to help farmers.

The most common complaint is that farm prices are so low that large numbers of farmers cannot make ends meet. Stories surface after each crop year of farmers who lost large sums of money. Nor are the difficulties restricted to farmers in any one section of the country or producers of particular farm goods. They range from dairy farmers to chicken and egg producers to grain and fiber farmers to cattle growers.

Farmers are not noted, of course, for boasting about their great profits. Who is? Those who work and produce rarely complain that they are overpaid or admit that they are adequately compensated for their efforts. It could be, too, that when farmers gather in the winter, bragging rights sometimes belong to the farmer who had the largest losses during the year. But there is naught of exaggeration or humor in the inability of farmers to make payments on their debts or the ensuing bankruptcies and foreclosures. These last are widespread and increasing by all accounts. Moreover, precipitately mounting farmer indebtedness signifies something of the extent of the difficulties.

Total farm real estate debt outstanding stood at slightly over \$7 billion in 1953. At the end of 1981, it stood at over \$92 billion. There was a steady, though not particularly dramatic, rise in farm real estate debt during the 1950s and 1960s. It began taking off in the 1970s and almost doubled between 1975 and 1981. Closer analysis shows, too, that the least well secured—most precarious—portion of the indebtedness was increasing even more rapidly.

Indebtedness to the Farmer's Home Administration, the lender of last resort for farmers, almost doubled in the period 1979-1981. These figures do not include the indebtedness for shorter terms secured by farm equipment or "rollover" debts, not completely retired from year to year because the proceeds from the sale of produce were insufficient. These add substantially to the overall debt.

Contributing Factors

A good many contributory reasons can be enumerated for short term difficulties of farmers in general and those of individual farmers here and there in particular. Most likely, some farmers who go bankrupt or have their farms foreclosed are ineffective managers. Some are what economists call marginal, or on their way to becoming sub-marginal, farmers.

More broadly, there have been fluctuations and changes which had an impact on farmers generally. One was the oil embargo of the Arab countries and the subsequent steep rise in oil prices. This development not only drove fuel prices up but also the prices of such things as fertilizer, pesticides, and herbicides. Another development has been the sharp rise in interest rates in recent years. Embargoes on grain shipments to communist countries have aggravated the situation for grain growers also. It can be added that, of course, farming is a risky business, and the vagaries of weather, of pests, and diseases contribute to the fluctuations in farm production.

These, and like, explanations might suffice if the trouble with farming were temporary or episodic. But some of the signs, especially mounting indebtedness, point to persistent and increasing difficulty. Moreover, if it were simply a market phenomenon, we might expect that farmers would make the necessary adjustments of production to demand to get prices that would enable those who stayed in the business to prosper.

But it is not simply a market phenomenon, certainly not of the free market anyway. None of the developments discussed above were simply responses to the free market: not the dramatic shift from extensive labor toward capital, not the enlargement of farms, not the buying of ever larger and more expensive farm equipment, not the mounting indebtedness.

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All these occurred in a framework of government tampering, intervention, restriction, subsidization, and tacit inducement. Farmers have been propelled, as it were, in the direction they have taken, including producing more than could be profitably sold, by government programs over the years. That is not to say that some of the developments, such as the shift toward capital by the use of large and specialized machines, would not have taken place, sooner or later, without the intervention.

But it is most unlikely that the changes would have occurred so swiftly, so dramatically, or so extensively if the market had been the sole prompter of them. That is a way of saying that it is most unlikely that farmers would have been caught in their present bind by the workings of a free market. At any rate, that is not the way it happened.

Although there have been many government programs over the years which affected farming more or less in a variety of ways, I want to focus on three categories of programs which have the most direct bearing on the present situation. They are: price supports, crop and production restrictions, and easy credit. While easy credit is at the heart of the present farmer difficulties, other programs provide an essential part of the background and highlight some of the fallacies which underlie them.

Price Supports

Farmers have long and often believed that their problems, when they became acute, were caused by low prices for their production. Over the past century, they, or those who claimed to speak for them, have identified a number of villains who either contributed to or caused the low prices. Among these were high transportation costs, extortionate rates for storage facilities, money shortage, the fact that farmers often sold their crops at the time when prices were lowest, protective tariffs on manufactured goods, middleman profits, and, belatedly and occasionally, their own overproduction.

Coupled with this has been a sentimental attitude toward farmers and farming, which goes back at least to Thomas Jefferson and was vigorously intruded into the political scene by William Jennings Bryan in the late 1890s. There were sporadic political attempts to "aid" the farmer by making easier money available and regulating rail rates over the years.

However, it was not until the 1930s that the federal government made a concerted effort to raise farm prices. The New Deal devised a variety of programs designed to accomplish this result. Among them were programs to increase the money supply, make loans on crops stored in warehouses until prices rose, subsidies, government guarantees, and government bidding up of prices. Some one, combination, or all of these efforts did succeed in raising farm prices, or some of them.

It happens, however, that one of the most important economic functions of price is to signal what is wanted. Higher farm prices tend to spur farmers to produce more of the goods for which prices are rising. (Not all farm products had price supports.) If the New Dealers did not know this at the beginning, there would soon be bountiful evidence to prove it.

In any case, they were intent on raising prices, and they did understand that the way to do that was to reduce the supply on the market. Sometimes, they, or their successors in government, limited the amount of particular crops that could be sold at support prices. But the main device by which government tried to limit production over the years was by acreage restrictions on controlled crops. Farmers were assigned crop allotments for crops that had price supports, usually for their commercial or "money" crops.

Distorted Signals

The combination of price supports and acreage (or production) restrictions bent or distorted the market in opposite directions. On the one hand, price supports, so far as they succeeded in raising prices above what they would have been on the market, signaled farmers to increase production. On the other hand, acreage allotments limited the amount of land that could be planted to those crops. That did not mean that farmers gave up in their efforts to increase production of supported crops. It did mean, however, that they would have to shift the economic mix from labor toward capital. In theory, they might have cultivated the commercial supported crops more intensely in the hope of increasing production. But that was hardly possible, even if it would have worked.

The government program was set up in a way that discouraged the concentration of labor on the controlled crop. Allotments were based on the total amount of land under cultivation on a given farm. (Government favored diversified farming.) Thus, on a farm, only an established percentage of the land could be planted to the controlled crop. In order to get his maximum allotment, a farmer had to keep a maximum amount of his land in cultivation. He could, of course, concentrate his capital expenditures for fertilizer, improved seeds, pesticides, and the like, on the commercial and controlled crops. Many, probably most, farmers did. More, when they could, farmers increased their capital expenditures for these over what they had done, for it was a route to increasing production.

Beyond that, however, farmers who survived generally had to bring more land under cultivation, rent it or buy it (or buy allotments, as was sometimes done in the 1950s and 1960s) to make a living. The record is clear that most of those on small farms could not make a go of farming. The mass exodus from farming got under way in earnest in the mid-1930s and continued to the late 1960s, when farm population tended to stabilize. The main path taken by farmers was to increase farm holdings. Since the number of hired farm workers was generally declining during this period, the main approach taken to the cultivation of these larger acreages was to buy mechanical farm equipment, i.e., tractors, trucks, planters, cultivators, and harvesters. Thus, the shift from labor toward capital was completed, so far as it has been.

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From Whence the Capital?

Where did the farmers get the capital? More bluntly, where did they get the money to buy the machines, the fertilizer, the pesticides, the herbicides, the improved seeds, irrigation systems, and the like? In addition, where did they get the money to buy or rent additional land? There is no need to generalize too broadly here.

Most likely, there have been farmers who financed their expansion over the years in a businesslike and sound financial way. They extended their land holdings from profits, savings, inheritances, and so forth, and bought additional land only as it became available at attractive prices. Such people might well have bought new and larger equipment from similar sources, supplemented by prudent borrowing. If so, and if they have managed well, they are probably succeeding in farming even today. In any case, we are looking for the sources of the difficulties of farmers in trouble. More, we are looking for what, in addition to support prices, has enabled farmers to get the capital to produce in such quantity that they cannot survive in farming with such price supports as still exist.

The source of much of the money for farm capital and land is no great mystery. It has been borrowed. It has been made available by easy credit. The easy credit is a result of the policies and programs of the United States government. The farm movement that got underway in the latter part of the nineteenth century was early penetrated with the idea that easy money, or inflation, was a panacea for the problems of farmers.

This easy-credit idea achieved political expression in the Green-backer and silverite movement, was propounded by the Populists in the 1890s, and entered the Democratic party by way of William Jennings Bryan and his followers in 1896. It began to bear fruit when the next Democrat, Woodrow Wilson, was elected to the presidency in 1912. The Federal Reserve Act was passed in 1913. The banks authorized under it were to become engines of inflation, for they were empowered to issue currency on the security of commercial and agricultural paper. That is, they could expand the credit by rediscounting notes held by banks, thus making more money and credit available.

The Federal Reserve system, then, has been the main fount of easy credit in the United States generally since that time. It is important to emphasize, however, that farm credit is a breed all its own. Otherwise, it might be supposed that farm financing is done in the same way as for other businesses. True, commercial farming is a business, and farm enterprises are often referred to as agri-business. But much of farm financing is not done under such restraints as apply to business concerns. Farming is an especially risky business, yet much of the risk capital is obtained as loans rather than from investors who knowingly share in the risk. Also, much of farm land is financed by borrowing.

The Farm Credit System

How has this come about? Mainly by the operation of what has come to be called the Farm Credit System. Since little is known about this system generally, and since those who know of one or more of its agencies may not be aware of the government connections or the strange organizational modes, some little explanation of it may be in order.

First, the Farm Credit System was government inspired, government authorized, has had initial and occasional government financial help, and is government controlled! The basic system was authorized by the Federal Farm Loan act of 1916. The Federal Land Banks, probably the best known of the organizations, were first organized in 1917, pursuant to this act. There have been changes in the system from time to time by congressional acts. The following remarks are about the system as it was authorized by the Farm Credit Act of 1971. According to the U.S. Government Manual, the system is organized in this way:

The Farm Credit Administration, an independent agency, supervises and coordinates activities of the cooperative Farm Credit System. The system is comprised of Federal land banks and Federal land bank associations, Federal intermediate credit banks and production credit associations, banks for cooperatives. Initially capitalized by the United States, the entire System is now owned by its users.

Some of the above information could be misleading, however. The Farm Credit Administration is “independent” in the sense that it does not fall under the authority of any regular department of the government. Otherwise, it is a government agency, as are all the others under its authority, and the governing board is politically appointed: 12 members by the President of the United States and one by the Secretary of Agriculture.

This is a nationwide system of credit for farmers, the central banks being distributed about over the country in much the same way as are Federal Reserve banks. The Federal Land Banks make long term (5 to 40 year) loans to farmers secured by real estate. Although portions of the loans may be used for other purposes, they are made basically for the acquisition of farm land. The Intermediate Credit Banks are discount banks, serving mainly Production Credit Associations. Their main purpose is to discount intermediate term notes, such as would be needed for the purchase of farm equipment. Production Credit Associations make mainly what should be called risk capital loans to farmers. The loans may be for periods of up to 7 years. Banks for Cooperatives are, as the name implies, banks for associations of farmers.

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Specialized Loan Companies

None of these organizations are banks in the usual meaning of the term. They are neither depositories of money nor issuers of currency. They might better be called loan companies, for that is their function, loan companies established by the United States government. But the word “company” may be misleading, if by that term we mean an organization owned and operated by investors for profit. The organizations in the Farm Credit System do not fit that description.

The investors have no control over the organizations; investment is separated from ownership; hired managers operate them; and the profits, if any, go to the borrowers. Basic policy is set by political appointees or by law. Financing came initially from the Federal government, and ongoing financing comes from consolidated bonds sold to investors and backed by the notes from borrowers. (The United States government does not guarantee these bonds, but that may be only a technicality.)

The borrowers hold the voting stock in the basic organizations for the duration of their indebtedness. They are required to purchase the stock in order to obtain loans, and when the loans are repaid they must either relinquish the stock, or, in some cases, accept non-voting stock in return. The voting stock serves basically as a means of choosing the members of the committee which approves or disapproves loans. Such profits as may be made are, in effect, paid out as reductions of interest rates to current borrowers.

The point of these arrangements may be easier to get by conceiving the matter in figurative language. The government has contrived to bring into being and caused to be planted and grown a vast cabbage patch, i.e., credit, for rabbits, i.e., farmers. The rabbits’ have been placed in charge of distributing the cabbages under guidelines laid down by politicians or their appointees. My point is that a vast system of easy credit to enable farmers to buy land and get risk capital has been made available by government. But to round out the account of credit institutions one more needs to be included. It is the Farmer’s Home Administration (known as the F.H.A. in rural circles).

The Farmer’s Home Administration (F.H.A.)

The Farmer’s Home Administration is a backup organization to provide easy credit, mainly for farmers, who cannot meet the requirements of other lenders. (Applicants for loans are usually expected to submit evidence that they have been turned down by other lending institutions.) Its basic authority stems from an act of Congress passed in 1921. It operates within the Department of Agriculture, and it is financed by proceeds from the sale of Treasury certificates. It makes loans to “pay for equipment, livestock, feed, seed, fertilizer, other farm and home operating needs; refinance chattel debts; provide operating credit to fish farmers;” for the purchase of land, houses, and other sorts of things for rural inhabitants and farmers. Terms of repayment and interest rates are adjusted to the financial situation of the borrowers.

None of this is meant to suggest that farmers borrow exclusively from government agencies. They, or some of them at least, borrow from regular banks, from insurance companies, from equipment dealers, and from private as well as other public sources. But there is every reason to believe that the major source of the easy credit which has many of them now swamped with debts are the government agencies.

While I was in the midst of writing this article there was an account on television of a farmer in Ohio who was trying to prevent the auctioning of his farm to pay his debts, or at least those secured by it. According to the television announcer, the man had 199 acres of land, and he owed \$400,000 to a Production Credit Association and \$200,000 to a Federal Land Bank.

Much more generally, the breakdown of the lenders to whom were owed the more than \$92 billion outstanding farm real estate debt in 1981 confirms the preponderance of these agencies. The largest portion, nearly \$36 billion, is owed to the Federal Land banks. Nearly \$8 billion is owed to the Farmer’s Home Administration. Life insurance companies had loaned nearly \$13 billion, and commercial banks somewhat under \$9 billion. The other lenders were not enumerated.

Here is a synopsis of an Associated Press release (published in the Birmingham News, January 2, 1983, p. 21A) which illustrates the ease with which farmers could borrow money and the consequences of debt for one man. It is about a man who was a farmer in Missouri. He began farming in 1965 with 68 acres of land and \$600. By 1970, he was planting 900 acres and feeding several hundred hogs. This expansion was built upon a mountain of debt; it eventually totaled nearly \$400,000. Drought, a disease which decimated his hog population, and inadequate prices drove him to the wall. The Production Credit Association, which had been supplying the risk capital for his operation, could carry him no longer. He turned to the Farmer’s Home Administration, but that aid did not last long. His farm was sold at auction, but many of the debts remain unpaid.

In retrospect, this farmer understands what happened to him this way. He believes he still would be farming had he not expanded with such zeal. Had his appetite for money not been so voracious. Had that money not been dished out so readily. “They made a feather bed for me to lie on . . .” [he] said of the lenders. “You know, I could basically sit down at my kitchen table and write out a loan. It was just too simple.”

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“The road to hell,” it has been said, “is paved with good intentions.” The road to trial and tribulation for farmers is paved with government programs. Undoubtedly, farmers would have a full quota of trouble if there were no government intervention. Commercial farming is a business, and it is beset with all the pit-falls of other businesses. Some businesses prosper, others fail. That is the story (of all business in good times and bad, and especially in bad. Beyond that, farmers face some risks peculiar to their undertaking. Thus, however unfortunate it may be, farming is unlikely ever to be a universally prospering undertaking for all who venture into it.

Conclusions

But the conclusions toward which this article has been moving are these. Government intervention has greatly aggravated the lot of the farmers. Price supports induce farmers to produce more. That, plus crop restrictions, promoted the expansion of land holdings and the shift from labor toward capital. Despite the fact that this was risk capital, the government set up a vast credit mechanism to supply much of it.

Price supports, crop restrictions, and easy credit sent misleading signals into the market. The crop restrictions have generally been abandoned over the past couple of decades, not, however, before millions of people had been driven from farming and the pattern had been set for those who remained to expand their land holdings and rely more and more on capital.

Price supports, while not so obtrusive as they once were, still serve to stimulate production. Meanwhile, farmers go deeper and deeper in debt in a desperate effort to produce more and more in the hope that they can pay off the debts which are threatening to crush them. Many are falling by the way. Others, perhaps most, are having a hard time due to the lower prices resulting from the increasing production.

Many farmers are raising the cry for government aid once again. But the hair of the dog that bit them will no more solve their problems than it will cure alcoholism. Neither economic theory nor historical experience support any such notion. It is government intervention which has bent, strained and distorted the market to produce the current mess, as well as a number of earlier ones.

The unhampered market provides the guides for how much to produce in order to survive in an undertaking. The free market price is the surest guide to what to produce and in what quantity. When credit is only available from those who hope to profit from lending the scarce money available, there is little likelihood of overexpansion of landholdings or overcapitalization. Not so long as these are dependent on credit. And the farmers who are in desperate straits today are those being crushed by a mountain of debt.

Agriculture and Macroeconomics

(Despite significance of agri sector, it couldn't grow to the required extent)

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Wheat harvesting



Wheat threshing

There is media hype that the economy has started to recover swiftly under intense political and pandemic situation. The political situation has been volatile since September 2020 while the second wave of Covid-19 got ascendancy in December. Usually, political instability leads to economic uncertainty, which in turn affects economic outcomes. The economy improved slightly after the first wave of Covid-19 due to some fiscal and monetary accommodation. The large-scale manufacturing sector grew around 5.5% in the first four months of FY21 and some analysts have called this a V-shaped recovery. The government has ascribed this recovery to the construction package, fiscal and monetary doses and timely reopening of the economy after the first wave.

In the first five months of FY21, merchandise exports declined 7% in dollar terms while imports fell around 1%. The reduction in trade deficit was achieved at the cost of economic slowdown as import growth remained curtailed. The trade deficit was financed through secondary income, which grew 30% during the said period. The palpable growth of secondary income is linked with growth in remittances and current transfers. The growth in remittances is associated with the cautious approach of expatriates in sending money since they have diverted away from Hundi and Hawala to some extent. Although growth is being witnessed in the manufacturing sector, yet it will be temporary. By looking at statistics, analysts and commentators think that the manufacturing sector has revived to a great extent.

However, the economic reality is different from the statistics where the role of agriculture sector is quite significant. The agriculture sector plays an important role in the development process of an economy. In order to expand the manufacturing sector in a sustainable manner, the growth in agriculture sector is indispensable. As agriculture and manufacturing sectors interact with each other and one sector is complementary to the other, a balanced growth is required. Despite the significance of agriculture sector, it could not grow to the extent required for the development purpose. In the first decade of 2000, the agriculture growth was slightly above 2%. Similarly, in the last decade, the sector grew 2.2%, which is quite low as far as its potential is concerned.

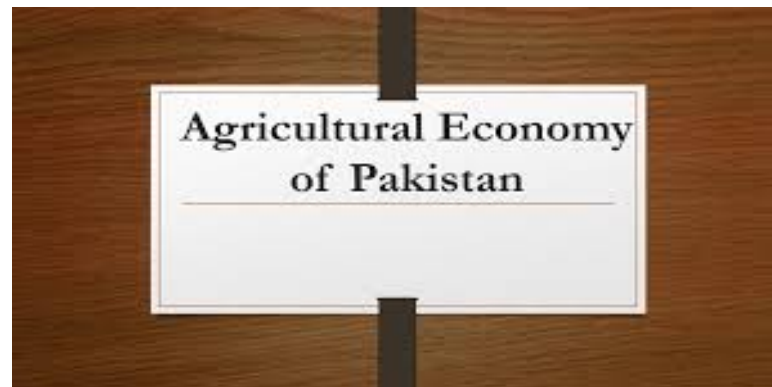
Whenever there is an outburst in the manufacturing sector, the agriculture sector comes under extreme pressure to perform. In the last political government, the manufacturing sector grew rapidly for a couple of years. Unfortunately, the agriculture sector could not match its pace with the manufacturing sector and the economy started to experience high food inflation. The food inflation started to increase as wheat, sugarcane and other crops became expensive over the years. The Economic Coordination Committee (ECC) has increased the wheat support price to Rs1,650 per 40 kg this year to compensate the farmers, though the current difference between the support and market prices is more than 25%.

This large difference would distort the supply chain and affect the supply of flour to the masses. In addition, the unintended consequence of low support price would compel the farmers to cultivate other crops in the coming season, which may further deteriorate the wheat situation. In short, instead of compensating small farmers through input subsidies, the government responded to the food inflation through the administrative muscle. As a result, food prices have come down slightly. However, the probability that food prices will increase is still high given the underlying economic situation.

Under the emerging situation, policy intervention will be required to grow the agriculture sector close to its potential. The writer is the Assistant Professor of Economics at SDSB, Lahore University of Management Sciences

Pakistan is No Longer An Agriculture Economy

Dr S. Akbar Zaidi , Director, the Institute of Business Administration at the University of Karachi, Pakistan



Dr S. Akbar Zaidi addressing at the launch of New Perspectives on Pakistan's Political Economy conference, State, Class and Social Change organised by the Applied Economics Research Centre (AERC) at the University of Karachi, Pakistan

"When we speak about the political economy of a country, it is interesting to read theory. But one also needs to see how these theories can help society today," said renowned academic, political economist and newly appointed director of the Institute of Business Administration Dr S. Akbar Zaidi at the launch of New Perspectives on Pakistan's Political Economy — State, Class and Social Change organised by the Applied Economics Research Centre (AERC) at the University of Karachi here on Tuesday.

Dr Zaidi, who is also the co-editor of the book with Prof Dr Mathew McCartney, also spoke about the late social scientist and historian Hamza Alavi whose work is mentioned in depth in the book's preface. "Hamza Alavi did a world of research on military, the business community, the landlords and bureaucracy of Pakistan. But his research, thoughts and observations are relevant to the Pakistan of the 1960s and perhaps not that much to the society of today. In order to know and understand today's society, we have to see what is happening on the ground. For instance, in theory, we all know the importance of taxation but then there is also the ground reality that here in Pakistan tax is not generated like it should be as many people do not pay their taxes here. Therefore, you cannot force theory where it can't be applied," he said.

About the book he said that it points towards the changes in Pakistan's economy while looking at various indicators such as rural and urban life, employment, sources of income, people, their potential, etc. "With an 18 per cent GDP, Pakistan is no longer an agriculture economy," he pointed out before talking about employment and what changes have taken place there along with the source of income of people in rural and urban areas. "Places have become more accessible with people coming closer thanks to telecommunications, media, etc. Things are becoming interlinked," he said. He also spoke about how social media was affecting lives here and how more women stepping out of their homes and getting good education were contributing to the feminist economy.

Providing his views on the book, Prof Dr Riaz Shaikh, dean, Faculty of Social Science and Education Department at Szabist, said that even though the nature of economy in Pakistan has changed in the past 70 years or so, the mindset of the people here is more or less the same even though Pakistan as a part of the global society is also bound to change. "We have been missing the politics of urbanisation," he said. "Urban politics has now captured Karachi's politics which is based on the struggle of classes and from class politics it is moving to sectarian politics," he said wondering if this is now an overdeveloped state using biopolitics as a tool to marginalise certain people such as the 'missing persons'.

He also spoke of the role of the media and journalists, how freedom of speech and expression were curtailed etc. "But after 2007, the media here has played an important role in teaching a lot to the Pakistani establishment though now there is also a business content emerging within the media as a result missing many things in the national discourse because the media doesn't want a hostile response from the government," he said.

Dr Shaikh said that the nature of development in Pakistan also needed to be looked at more closely as one province was feeding and developing itself on another's resources. Senior journalist Khurram Husain, meanwhile, spoke about how it has become evident about who really represents the state from the recent meeting of the army chief with the business community. "The businessmen were complaining about taxes and saying that the structural change was killing them but the government is not backing down.

They are told that they were willing to listen to them and help them but within certain limits or constraints," he said, reminding also about the mini-budget of early last year which was to serve as a revenue exercise though the billionaires were still having their way during it all at least until former finance minister Asad Umar left and the state got its voice. "Class in Pakistan operates at some points and not at others as class is heavily fragmented," he said. About the book and other books like it, he said that sadly the last people to read them are the ones about whom these books are written. "If the people you are writing about are not reading about themselves, then you must think of how to make your writing more meaningful to them," he concluded.

Agroforestry Status And Its Role To Sequester Atmospheric CO₂ Under Semi-Arid Climatic Conditions In Pakistan

M. Farrakh Nawaz (*et al*), Department of Forestry, Range Management and Wildlife, University of Agriculture, Faisalabad · Pakistan

Carbon dioxide (CO₂) is the major cause of global warming. Many countries including Pakistan have signed the Kyoto Protocol agreement under the United Nations Framework Convention on Climate Change (UNFCCC) and agreed to control the release of CO₂ and to increase the CO₂ sequestration. Agroforestry sector can contribute efficiently in carbon sequestration.

This study was carried out to determine the status and potential of agroforestry and its role in carbon sequestration under semi-arid conditions. Data was collected through a multi-objective and pre-tested questionnaire from 250 village farmers in tehsil Sumandri, Pakistan. Height and girth of trees were measured from 250 randomly selected 0.405 ha farm plots. Soil samples from each cropping pattern were collected and analyzed.

The whole study area has 2069.19 Mt of above ground carbon stocks and has sequestered a total of 7579.46 Mt of carbon dioxide at the rate of 186201.85 t CO₂ yr⁻¹. Furthermore, the study area has the potential of stocking 3607.61 Mt and sequestering 13214.67 Mt of CO₂ at the rate of 327232.46 t CO₂ per year. According to calculations, increasing the number of farm trees/ha, average CO₂ sequestration rate of the study area can be increased from 2.05 t CO₂ ha⁻¹yr⁻¹ to 3.59 t CO₂ ha⁻¹ yr⁻¹. The role of agroforestry as C sink is not negligible and it should be given a dire consideration in policies, especially, in low forest countries like Pakistan to meet the millennium goals of atmospheric C reduction.

Soil Carbon: It was found that farmers are mostly planting diverse trees species (not mono-species per plot) along with all crops. However, four types of tree-crop combinations were frequent as compared to all other types. Farmers liked to plant trees with wheat (*Triticum aestivum*), sugarcane (*Saccharum officinarum*), berseem (*Trifolium alexandrinum*) and sarsoun or mustard (*Brassica rapa*). So, soil C was measured for these four combinations.

At the soil depth of 0-15 cm, it was estimated that maximum amount of soil carbon was present under the combination of trees plus berseem crop (0.45%). It was followed by sugarcane plus trees (0.43%). Results showed that trees grown in combination with wheat crop capture less soil carbon than tree plus sugarcane but more carbon than the sarsoun plus trees. At 15-30 cm soil depth, the minimum carbon (%) was observed for sarsoun plus trees with no significant difference for other three combinations. The overall carbon percentage in the soils was less than 0.5 signifying that studied soils were carbon deficient and have poor organic matter contents.

Maximum number of respondents tells that there should be 10-12 trees at one acre followed by the category of more than 15 trees per acre. Minimum number of respondents said that there should be 13-15 trees at one acre. The farmers were reluctant in growing of trees due to several reasons. The maximum number of shisham trees were grown on the farmers' fields but they were not grown during last five years. Sufaidah is followed by shisham in which is being followed by kikar and so on. The distribution is shown in Fig. 5c. The maximum number of farmers planted Eucalyptus during the period of last five years. Then people planted kikar and poplar. These tree species are replacing shisham trees. Sarsoun plus trees has the maximum value of electrical conductivity (2.26 mS/cm) followed by sugarcane plus trees (2.10 mS/cm) and then wheat plus trees (2.09 mS/cm). The Fig. 7b showed that maximum pH is shown sarsoun plus trees (8.38) followed by wheat plus trees (8.2) followed by sugarcane plus trees (8.16).

The amount of carbon sequestered in each union council differs from each other slightly. The climatic conditions of the tehsil Samundri are almost same. But species distribution also determines the amount of carbon sequestered in each union council. Moreover the area of each union council is different. So the statistical tools which are being used also depend on the area of each union council. It was also observed that if the average number of trees per hectare is greater than the amount of carbon sequestered by the trees is also in huge amount. The carbon storage capacity in agroforestry differs across species and geography.

Furthermore, the amount of carbon in any agroforestry system depends on the structure and function of different components within the systems (Schroeder, 1994; Albrecht and Kandji, 2003; Nawaz et al., 2017a). It has been estimated that the croplands of the whole world have potential to sequester about 0.75-1 Pg yr⁻¹ of carbon. It is important to mention that removal of forests and other agricultural activities are responsible for removal of about 1.6-1.8 Pg C yr⁻¹ (Lal and Bruce, 1999). The rate of storing carbon in silvopastoral systems was 6.72 tCha⁻¹yr⁻¹ while the rate at which carbon accumulated in grass lands was only 3.14 tC ha⁻¹yr⁻¹ (NRCAF, 2007).

Similar to current status, the potential of each union council is different. At the full potential, additional 1.54 CO₂ t ha⁻¹ yr⁻¹ can be sequestered by increasing and properly managing the farm trees. In the literature it is reported that the tree species which were grown on the agricultural lands have the potential to capture 3.9 tC ha⁻¹yr⁻¹. And if tree species are grown on the forest lands which are considered to be degraded then they can sequester 1.79 tCha⁻¹yr⁻¹ (Maikhuri et al., 2000; Oelbermann, 2004). So, our findings are well coherent with the previous studies and it shows that even under semi-arid climatic conditions, if these agroforestry areas are well managed they have the great potential to sequester and stock the atmospheric CO₂.

(Cont'd.)

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