

Sustainable Agriculture Growth Strategy to Ensure Food Security in Pakistan in Post-Pandemic Era

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ABSTRACT

The study attempts to develop some coherent policy recommendations for growth sustainability to overcome the challenge of food insecurity for rapidly increasing populations with its changing consumption patterns and to address the 04th agricultural revolution of digital farming in a post-pandemic era in the greater public interest. The findings of part one of the study have been incorporated to assist in re-map the present strategic plan to promote the sustainable agriculture sector growth in the greater public interest to provide inputs i. e good quality seed, fertilizers, quality pesticides, modern tools and equipment, and easy credit services and feasible training to the farmers to re-build the cultivated areas for food security of rapidly increasing population and exports. The feasible policy recommendations are also helpful to make awareness at all regarding the significance of agriculture growth to cope-up the challenges and uncertainties and to make strategic collation between Private landowners and government agriculture sector concerns to reconcile the agriculture sector of the Indus valley for the benefit of the farmers to enhance their disposable income, food security for future generations and global welfare of the human in way of more food products at the lowest cost that will strengthen food supply chains.

Keywords: Agriculture, Growth, Sustainability, Public Policy, Strategic Planning, Green revolutions and Food Security

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INTRODUCTION

The Importance of Sustainable Agricultural Growth and Development Policy

The growth and development policy focuses on the entire agricultural sector, given overall economic development: higher income, production, and consumption improved healthy life and many positive changes for the society and economy. It is concluded that it guarantees food security to ever-increasing populations, supplies fibre for animals and industries, provides jobs opportunities for millions through services and value addition, has a minimum cost of development, maximum return with minimum investment, minimum gestation period, a most

potent weapon for poverty alleviation, equitable distribution of wealth lifeline for the industrial sector, minimum dependence on energy. It leads to rural development, a source of foreign exchange, a source of hunger reduction, support to reduce malnutrition, and a stunning significant role to play for happy and healthy life having a role for environmental betterment at large.

A subset of public policy towards sustainable agricultural growth is the guiding principle leading to a course of action that is pursued by the government. The policies and programs are major forces for change in the sector. Growth instability, globalization, technology, food safety environment, industrialization of agriculture, politics, and unforeseen events are key components. It also focuses on the inputs markets' use of land and other natural resources, agricultural credit and finance, and labour and industrial products are important issues to address in public policies. Agricultural output markets are also focused on production, consumption, marketing, and international trade to earn foreign exchange in the greater public interest.

The currency of the research topic

The title of the study depends on the reliable source of Governments of Pakistan which concludes and confirms that this topic of the proposed study is equally important for Pakistan's economy and its people in the post-pandemic era and greater emphasis on policy recommendations to boost the growth up to 2050, strategy food for all“During the last few decades, agricultural contribution to gross domestic product (GDP) has gradually decreased to 19.3 per cent, however, there is a lot of potential in the sector to increase its share in the gross domestic product(GDP) through increased productivity utilization of latest agricultural technologies. The challenges of climate change, pest attacks, shortage of water etc., kept agriculture production far less than the potential. One key issue related to agriculture is that the farmers have limited direct access to the market due to which the role of the middleman remains crucial and farmers normally do not receive fair market prices for their produce. In terms of potential, the agriculture sector cannot only produce for the domestic population but have surplus production for exports, which can ensure food security as well as contribute towards foreign exchange earnings”. (Economic Survey Pakistan ESP 2019-2020)

THE REVIEW OF THE LITERATURE

Agriculture sector has a strong linkage with food security and the growth of other sectors of the economy. The government of Pakistan claimed that “it has assigned high priority to the growth of the agriculture sector on a sustainable basis and is implementing the most appropriate policies to achieve the desired outcome. The government’s packages for the growth of agriculture will further improve its output and trickle down to farmers. The emphasis is on the use of the better quality seed, and modern technologies to ameliorate agriculture outlook and food security”. (Economic Survey Pakistan 2021-2022)

(Raju, 2009) concluded in their study that “instability has declined during the post-green revolution period. However, a macro perspective overlooks many of the peculiarities at the regional level since the socioeconomic and agronomic conditions vary from one region to another. Thus, there is a need to study instability at the disaggregated level so that the policy implications are more relevant”.

(Paltasingh & Goyari, Analyzing Growth and Instability in Subsistence Agriculture of Odisha: Evidence from Major Crops, 2013)suggested to policymakers in sustainable growth interest that “public investments on irrigation, water management, droughts and flood control should be enhanced. The relationship between growth and instability has shown that there is no basis to believe that high growth causes high instability. Therefore, the growth rate of production can be augmented by minimizing instability. He further suggested that the yield stabilizing measures should be prioritized. Development of market infrastructure with adequate support pricing, setting-up cold storages and introduction of farmer-friendly weather insurance, better contact with development authorities and extension services can minimize the income risk of the farmers in the state”.

(Pakistan Ministry of National Food Security & Research., 2018), focused on Pakistan's national food security concludes that “feeding the ever-growing population in the country means harnessing the food and agriculture system more effectively towards sustainable agriculture development imperatives. The study further pointed out that agricultural development cannot be called sustainable unless it improves Food Security and Nutrition (FSN). The agriculture and agricultural systems of Pakistan are continuously evolving and adjusting to meet the increasing demand for food and changes in nutrition and diet habits. Pakistan’s agriculture has the potential to grow at the rate of 7%, provided that a comprehensive program for the development of all the sub-sectors is implemented. There is a need for the guiding principles of the strategic framework of the food security policy”.

(Shikur, 2020)A study on sustainable agricultural growth draws three major implications. “First, irrigation policies increase agricultural production and investment in irrigation equipment and encourage investment simultaneously in other sectors, and raise rural households’ income and consumption”.

(Transforming Food & Agriculture to Achieve the SDGs, 2015)Rome-based food and agricultural organizations developed a food security strategy in 2015 and concludes that “production systems and the policies and institutions that underpin global food security are increasingly inadequate. Sustainable agriculture must nurture healthy ecosystems and support the sustainable management of land, water and natural resources while ensuring world food security. To be sustainable, agriculture must meet the needs of present and future generations for its products and services, while ensuring profitability, environmental health and social and economic equity. The global transition to sustainable food and agriculture will require major improvements in the efficiency of resource use, environmental protection and in systems resilience. Sustainable agriculture requires a system of global governance that promotes food security concerns in trade regimes and trade policies, and revisits agricultural policies to promote local and regional agricultural markets”.

Objectives of the study

The emerging challenges of national food security and climate change have shifted the policy focus globally towards the development of the agriculture sector during the last two decades of the new millennium. The study is aimed to evaluate the performance of Pakistan’s agricultural growth towards a country's economy in the context of its policy framed by the political economy institutions, sustainability with agriculture and economic growth of other sectors of the economy in various phases, secondly to analyze drivers of agriculture growth with causes

of the slow growth of the sector even some times negative growth and thirdly to develop decent policy document for effective tapping of natural resources that can support sustainable agriculture and economic growth in the Indus valley which is essentials to ensure food security of the population, reduction of poverty and healthy life of masses. There is a strong relationship between agriculture and changing climate/temperature, floods and other aspects of weather that affect crop production performance and its prices and finally impacts agricultural, economic growth and overall development process in the country. The end of hunger from the entire world, achieving food security for all and improving the nutrition of tomorrow's people and promoting sustainable agriculture are important global development goals, end poverty in all its forms, ensure healthy lives and promote inclusive and sustainable economic growth with conservation of natural resources for the universal welfare are directly linked with sustainable agricultural growth policies and practices. Keeping because of the above discussions the following two are key objectives of the paper in the general public interest.

- i. To propose a coherent strategy as a way forward for effectively tapping natural resources to reach sustainable agricultural growth destinations for the prosperous future of tomorrow's people as post-pandemic policy reform in the agriculture sector of the Indus valley.
- ii. To suggest a feasible empirical implementation roadmap to ensure food security in the post-pandemic era?

RESEARCH METHODOLOGY

The mixed explanatory approach has been used to test the hypothesis empirically using time series data of agricultural growth from 1951 to 2020. The simple cross tabs have been used to measure the agriculture growth associations with the gross domestic product (GDP) and other allied sectors of the economy with an overview of Pakistan's agricultural practices and performance in the last 70 years in detail. The second part of the study is mostly descriptive and based on the pieces of evidence discussed in the first part of the study.

POLICY DISCUSSIONS AND RESULTS

Optimum Utilization of Farm Land

(Agricultural Census of 2010) concludes in its executive summary that there were 8.26 million farms in the country. These farms were operating an area of 52.91 million acres. The distribution of farm area among small and large farms was highly skewed and poses a challenge in rapid growth because farms with less than 5 acres of land constituted 64 per cent (5.35 million) of the total private farms but they operated only 19 per cent (10.18 million acres) of the total farm area on a small scale of operations. Whereas, the farms that were 25 acres and above in size, comprised only 4 per cent (0.30 million) of the total farms but they commanded 35 per cent (18.12 million acres) of the total farm area this is an ideal farm at a medium scale operated by progressive farmers. There is an inverse relationship between proportional cultivated area and the size of the farm. It is evident that privately managed farms were mostly cultivated by the owner cultivators (82 per cent) followed by tenants (11 per cent) and then by owner-cum-tenants (7 per cent). Census data indicate that owners and owner-cum-tenants operated an area of 39.43 million acres and 3.10 million acres respectively, accounting for 42.53 million acres in total.

The Degradation of Land in the Region

Salinity and water logging is the major cause of land degradation in the country. This degradation of land leads to a reduction in productivity and also reduces the rate of agricultural growth. Installation of new tube wells, maintenance of the old ones, subsidy by the government on various inputs, and effective soil testing program can also reduce the ever-increasing land degradation problem as it poses a serious threat to agric- development and the economy as well. The crop zoning and change in crop rotation should be strictly enforced, farmers should be educated and trained. The anti-degradation / resistance variety of crops may be encouraged by offering incentives by the government.

Improvement in the Land Tenure System

It plays a key role and has been divided into three categories. i.e. owner or self-cultivation method, sharecropping system and leasing of land on a rent basis. Owner-cultivated farms are more productive than sharecropping farms. In this system, the owner fully utilizes his skills, time and capital due to sole entrepreneurship as compared to the sharecropping system which is based on a fifty, fifty % divide in net production after expenditure calculations. Self-cultivation with modern tools can improve productivity on a large scale.

Land Fragmentation

It reduces the size of farms into small pieces and creates many difficulties in irrigation, drainage, disease control, credit-seeking and other improved cultivation practices. It also reduces the energy and power of the growers and creates hurdles in the mechanization of farms and reduces the agricultural productivity and growth rate in this sector. The main causes of fragmentation are; Law of inheritance, increasing population pressure on land, sale of parts of the landholding and allotment of small pieces of farm among tenants by the landlord. The new anti-land fragmentation laws may be introduced and implemented as soon as possible to avert further fragmentations of agricultural land by setting up a minimum level of farm size for maximum productivity in the light of cost-benefit analysis and zone-wise ground realities.

Implementation of the Land Reforms Policy is the viable solution to boost the growth

This is evident that from 1958 to 1993 four-time land reforms law was introduced but all reforms could met with little success, due to the strongholds of feudalists in the country with the help of civil and military bureaucracy. The last land reforms of 1977 fixed 100 acres of irrigated land and 200 acres of barren landholdings but are yet to be implemented. This is not a difficult task as our neighbour India solved it in the initial period. Sustainable advanced collection of overall data regarding the number and composition of landless families, distribution and concentration of land ownership, and production, rent and land incomes is important to program, design and implement with great force of the state is necessary. Land reforms should primarily focus on social justice and economic efficiency in agriculture rather than power politics. Institutional mechanisms should be developed for the proper implementation of reforms monitoring, survey and impact analysis. Land institutions are a vital element of ineffective governance. Access to information regarding land-related issues, especially the allotment of state land, should be made easy through print /electronic media. More attention should be paid to safeguarding and assuring customary land rights of the poor, including rights to forest land, grazing land and wetlands. The intra-household allocation of land rights, assuring greater rights for women in the enjoyment, disposition, partitioning, and inheritance of land should be mandatory.

An Appropriate Utilization of Water Resources

The Indus civilization and its irrigation system have a decent past glory, and undoubtedly, serve as a backbone to the agriculture sector. It accounts major source of the total irrigated land in Pakistan. An increase in the supply of water and improvements in the timeliness of the delivery are instrumental in increasing yields and responsible for over 90 per cent of agriculture production but a big chunk of the resources is wastage due to poor water policy and inefficient use. The drought situation every 3 to 5 years hampered growth sustainability. The Ground Table Water has very little potential and is also sodic and saline. The high cost of electric power tube wells is also an obstacle to using water for cropping. The Rain Feed Irrigation System is only a single source in the desert areas and western/northern hilly areas. This area is less suitable for cropping agriculture as compared to the livestock sector which has higher value addition with the lowest input cost. The lining of watercourses, minors and canals and the use of laser technology will bring about a great change in levelling of land and the wastage of water resources. The drip irrigation system is one of the innovative methods of irrigating. This method works wonders in terms of water-saving and yield increase. It reduces water use at the farm level and saves a lot of water. It also reduces the rate of land degradation, water logging and salinity. In yield increase, its highest impact has been estimated in sugarcane pomegranate, tomato and chillies and the case of banana and other fruit farms up to twofold.

Input Use and Growth Sustainability

(Agricultural Census 2010, 2010) findings indicate that out of a total of 8.26 million farms in the country; 3.35 million farms (41 per cent) reported the use of fertilizers only, while another 2.45 million farms (30 per cent) reported use of both fertilizers and manures. The use of manures only had been reported by 0.22 million (3 per cent) farms. The remaining 26 per cent of farms had not reported the use of fertilizers and or manures. The use of insecticides had been reported by 2.75 million farms, representing 33 per cent of the total farms in the country. Out of the total, 7.88 million farms (95 per cent) reported cultivated area at their farms at the country level, amongst them 6.04 million farms (77 per cent) had reported the use of tractors only for the cultivation of land, covering an area of 37 million acres i.e. 77 per cent of the total farm area. There were another 1.55 million farms (20 per cent) reporting the use of both tractors and animals for cultivation, covering an area of 9.93 million acres (20 per cent). The use of bullocks/other animals for the cultivation of land had been reported only by 0.29 million farms (3 per cent), covering an area of 1.28 million acres, i.e. 3 per cent of the total farm area. It was observed that the average crop yield per hectare is 3 to 6 times less than the developed countries. This also indicates the potential to further increase productivity growth which is essential to accelerate the development process with simple efforts if taken during the sowing season by the provision of good quality seed on the cheap at the farm level. To increase crop production, small and medium farmers should be given due attention to the supply of improved seeds to boost crop production throughout the country. The supply of good quality seed should be consumed through an effective organization of a scientifically based seed production system to incorporate standardization if all steps involving variety evaluation approval and release of variety, setting up of seed multiplication chain starting from pre-basic seed and leading to the production of the basic and certified seed, seed processing, seed quality control, appropriate storage and setting up of distribution and marketing systems are taken into account.

Enhancement of Credit Institutions and Stable Growth Nexus

The Small growers receive fewer shares in credit distribution. The Agriculture Credit card system for growers, livestock owners and fishermen should be introduced by all commercial, cooperative and Agricultural Development Banks. There is a vast market in rural areas for the said purpose and it may bring about a great change in rural masses and facilitate the purchase of inputs for cultivation. The credibility of the institutional credit system should be restored. At the institutional level, the cooperative bank should be reorganized for agricultural prosperity at the union council level with the cooperation of professional bankers and farmer organizations. The insurance of crops, livestock and inland fish farms should be introduced; it will fight the fear among growers, provide cover during calamities and reduce the rate of rural poverty and also extend economic activities in rural markets. Microfinance has great importance as a tool of poverty alleviation and social mobilization, especially in rural areas. This mode of credit access to financial services enables poor farmers to increase their household income, build assets and reduce their vulnerability to impediments that are so much a part of their daily life during the harvesting period for input demand i.e. seed, fertilizer, pesticides, hiring of tractor and others implements.

Rapid Change in the Environmental Betterments for Growth Sustainability

The agricultural sector should operate in a new and dynamic business and social environment in the context of global competitive consumer demands and also has significant impacts on the overall economic development of the regions. The conservation strategy of natural resources, lowest use of various kinds of chemicals, use of animal manure, garbage, local herbicide manufacturing for pesticides, plantation of trees, and implementation and monitoring of pollution laws may lead to environmental betterment in the region. Sustainable agriculture growth can be used continuously and does not deplete its resources or endanger its environment and also ensure good quality food products for import- the basic requirement of consumers of developed nations in the age of global competition. The sharecropping system strengthens more socioeconomic power of landlords, slows down the process of mechanization and encourages old traditional /cultural methods of cultivation and above all creates social unrest and poverty among rural masses. Better socioeconomic & agricultural infrastructure will usher in major cultural changes through education, development of communication means, betterment of law and order, creation of middle-class progressive farmers in the rural society, and reduction of poverty affected by time-barred feudal culture. This approach entails the implementation of agri-business for development- a dynamic approach, instead of the traditional subsistence approach of agriculture that is in vogue for ages.

Investments in Infrastructure and Output Markets for Agricultural Growth

The government in place should enhance investment in farmer field schools to improve literacy and numeracy. Besides, the curricula for schools in rural areas should reflect the practical importance of farming to check youth alienation and invest in creating non-farm skills for the well-being of the landless. The agricultural technical/vocational training centres should be established at the district headquarters level in the first phase and later enhanced at the town level. The infrastructural investment should entail improving the performance of Agriscientists, laboratories, research methods, data collection and information, institutions, and technologies for rapid change in the sector. Markets in the vicinity would also reduce the cost of time and transportation. In this way, the growers will get the right price and urban consumers will purchase agricultural- commodities and other food items at cheaper prices with

an equilibrium in demand and supply. It will also reduce the galloping rate of food inflation in Pakistan and increase the purchasing power of consumers which will lead to food security of common. It is very important to train and update the growers in terms of the benefits of maintaining the standard and grading of agricultural commodities to face the globalization challenge in this regard. In the competitive world, the Government should not control the input and output markets but regulate them properly and with utmost care. In this regard, the monopoly of agents should be checked in markets for grains, fruits and vegetables, and live animals and abattoirs, besides ensuring they do not try to cap the price of any agricultural product. A public/private joint venture should take the primary responsibility for market information, regulate the quality of products and maintain grades and standards for export according to global standards.

Significance of Emerging Sub-Sectors to Address the Challenge of Export Sustainability: Livestock

The Post pandemic strategy should be focused on livestock production because of the potential as described by the recent Economic Survey "Livestock having a share of 60.07 per cent in agriculture and 11.53 per cent in GDP achieved a growth of 3.06 per cent. The fishing sector, with a share of 2.01 per cent in agriculture value addition and 0.39 per cent in GDP, grew by 0.73 per cent, while the forestry sector had a share of 2.10 per cent in agriculture and 0.40 per cent in GDP, and grew by 1.42%". (Economic Survey Pakistan 2021-2022) Animal research and development centres should be established, much attention should be given to animal health services and their marketing development. The problem of animal nutrition during periods of feed scarcity could easily be solved through the manufacturing of briquettes. Crossbreeding has resulted in crossbreds with higher live weights at marketable ages. The department should consider livestock development programs, targeting and promotion, and extension of livestock production on rangeland. It should initiate an adaptive research program, aiming at generating appropriate husbandry and management technological packages to be disseminated to range livestock farmers through the use of suitable and efficient livestock extension messages.

Poultry

The poultry sector of Pakistan has vast potential to act in the global (halal) food market due to its driven demand, particularly in the Middle East, Eurozone area and central Asian countries to some extent. It contributes billions of dollars every year but is not organized in the required path of development as in the others emerging economies. It also brings foreign direct investment in the country and needs sustainable policies to grow more as a reduction in taxations, incentives and protection policies to save it from natural calamities and viral diseases for a decent business environment for this emerging sector.

Fisheries Resources

The development of fish habitats and assurance of water flow in the lower Indus basin is the lifeline of fisheries resources. The natural reservoirs/lakes should be conserved with modern tools and equipment in the context of incoming climate change. Post-harvest facilities, fish biology, reproductive physiology, ecology, fish nutrition, health management, fishing gear, craft handling, and transportation and marketing practices may be improved as per the world standard of hygienic and certified product supply in the global market. Hatcheries/nurseries

may be developed for more production of fish seed with the collaboration of international food chains for sustainable supply and growth.

Forest Sub Sector

The growth of forests is dependent on River Indus in the entire valley. According to the estimation of forest experts flow of one cusec (28 liters) for every 100 acres of forests is necessary for the growth of forests especially mangroves forests located in coastal areas but this supply is inadequate due to large dams and barrages construction in the upper northern areas caused massive reductions in the forest areas determined by the global standard as 25%. The protection of available forestry resources will play a significant role as defence walls in climates change in the future. Habitats and assurance of water flow in the lower Indus basin are the lifelines of fisheries resources. The natural reservoirs/lakes should be conserved with modern tools and equipment in the context of incoming climate change. Post-harvest facilities, fish biology, reproductive physiology, ecology, fish nutrition, health management, fishing gear, craft handling, and transportation and marketing practices may be improved as per the world standard of hygienic and certified product supply in the global market. Hatcheries/nurseries may be developed for more production of fish seed with the collaboration of international food chains for sustainable supply and growth.

Growth Sustainability and Policy Formulations in Political Economy Perspectives

It is the study of how economic theories affect different socio-economic systems such as socialism and communism, along with the creation and implementation of public policy. Different groups in the economy adhere to their theory on how the economy should be developed; hence, political economy is a complex field that covers a broad range of political interests. In simple terms, political economy refers to the advice given by economists to the government on either general economic policies or certain specific proposals created by politicians. This is the real fact that policy attention was not given to agriculture and the rural economy by the National Planning Commission in its Framework for Economic Growth. Agriculture was ignored at large and policymakers mostly belong to urban centres and served in favour of urban growth, real state markets, trade centres expansion, and good governance in their interest only. The need of the hour is to develop a framework which can be addressed Pakistan's real needs, such as pro-agriculture policies for food insecurity, and malnutrition, and to reduce rural poverty. The top-level policy elites think that these are local issues that had been devolved to the provinces under the 18th Amendment. This is very important to point out that many kinds of past strategies and policies for agricultural sector development and the rural economy bitterly failed due to a lack of interest at the implementation level. The old traditional, time-barred governance system of the bureaucracy is quite unable to implement development strategies and sustainable policies because they opted for highly marked targets without giving due attention to implementation at grassroots levels in the greater public interest. It is also a fact that Pakistan's federal and provincial governments lack detailed subsector priorities according to their potential for more products as we have an example of the livestock sector which is performing better in the last two decades in national and international scenarios.

Political Instability and Implementations of Agricultural Development Plans

In the Indus valley regions some plans and programs were designed by renowned economists of international repute in the decade of 1950 and 1960 and were decently implemented and result oriented which brought 11% growth in the sector but after separations of East Pakistan

mostly plans particularly land reforms are failed at cross the road. The government of Pakistan revised its strategy in the perspective plan of 2010 and Vision 2025, prepared and published by the Planning Commission in 1998 and 2014, but due to sudden changes in the government these policy initiatives were not implemented and remain only on the papers and do nothing for agriculture and food security into the national policy plan. It aims to "Create a modern, efficient and diversified agricultural sector – aligned with associated water and energy infrastructure –that can ensure a stable and adequate provision of basic food supplies for the country's population, and provide high-quality products to its industries and for export" (Pakistan 2025 One Nation Vision, 2025)

After the 18th constitutional amendment, the provincial governments now have a stronger policy role to formulate feasible and comprehensive plans and tap their resources for agricultural growth and development as per the needs of the nations with precise actionable policies, greater allocation of resources for the development of the primary sector, and coherent strategies for proper implementation, close inspection of the agricultural and allied institutions with monitoring, and evaluation of allocated funds for further development of the sector.

The New Agents of Growth Sustainability

The future of Pakistan's agricultural sector and the welfare of the country's farming communities up to 2050 will be placed by major agents of change. These are the global climate change, protection of natural resources, agricultural productivity growth at reduced cost laws of returns, rapid urbanization in the world, development of urban international markets, agribusiness, and role of the political economy of public policy and role of social cohesions with progress in poor health, nutrition, and educational outcomes in the rural population. The steady climate change in the long run and short-run weather up and downs in temperature impact the sustainable agricultural growth in Pakistan, particularly because of the rapid change in climate i.e. drought situation after every three to four years and heavy rain flood and rural and urban centres as experience in, 2016 and 2020 and the dependency of the agricultural sector on irrigated water of Indus river. The future progress of the agriculture sector of the Indus valley will depend on more than just good economic policy and strategic investments in science, technology, infrastructure, and markets. Solutions to Pakistan's challenges need a comprehensive approach to poverty reduction and welfare improvement. High rates of agricultural growth may have only modest effects on rural employment and the welfare of the poor in Pakistan if growth is concentrated mainly on larger farms without a broad-based growth strategy, downstream growth linkages arising from higher farm incomes and consumption expenditures may accrue mainly to enterprises and better-off households producing nonagricultural goods and services in urban centres.

A Post-Pandemic Challenge of Digital Farming in Indus Valley Agriculture

(Briers, 2018), discussed that 18th-century rapid agricultural production with new tools and techniques adopted by the European farmers is the first green revolution and it's the real impact of the industrial revolutions of the 16th century. Some of them think that around 12000 years ago first organized agriculture was the first green revolution in the sector when it was managed by the farmers in the long term perspective of food security for their families and livestock for meat and milk production. It was the first step toward the modernization of the sector by adopting strategies to increase production and to make cities into developed societies and economies through urbanization and industrial innovations in the world. The use of animal

waste manure to store good seeds for the future was a significant step to grow more. The second revolution of 1920 in the agriculture sector was brought after a long and hard journey 1920 by the innovations of the engine and energy tools leads mechanization in the agriculture sector was the foundations stone of the second green revolution in the world. It enhanced the efficiencies of the farmers at large. World war two also insists farmers face food insecurity in the world. The machinations in the agriculture sector supported farmers and industries. The Third Green Revolution period from 1960 to 1980 was the actual period of agricultural reforms which brought greater real change in the agriculture development in the entire world. The crisis creates opportunities after World WarII; the whole world was reorganised and reconstructed again. The struggle for more food and fibre for industrial growth was focused on poly initiations globally. The tractors, fertilizers, tubes, wells, pesticides, hybrids seeds land reform policies and irrigational development projects were launched to bring a greater change in the sector that was result-oriented in the fields and named green revolutions. It is a real fact that despite the increase in the production of the crop the third green revolution brought new diseasing the human body as the chemical effects of fertilizers and pesticides and tractors affects land to nature and all combined affect Agro ECO System widely. The above situations and awareness of people need sustainable resources to use nature in favour of tomorrow's people and for environmental betterment and to face speedy climate change overall. Other challenges of the 21st century are climate change, rapid increasing populations and changing consumptions pattern in the entire world.

Digital agriculture is the reality of the new era that emerged as a way of new thinking sustainable feeding of the world with modern tools and equipment to create equilibriums in demand and supply by technology tools means the use of digital technology on-farm to manage it decently in favour of the all. It will be very fast in its nature, easy to use and based on low-cost farmers friendly to reduce the distance between rural farmers and urban consumers. it will connect food networks at one platform, farm machinery supply and use and smart management of all the relevant activities at the farm. Digital farming will be helpful to arrange timely swings with favourable weather information, inputs prices and availability, decreasing overall farming costs and increasing aggregate profitability from the farm.

The Low Literacy of Masses and Challenge of 04th Green Revolutions

The most important resource of a nation is its human capital. The best cultured and valued wise men are products of an effective education system. New ideas, concepts, and effective and innovative ways to do things come only when the education system is strong and benefits brilliant minds. Pakistan is a developing country and it is densely populated. The literacy rate in Pakistan is considerably low compared to the male literacy rate and it is even lower in rural areas of Pakistan. Therefore, a young population with a major portion of females is a very important resource that if used wisely can help to bring benefits to the country in all terms of growth and development. (Pakistan Social And Living Standards Measurement, 2019)concludes that Pakistan's populations are 212 million in total (currently 226 million) and nearly 22.5 million children are out of school. Girls are particularly affected. Thirty-two per cent of primary-school-age girls are out of school in Pakistan, compared to 21 per cent of boys. By grade six, 59 per cent of girls are out of school, versus 49 per cent of boys. Only 13 per cent of girls are still in school by ninth grade. Sustainable agricultural growth rates, poverty reduction in rural areas, and empowering the rural population of the country with literacy and technical skills is the first step for change in agriculture overall scenarios is called development in the

Indus valley. There is a need for in-depth studies of higher-quality data on the causes, impacts, and constraints associated with technological change as in the case of china agriculture, good governance, improving public-service delivery in inputs during swings sessions, and improvements in the health and nutrition of the population, especially women and children literacy/skilful educations and health are mandatory to bring change in the agricultural development process in long run.

Feudalism and Challenge of Digital Farming in the Indus Valley Agriculture

It is also important to mention here that very small and large farms are less productive than medium size, large farmers mostly due to mismanagement and small ones due to diminishing returns in the long run. So, there is a need to encourage medium size/owner farms that are measured from above than 25acres and up to 150 acres. Hence there should be no further land reforms in the size of land because it is very likely to lead to degradation in future. Last land reforms are awaiting implementation because they may boost medium size farming in the area as we require progressive farming as a prerequisite for agriculture sector development. The feudal lords are the self-appointed emperors & kings as they maintain their age-old traditional norms and values to settle disputes, subjugate the common man and run their courts According to the long-established and time-honoured rules and regulations. The landlords keep/possess/occupy large tracks of land for social and political clout but not for agro-economics. Their poor interest in modem methods/techniques and in leaving the land labour in the lurch emanates from the ignorance and backwardness of the local population. As a result, proper attention is not being paid to using innovative techniques leading to low/poor yield.

Socio-Cultural Taboos, Mechanizations and Digital Farming in the Indus Valley

The customs, the lifestyle, the arts, the manners and norms, the gentility and humility, the good taste, the simplicity, the politeness, the urbanity, the agriculture, the agronomy, the cultivation farming and husbandry have been an integral part of culture Indus valley culture. In developed countries, agriculture has been automatic and machine-driven. The tenant of the Indus valley region lives in a world of uncertainty. A world where innovative/ modem methods/techniques in growing crops and enhancing their per hectare yield are still a far cry for him. The economic development of rural regions is based on agricultural development but it is chained with time-barred cultural traditions, self-appointed feudal, and their partners for their vested interest to keep the local population under control. Only a peaceful environment, efficient land reforms with great force of the state, huge investment in rural infrastructural schemes, education of rural masses and agro-based industries programs may usher in an era of positive cultural change, peace and prosperity and above all needs serious efforts at policy level with huge public / private investment in the sector.

Public Policy towards agricultural growth, Rapid growth of the Populations & Food Security in the Post-Pandemic Era

Pakistan is a low-income developing country with a huge population of 226 million, having less than 1200 dollars per person income and agriculture is its most important sector due to its primary commitment to providing healthy food to her fast-growing population. The total cultivated area has increased by less than 40 per cent during the past 70 years, while there has been more than a four-time increase in population and a sevenfold urban expansion resulting in megacities of Karachi and Lahore as well as rising population pressure on other urban centres and cultivated land for more productions. The production of wheat a major food crop

has increased five-fold during the same period, yet the country is a marginal importer of wheat because of no alternatives and low production in comparison to the developed country's per acre yield. The cultivations of rice, and maize horticulture edible oil can be the best alternative in the present scenario of changing consumptions pattern as a future strategy to overcome the challenge of food security in the post-pandemic era. The Pakistani policymakers should follow the successful case studies to ensure growth sustainability and food security in the post-pandemic Era and a comprehensive planning strategy should be up to the year 2050 in a long-term perspective and the greater public interest. they may follow the case studies of livestock in Australia, the case study of the Netherlands in the relevance of horticulture productions and the significant case of Spanish agriculture to cultivate barren land to produce grapes, olive and edible oil with saffron to boost its unstable growth and face the manic of increasing populations and their food security at large by adopting the unique policies of the above-referred countries. The findings of the study proposed a comparative research study on Spanish agriculture with Pakistan and follow the same empirically in Indus valley agriculture for further growth and development in the long run because of serial systemic similarities in both countries.

CONCLUSION

(Pakistan 2025 One Nation Vision, 2025) recognizes in its executive summary that “sufficient, reliable, clean and cost-effective availability of energy, water and food – for now, and in the future – is indispensable to ensure sustainable economic growth and development. There is a need to fill the enormous gaps in these areas, while simultaneously making efforts to respond to the looming threat of climate change. This plan emphasizes the need to search the new resources through public and private sector collaboration in these areas and ensure required production and storage capacities. At the same time, efforts are needed towards conservation, efficient distribution, and usage of resources, and preventing contamination and environmental degradation”.

It further concludes in the plan that Pakistan today faces formidable social, economic, security, and governance challenges. The above-referred vision 2025 further explains with policy guidelines that many nations have faced similar challenges in history and successfully turned them into opportunities through sound economic planning, good governance, and consistency in policy implementation.

Another side agricultural growth in Pakistan throughout most of the last seven decades was observed as unstable and created food insecurity at large and depended to a large extent on the major crops (wheat, rice, cotton, and sugarcane). Although there is still scope for production increases of these crops, future increases in agricultural productivity and rural incomes are likely to be driven by diversification into high-value crops and livestock.

The poultry sector is already expanding rapidly, spurring substantial growth in maize production (a major feed) and poultry and egg production. Productivity gains in the livestock sector are especially important for pro-poor rural income growth, as livestock ownership in rural Pakistan is distributed far more equitably than is land ownership.

Export of agricultural commodities and its allied value additions products strategy is appreciated in emerging economies for further improvement and an expansion in employment, income and economic growth of the country. It's also very essential for rapid economic growth

and reduction in the country's external account, so government should focus to implement effective policy guidelines discussed in the paper to boost exports of agricultural commodities and to ensure the food security of the masses which is at high risk after the recent flood of 2022; and roughly estimated at 30% of the populations.

References

(2025). Retrieved from Pakistan 2025 One Nation Vision: <https://www.pc.gov.pk/uploads/vision2025/Vision-2025-Executive-Summary.pdf>

(2010). *Agricultural Census 2010*. Lahore, Pakistan: Government of Pakistan, Statistics Division, Agricultural Census Organization.

Briers, M. (2018). *Digital Farming and the 4th Agricultural Revolution*. Retrieved from Food agility: <https://www.foodagility.com/posts/digital-farming-and-the-4th-agricultural-revolution>

Economic Survey Pakistan 2021-2022. (n.d.). Retrieved from Government of Pakistan Finance Division: https://www.finance.gov.pk/survey_2022.html

Economic Survey Pakistan ESP 2019-2020. (n.d.). Retrieved from Government of Pakistan Finance Division: https://www.finance.gov.pk/survey_1920.html

(2018). *Pakistan Ministry of National Food Security & Research*. Islamabad: Government of Pakistan.

Pakistan Social And Living Standards Measurement. (2019). Retrieved from Pakistan Bureau of Statistics, Government of Pakistan: <https://www.pbs.gov.pk/content/pakistan-social-and-living-standards-measurement>

Paltasingh, K. R., & Goyari, P. (2013). *Analyzing Growth and Instability in Subsistence Agriculture of Odisha: Evidence from Major Crops*. Retrieved from AgEcon: <https://ageconsearch.umn.edu/record/158492>

Raju, R. C. (2009). *Instability in Indian agriculture during different phases of technology and policy*. Retrieved from ResearchGate: <https://www.researchgate.net/publication/287000746>

Shikur, Z. H. (2020). *Agricultural policies, agricultural production and rural households' welfare in Ethiopia*. Retrieved from Shikur Economic Structures: <https://journalofeconomicstructures.springeropen.com/counter/pdf/10.1186/s40008-020-00228-y.pdf>

Transforming Food & Agriculture to Achieve the SDGs. (2015). Retrieved from Food & Agricultural Organization of the United Nations, Sustainable Development Goals.: <https://www.fao.org/3/I9900EN/i9900en.pdf>