Theme: Revitalizing Agriculture Sector

Does democracy foster Agricultural Efficiency in Pakistan: A Historical Perspective

Dr. Qaiser Munir*
Dr. Muhammad Afzal**
Kanza Sohail*
Hania Afzal*

***Institute of Business Administration, Karachi**

****Planning Commission Pakistan**

Abstract

Agriculture sector is the backbone of Pakistan's economy as it accounts for 19.5% of the GDP. It employs 42.3% of the labour force and thus play a pivotal role in economic development, food security and poverty reduction. However, political interventions and agricultural policies during democracy regime and dictatorship regime have significant effects on development outcomes. In this paper, we investigate deeper in the relationship between agricultural efficiency and democracy. We precisely studied how differences in the institutions (Democratic regime vs dictatorship) may explain differences in aggregate efficiency in agricultural output. We did so by applying the MLE Cobb-Douglas Stochastic Production Frontier (SPF) approach to analyze the technical efficiency score of Pakistan over the 1960-2016 period. A comparison of democracies and dictatorship may also enhance the understanding of democratic institutions by providing an empirical test. The inputs used in model are agricultural land, fertilizer consumption, total number of tractors in agriculture, agricultural labour, average rainfall, and average temperature The output is produced add value in agricultural area as USD currency. Our results support our main contention that dictatorship regime is bad for efficiency. Namely, not only does dictatorship reduce the accumulation of factors of production but it also results in a waste in the utilization of existing resources. Specifically, the results show that mean technical efficiency score (0.876) in democratic regimes is higher than in non-democratic regime (0.733) suggesting democracies increase returns to farmers compared to dictatorship. Over the period, we find the lowest efficiency during the period 1969-1971 and 1978-1987 and the gain in efficiency during 1994-2001 and 2008-2013. Though tentative, our findings, if confirmed, may have important policy implications.

Keywords: Stochastic frontier analysis, Technical efficiency, Agriculture, Pakistan

1. Introduction

In this era of industrialization and commercialization, agriculture is still considered as a fundamental instrument of development specially in order to reduce poverty and sustainable development. Pakistan being an agricultural country depends heavily on agriculture for economic

development in general and poverty reduction and food security in specific. Agricultural efficiency is very crucial for the economic development of a country like Pakistan as higher agricultural productivity not only improves the living standard and reduces poverty but also assists in controlling the real wage in industrial sector and thus encouraging investments.

There are various factors that affect the agricultural productivity and many researchers have attempted to dig out the reasons of why farmer's productivity are lower in some cases and higher in others. Conventional approaches consider physical capital, human capital and technology as the driving force behind higher agricultural efficiency but the recent literature has also emphasized on the role of institutional factors that incentivize agricultural productivity and efficiency (Hayami & Ruttan, 1985; Binswanger & Deininger, 1997).

Since Political system is the most important institutional characteristic that effects policies and reforms, thus it is expected to have some effect on agricultural efficiency and productivity. There are two main political systems discussed in literature to have effect on macroeconomic and socioeconomic variables of a country. These two systems are democracy and dictatorship. It has been identified that democracy, when adopted by countries reported higher level of economic development and growth around the world. Furthermore, in the context of agricultural efficiency, it can be observed that most of the countries with higher agricultural efficiency are democratic countries. Democracy may benefit agriculture efficiency in many ways. Binswanger and Deininger (1997) have pointed out that democracy enhances transparency and thus incentivize previously powerless groups to participate in agriculture. Rodrik (1999) suggested that democracy inhibits stability which is translated into higher investment by all the sectors including agriculture. Aghion et al. (2007) also suggested that democracy reduces entry barriers

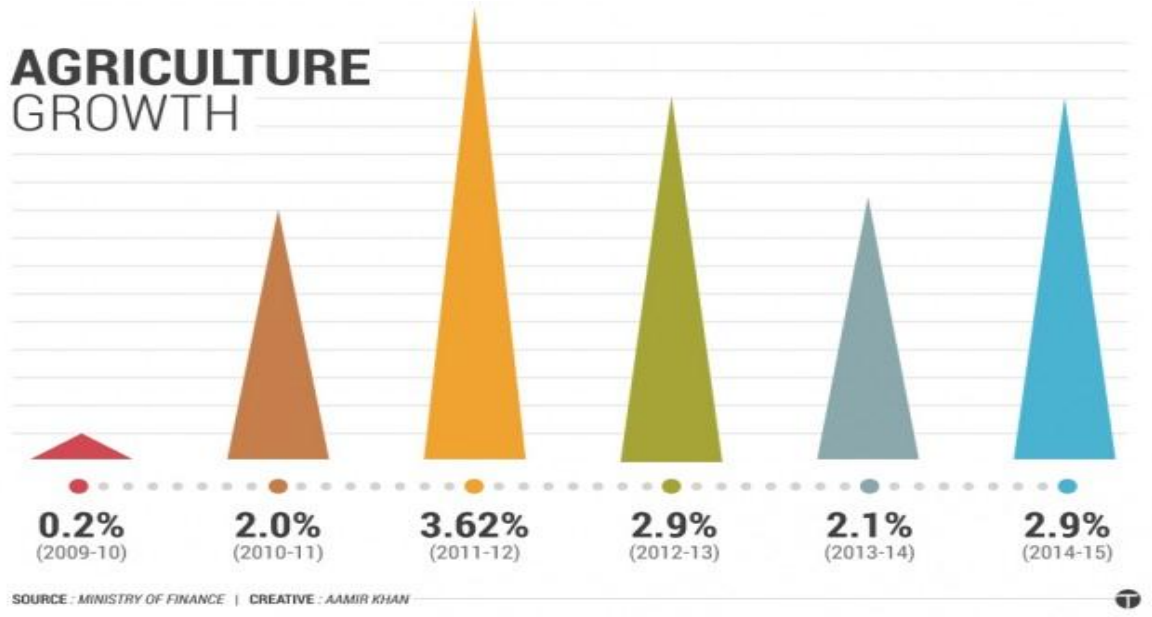
and thus lead to introduction and adoption of technology in agricultural leading to improved efficiency.

Thus in this study, we will attempt to analyze the impact of political system – democracy vs dictatorship on agricultural efficiency in Pakistan by using the data from 1960 – 2016. The rest of the paper will discuss the agriculture sector in Pakistan, literature review on the topic, details about the data and model adapted for analysis and finally the results and conclusion.

2. Agriculture Sector of Pakistan

Agriculture sector is considered as the backbone of Pakistani economy by employing 42.3% of labor force and contributing 19.5% to GDP of the Pakistani economy. It plays a crucial role in development of country by providing employment opportunities and poverty reduction. The agriculture sector of Pakistan is comprised of four important sectors that includes livestock, crop, forest and fisheries. The focus of our study will be on crop sector that adds 38% being the second largest contributor after livestock (56%) to the agricultural sector. The agriculture sector growth had been fluctuating in the past showing no clear pattern of growth. In the last decade the highest growth rate recorded was of 3.62% during 2011-12 (See figure 1). Whereas in 2016-17 the agriculture sector has achieved the growth rate of 3.46% which is better than last year's performance where the sector experienced a meager growth of 0.27%.

Figure 1: Agricultural Growth in Pakistan 2009-2015



Various studies have been conducted to find out the impact of government policies on productivity growth and the results were significant. The governance affects the agricultural efficiency through multiple channels. First, if the government is bad then it's kind of taxing the agricultural production that ultimately results in low productive resources and lower efficiency. Secondly, the governance also targets the agricultural efficiency by manipulating or putting forward the political interests. These political interests may be fulfilled by levying certain taxes and providing subsidies that are not in the benefit of the economy rather act as deal between the interest groups and government. The country where corruption is common the economic activities are not performed efficiently and resources are diverted towards the rent seeking activities. The country with poor law and order situation engages the individuals in protection of their assets and doesn't contribute completely in production activities. Third, the agricultural production efficiency is dependent upon the facilities provided to farmers in

the form of public goods and services like the irrigation system, infrastructure, education, awareness and research in agricultural sector.

The democratic governments tend to lower the agricultural efficiency because democracy could play its role in determining better law and order, corruption and taxes on agriculture sector so as the farmers could produce efficiently. But democracy may also foster some negativities that will adversely affect the production. The agricultural efficiency in a democratic system of government is achieved only if the economic efficiency and political system of country is effective and efficient.

The government involvement in agriculture sector plays a positive role. Government sometimes make such policies that directly affect the agricultural production but certain policies are made for other macroeconomic issues but still affect the agriculture sector and this effect is secondary. Agricultural policies are categorized into two main groups. One that helps in correcting the market inefficiencies or market failures, reduced cost, increased productivity and the other that provides benefit to special interest groups at the cost of agricultural efficiency. The government policies have significant impact on the structure and productivity of the agricultural sector

Every Pakistani is dependent to the agricultural sector directly or indirectly. This sector is a source of largest foreign exchange earnings. Pakistan is ranked as the 8th largest farm output producer in the World. The share of agriculture production as percentage of GDP has fallen adversely from 53% in 1949-50 to a meagre figure of 19.8% in 2016-17, which is a very disappointing figure for an agriculture-based economy.

From independence till 1950 Pakistan has been the major and only supplier of raw material for the subcontinent and some other economies of the world. The agricultural sector felt a boast

during the Korean war during 1950-53 but the overvalued rupee currency has negatively affected it.

The era of general Ayub khan during the 1960s is called as the Green Revolution period during which certain relaxed policies and subsidies were provided to farmers. Land reforms were also introduced that had put ceiling on the area of land an individual could keep, agricultural university was made and tube well systems were installed. The growth rate during this era was 5.07%.

The nationalization program was running in 1970s with the objective to solely manage the production and distribution of farm product under government. The growth rate however was only recorded 2.37%, one of the lowest during the preceding years. During this period the government also managed to introduce the land reforms successfully.

1980s period was relatively better than the last one as growth rate was improved and recorded at 5.4%. It happened because government took certain measures to set the prices of crops that were competent to global market prices. Moreover, the commission was formed for helping the government policymakers in setting the support prices for sugarcane and cotton. World Bank also intervened to set the input and output prices for farm products that are in accordance with global market prices and subsidies were removed to achieve this target.

During the 1990s the growth rate remained somewhere between 6% -4.4%. It's because various structural changes were made like livestock (one third) was included as a subsector of agricultural GDP. So, the agricultural sector has grown up and improved manifolds during the past 75 years achieving various milestones.

This study will use the stochastic frontier approach to measure the technical efficiency of agriculture sector in Pakistan. After the 2000 fast-track land reform, only a few studies have looked into the agricultural efficiency but none of them related it to the institutional characteristics of democracy and dictatorship; this paper is therefore an important addition to the literature.

3. Literature Review

Agricultural Productivity and efficiency is the topic of research for long. Enhancing agricultural productivity is important for countries like Pakistan where agriculture is the major economic sector and the gap between the primary sector and other industries is quite wide. Increased agricultural productivity contributes towards poverty reduction as it provides improved food security and higher incomes to farmers.

With the emphasis on agricultural productivity in the Sustainable Development Goals, the research in the said arena has extended to additional statistical frameworks for productivity and efficiency especially for the developing countries. "Productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input use" (OECD). At its most fundamental level, productivity measures the amount produced by a target group (country, industry, sector, farm or almost any target group) given a set of resources and inputs. Thus agricultural productivity in its simplest form is the ratio of agricultural output to its factors of production i.e. land, labor and capital.

In the recent past there has been a lot of research on comparing the productivity of countries with other countries and regions with other regions (Millan & Aldaz, 1998; Minh & Long, 2008; Serrao, 2003). All these researches realized the fact that agricultural productivity in poor countries is much lower than their counterparts in rich countries. Schultz (1964) suggests that the

reason of this lower productivity is not the poor allocation of resources by the farmers as they allocate their resources efficiently and rationally. He argues that farmers in these countries cannot reach higher level of productivity due to shortage of modern agricultural technology. Thus it is important for developing countries depending heavily on agricultural output to emphasize on enhancing the capacity of technology supply industries in the country and overall capacity building of farmers. The recent researchers have also pointed out the fact that even if the country develops the technologies to foster efficiency and productivity, the weak institutional performance may hinder the growth and productivity (Olson, 1996). The gains from technological advancement, innovation and specialization cannot be fully realized in the absence of necessary institutional framework.

In other words, individual rationality does not guarantee that a society produces efficiently. Individual rational behavior may still lead to socially inefficient outcomes because of institutional failure. This is evident in the case of agricultural production. Individual rational behavior along with technological advancement can still result in inefficiencies due to institutional defects. Poor institutions and weak governance hinders the adoption of technology and innovation (Kawagoe, Hayami, & Ruttan, 1985). World Bank development report (2008) has also highlighted the importance of governance in agricultural development as it suggests that improved democracy and participation of civil society, public sector reforms, and control over corruption can improve agricultural performance substantially. The influence of local conflict and instability on agricultural productivity is quite evident as countries in state of war destroys the effectiveness of the government thus discouraging the local agricultural production that can even lead to starvation. Other institutional protections such as property rights, enforcement of contracts, labor laws, all are important to develop a suitable ecosystem for efficient agriculture

production. This was demonstrated in China when secure land rights were granted to famers and significant agricultural development was observed (Duncan, 2003).

This importance of institutional and governance factors in the agricultural productivity lead to the study of relationship between agricultural productivity and governance indicators. Governance influences agricultural productivity through many dimensions that includes taxation policies (Campos, Lien, & Pradhan, 1999)), market unfriendly macroeconomic policies, infrastructure, and institutional performance. For example, the laws regarding property right protection, contract enforcement and strong judiciary system strongly effect the investment and production. Good governance also supports a competitive and low cost environment that fosters innovation and technological advancement in all the sectors especially in agriculture. Agricultural is generally a rural phenomenon and involvement of government on providing rural infrastructure, public goods and services and farmer's support stimulates better agricultural productivity. In countries where rule of law is weak and corruption is widespread, people devote their efforts to unearned income and productive activities are left behind. As per World Bank report (2007), corruption is an obstacle on agricultural development. Though many researchers and theoretical framework suggests the importance of good governance as an indispensable ingredient for enhanced agricultural productivity and efficiency, some researchers suggest the opposite. The famous "Grease the Wheels" hypothesis suggests that corruption increases efficiency in countries with slow and inefficient bureaucracy (Huntington, 1968). Similarly, it is said that many reforms were made during the time of crises that proved to accelerate productivity and thus political stability might not always lead to such reforms (Binswanger & Deininger, 1997).

Bayyurt & Yılmaz (2012) explained the interaction between agricultural productivity, education and governance for developed and developing countries and suggested that agricultural efficiency in developing countries is positively influenced by regulatory qualities much more as compared to developed countries. The author also suggested that developing countries need to focus on improving regulatory qualities and promoting private sector.

Méon & Weill (2005) also tested the relationship between governance and macroeconomic technical efficiencies for 62 countries. The results suggested that governance is always associated with higher efficiency. Out of the six dimensions, they observed that efficiency of government most robustly affects aggregate efficiency.

Agricultural sector is most important for Pakistan's economy but there are very few studies in this regard. Only a couple of studies have discussed the agricultural productivity and its impact on other microeconomic and macroeconomic indicators (Ahmad, 2003). This study pioneers in analyzing the relationship between agricultural productivity and governance indicators in Pakistan between various regimes.

4. Methodology and Dataset

4.1.Dataset

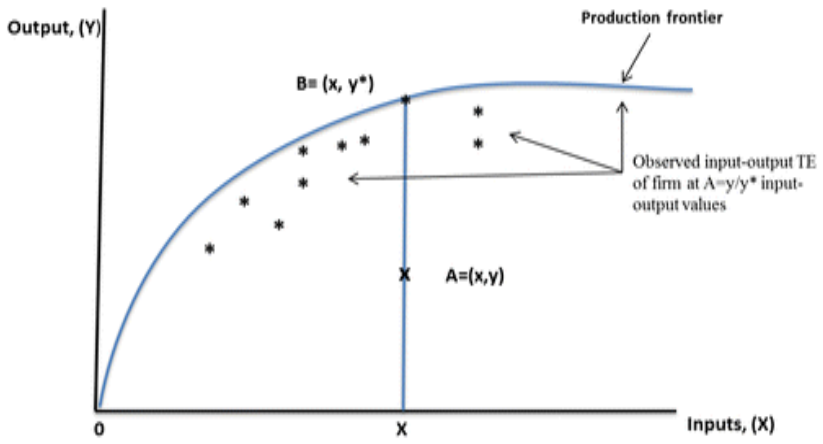
The analysis covered in this study is over the 1960-2016 based on data drawn from FAOSTAT (http://faostat.fao.org) databased compiled by the Food and Agricultural Organization. The production data on number of tractors is collected from Pakistan Automotive Manufacturers Association (PAMA). The efficiency measurement considers one output and five input variables. The inputs variables used in model are agricultural land in 1000ha, fertilizer consumption (in 000 tonnes), total number of tractors, agricultural labour (% of total employment), average yearly

rainfall, average yearly temperature. The output variable is produced add value in agricultural area as Constant 2010USD currency. All the input and output variables are in natural logarithm.

4.2.Estimation Method

The farmer's ability to maximize the level of output given a set of inputs and technology is referred to as technical efficiency in agriculture. Thus the degree of technical efficiency actually reflects the farmer's ability to attain the highest possible output level given the set of inputs and technology used. This highest possible output is shown as the production frontier (see figure 2). It shows the frontier where the technical efficiency depends on the level of inputs used (adapted from Battese, 1992).

Figure 2. Technical efficiency of firms in input-output space.



It is important to understand the difference between technological change and technical efficiency. In case of technological change, the production frontier will shift as the new technology increases output per unit of input (Bravo-Ureta, 2007). Whereas, technical efficiency is the difference actual and expected yield at a given level of technology and inputs.

The stochastic frontier production function to be estimated is

$$\ln y_t = X_t\beta + v_t - u_t \quad (1)$$

Where, y_t represents total output per annum in constant 1960-2016 US dollars, X_t is the vector of production inputs and β is the vector of parameters to be estimated. Both v_t and u_t are error terms that cause the actual production to deviate from the production frontier. v_t is the error term that represents the random uncontrolled variation that cannot be influenced by the producers. Whereas, u_t is the deviation in the actual output due to technical inefficiency and is uncorrelated to that v_t.

Thus the technical efficiency of the agricultural production can be given by the expected value of conditional distribution of u_t given ε_t (Miljkovic and Shaik 2010) as:

$$E(u_t|\varepsilon_t) = \frac{\sigma_u\,\sigma_v}{\sigma^2}\left[\frac{f(\frac{\varepsilon_t\lambda}{\sigma})}{1-F(\frac{\varepsilon_t\lambda}{\sigma})} - \frac{\varepsilon_t\lambda}{\sigma}\right]$$

Where $\lambda = \sigma_u / \sigma_v$

$\sigma^2 = \sigma_u^2 + \sigma_v^2$

F= cumulative distribution function

f = standard normal density

Thus year specific technical efficiency can be written as:

$$TE_t = \frac{y_t}{y_t^*} = \frac{e^{(X_t\beta+v_t-u_t)}}{e^{(X_t\beta+v_t)}} = e^{-u_t} \quad (2)$$

Where y_t is the observed output in year t and y_t^* is the output on the frontier in year t.

Thus on this basis, the following Cobb-Douglas production function was estimated:

$$\ln y_t = \beta_o + \sum_{j=1}^{6}\beta_j X_{jt} + v_t - u_t \quad (3)$$

Where y_t represents the agriculture value added production as constant 2010 USD, X represents the explanatory variables that include, arable land, agricultural tractor in use, employment in

agriculture, rainfall and temperature as mentioned earlier. The parameters for the stochastic production frontier model (equation (3)) is estimated using the maximum likelihood estimation (MLE) program. In terms of its magnitude and significance, λ is an important parameter to determine whether a stochastic frontier is warranted, as opposed to an average (OLS) function. The rejection of the null hypothesis, Ho: $\lambda = 0$, implies the existence of a stochastic production frontier. Similarly, $\lambda = 1$ implies that all deviations from the frontier are due entirely to the technical inefficiency effects.

5. Estimation Results and Discussion

The summary statistics of input and output variables included in the technical inefficiency model to determine their influence on technical efficiency in agricultural output.

Table 1: Summary Statistics of Output and Input Variables

Variables	Mean	St. Dev	Minimum	Maximum
Agricultural value added	1.60E+10	1.75E+10	1.62E+09	6.47E+10
Arable land	30762.11	769.17	29390.00	33140.00
Agricultural tractors in use	146120.25	136253.89	5000.00	439741.00
Employment in agriculture	46.81	2.57	41.01	50.06
Rainfall	25.80	5.09	16.02	35.60
Temperature	20.21	0.49	19.39	21.14
Fertilizer	1898.40	1448.60	31.40	5040.00

Table 2 and 3 show the results of maximum likelihood estimates of the SPF based on the democracy and non-democracy. As expected, the slope coefficients (βs) of the stochastic frontier or output elasticities of all inputs were positive except temperature and rainfall in democracy model whereas temperature and employment in agriculture in non-democracy model. Except for employment in agriculture and rainfall, output elasticity estimates for all inputs were significant at the 1% level in democracy model. while the employment in agriculture and rainfall parameters remain insignificant in non-democracy model. In view of rainfall the insignificant estimate in

both regimes was not unexpected as in Pakistan case there is no severe effect of unexpected rainfall on agriculture output over the time. However, the negative and significant sign of temperature in both models were expected. Climate change is a serious global threat and Pakistan has been ranked eighth on the list of countries most vulnerable to climate change. Beside this, the adverse effects of climate change in Pakistan includes extreme temperatures which severely impact the agriculture sector in Pakistan.

As shown in Table 2 and 3, both magnitude (0.99 and 0.74) and significance ($P < 0.01$) of the variance parameter, λ, suggest that the technical inefficiency effects are highly significant in explaining the level and variation in agriculture value added production. Thus the traditional average (OLS) production function, with no technical inefficiency effects, is not an adequate representation compare to MLE function.

Table 2: Maximum Likelihood Estimates of the Stochastic Production Frontier – Democracy

Variables	**Parameters**	**ML function**	**St. Error**	**t-ratio**
Intercept	β_0	19.44*	1.00	19.52
Arable land	β_1	0.75*	0.05	15.01
Agricultural tractors in use	β_2	0.33*	0.07	4.56
Employment in agriculture	β_3	1.32	0.93	-1.41
Rainfall	β_4	-0.20	0.20	-1.03
Temperature	β_5	-1.48	0.07	-16.43
Fertilizer	β_6	1.37*	0.09	14.45
Variance Parameters				
sigma squared	σ^2	0.12*	0.03	4.01
Gamma	λ	0.74*	0.01	74.01
Meu	μ	restricted to zero		
Eta		restricted to zero		
Log likelihood function		23.60		
LR test on one sided error		1.47		

Notes: *represents significant at the 1% level of significance.

Table 3: Maximum Likelihood Estimates of the Stochastic Production Frontier – Non-Democracy

Variables	**Parameters**	**ML function**	**St. Error**	**t-ratio**
Intercept	β_0	41.18*	1.00	41.25
Arable land	β_1	2.92*	0.68	4.32
Agricultural tractors in use	β_2	0.26*	0.06	4.31
Employment in agriculture	β_3	-1.54	1.22	-1.26
Rainfall	β_4	0.21	0.13	1.55
Temperature	β_5	-4.90*	1.14	-4.30
Fertilizer	β_6	0.65*	0.06	10.73
Variance Parameters				
sigma squared	σ^2	0.17*	0.02	9.91
Gamma	λ	0.99*	0.00	19790.95
Meu	μ	restricted to zero		
Eta		restricted to zero		
Log likelihood function		5.01		
LR test on one sided error		9.21		

Notes: * represents significant at the 1% level of significance.

Next, we investigate the mean technical efficiency score in different regimes in Pakistan. This is important because it provide us the clear guidance in which era the efficiency was high. Table 4 show the results of the mean technical efficiency score in agricultural output over the period 1960-2016 in different regimes of Pakistan. On average, the technical efficiencies in democracy (0.876) regimes were somewhat higher than that from the non-democracy (0.733) regimes. If we look into each regime, the highest technical score (0.920) during the period of Benazir Bhuto (1994-1997) when Farooq Laghari was president. Whereas, the score (0.783) during the period of 1974-1977 when Zulfiqar Ali Bhutto was prime minister of Pakistan. In contrast, our results show that there is large variation in the score during the non-democracy regimes. For example, the results show that during Pervaiz Musshraf (2002-2008) era the score (0.818) is much higher than Yahya Khan (1969-1971), i.e. 0.479. Thus the results indicate that, on average, the

agricultural output is not only technically more efficient during democracy regimes than the non-democracy regimes, but it is also more equitable in terms of distribution of technical efficiencies.

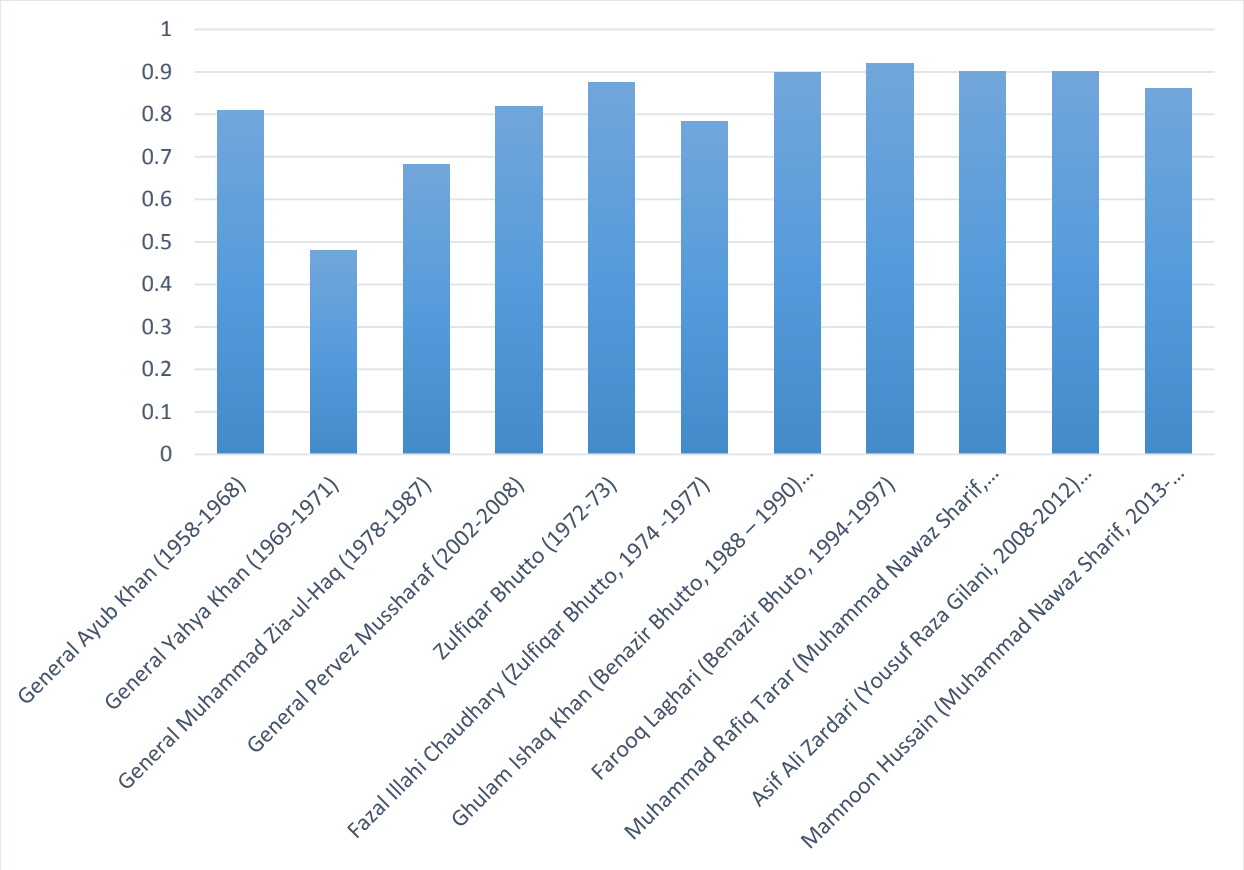
Table 4: Mean Technical Efficiency during different Regimes

Non-Democratic	**Technical Efficiency**	**Democratic**	**Technical Efficiency**
(General Ayub Khan, 1958-1968)	0.809	(Zulfiqar Bhutto, 1972-73)	0.875
(General Yahya Khan, 1969-1971)	0.479	Fazal Illahi Chaudhary (Zulfiqar Ali Bhutto, 1974 -1977)	0.783
(General Muhammad Zia-ul-Haq, 1978-1987)	0.682	Ghulam Ishaq Khan (Benazir Bhutto, 1988 – 1990) (Muhammad Nawaz Sharif, 1990-1993)	0.898
(General Pervez Mussharaf, 2002-2008)	0.818	Farooq Laghari (Benazir Bhuto, 1994-1997)	0.920
		Muhammad Rafiq Tarar (Muhammad Nawaz Sharif, 1998 – 2001)	0.901
		Asif Ali Zardari (Yousuf Raza Gilani, 2008-2012) (Raja Pervaiz Ashraf, 2012-2013)	0.901
		Mamnoon Hussain (Muhammad Nawaz Sharif, 2013-2016)	0.862
Mean Technical Efficiency for Democracy	**0.733**	**Mean Technical Efficiency for Non- Democracy**	**0.876**

Notes: The prime minister names are shown in brackets.

Figure 2 presents the efficiency measures by democracy and non-democracy regimes. The technical efficiency measures for democracy regimes over the period indicated democratic regimes are consistently efficient and utilized all of their resources efficiently and their technical efficiency lie above the efficiency frontier in contrast to non-democratic regimes.

Figure 3: Technical Efficiency Measures by different regimes, 1960-2016



5.1 Discussion

General Ayyub's era is also called green revolution which includes the introduction of fertilizers, pesticides, better irrigation system and improved seed quality. Small agricultural loans were also provided to small farmers to improve the financial condition of the farmers and boasting economic activity. These reasons lead to a high coefficient of 0.80 of technical efficiency.

The technical efficiency is 0.87 which quite high during Bhutto's era. It's because Bhutto was a strong supporter and advocate of empowering farmers, especially small farmers. During his era various land reforms were implemented that includes the reducing the land ceilings. He wanted to make farmers strong so that they don't feel weak and demoralized and making agriculture sector the strength of country. His reforms also incorporated controlling issues of water logging, salinity.

The pricing of rice, sugar and wheat husk was intensively under government's control. The small farmers and landowners were provided with incentives like tax relaxations to boost the economic activity and agricultural produce.

During the Zia Period economic growth was high as compared with Bhutto's era and Zia period was much better from economic point of view. It was because of increased military spending and improvements in balance of payments because of huge amount of workers remittances. Although the martial law extended to a period of eight and a half year but no adequate attention was given to structural policy reforms in agriculture sector and tax system (Majeed & Saifullah, 2014).

During Ghulam Ishaque and Nawaz era the agriculture sector was provided subsidies and efforts were made to make the prices of agricultural produce competent with the international market prices. These efforts helped in improving the effectiveness and efficiency of agriculture sector.

During the third era of Nawaz government it has further expanded its farmer friendly policies. His policies included the introduction of latest and modern technology like the use of biotechnology. 20 billion rupees were allocated for the improvements in the farmers' crop yields. Research was also encouraged in the biotech field as it will help the farmers to enhance their per capita income (Daily Dawn, 2017).

General Musharraf is considered as the savior of Pakistani economy as he saved the economy through his economic policies from. The technical efficiency score 0.82 is high as compare to other non-democratic regimes. His efforts for reviving Pakistani economy could never be ignored. His efforts included the removal of certain barriers that were main cause of hindrance in agriculture exports and imports. All tariffs were removed that were protecting the Pakistani agriculture industry (Naeem, 2007). Thus, wheat production was recorded as 25 tones which is the highest in history and Pakistan became wheat exporting country as well. Prices of major crops like sugar

were kept under control. Moreover, rice crop also performed better as the quality of rice production was improved because of improved variety of rice seeds.to facilitate and encourage the farmers various policy measures like improvements in agriculture infrastructure, tractor facility, crop loan and insurance scheme and water sector development were taken to boost the agriculture produce (Agriculture Corner, 2012). We also provided the results of technical efficiency score in every year from 1960 to 2016 (see Appendix).

6. Conclusions and Recommendations

Development outcomes are significantly affected by political intrusions in agricultural markets. Due to urban biased policies of non-democratic government, the prices of agricultural produce are found to decrease, but this reason is not sufficient to explain variation in agricultural policy across regime type. Thus, the main purpose of this study was to investigate the performance of the two institutional systems (democracy vs. non-democracy) in terms of technical efficiency in agricultural production. For this purpose, we apply stochastic frontier production function over the period of 1960-2016 to measure the technical efficiency score in agriculture output. The results revealed significant technical inefficiencies for the non-democracy regimes, especially during the General Yahya Khan and General Muhammad Zia-ul-Haq era. Whereas, the technical inefficiency show highest during the era of Zulfiqar Ali Bhutto (1974 -1977) suggesting that democracies increase returns to farmers compared to non-democracies.

Pakistan is an agricultural country and its economy rely heavily on the major crops. There is immense gap between the acquired and actual output. The reasons to this include unavailability of water, lack of technology, wrong use of inputs, and inadequate awareness about pest control. All these problems not only impact the quality but also the quantity of agricultural output. In 1969-70 agriculture was the chief commodity producing sector of the country with 38.9% share

in the GDP but unfortunately it has deteriorated to 19.53 % 2016-17; thus the contribution of the agriculture sector has been declining over time. However, the contribution of services sector has grown to 59.59% in the 2016-17 thus signaling an increasing share of the services sector in GDP over time. This is attributable to the fact that Pakistan has been undergoing structural transformation in its economy like other growing economies as its GDP structure has endured important changes during past few decades. Scientific development and technological advancement has recently played an important role in raising all the sectors of Pakistan economy but the pace of transformation in different sectors is different depending upon the dynamics of that sector. It seems that agricultural sector got lesser paybacks against the manufacturing and services sector in the recent past.

For the policy purpose, the government should focus on supply-side reforms in the agriculture sector, including by encouraging private participation, reducing leakage, increasing public investment and improving marketing infrastructure for agriculture related commodities trading and developing efficient value chains. Although Pakistan is taking a number of initiatives to improve the agriculture sector, there is a need to do more, especially in terms of structural reforms. Not only is there a need to massively reform the seed provisioning system, low price fertilizer supply, pesticides, water shortages, but the government should also re-think its subsidy regime. In the longer run, the government must look at streamlining farm sizes, climate change and land holdings. Without these meaningful yet difficult reforms, public investment in other areas may not yield desired results Thus, government should focus on structural issues instead of resorting to short-term policy measures implemented during different regimes for the political reasons.

References

Ahmad, M. (2003). Agricultural productivity, efficiency, and rural poverty in irrigated Pakistan: A stochastic production frontier analysis. *The Pakistan Development Review*, 219-248.

Agriculture Corner (2012, 17th October) Pakistan is now a wheat exporting country: Retrieved from http://www.agricorner.com/tag/wheat-pakistan-export/

Battese, G. E. (1992). Frontier production functions and technical efficiency: A survey of empirical applications in agricultural economics. *Agricultural Economics*, 7, 185–208.

Bayyurt, N., & Yılmaz, S. (2012). The impacts of governance and education on agricultural efficiency: An international analysis. *Procedia-Social and Behavioral Sciences*, 58, 1158-1165.

Binswanger, H. P., & Deininger, K. (1997). Explaining agricultural and agrarian policies in developing countries, Policy Research Working Paper, The World Bank.

Bravo-Ureta, B. E. (2007). Technical efficiency in farming: A meta-regression analysis. *Journal of Productivity Analysis*, 27, 57–72.

Campos, J. E., Lien, D., & Pradhan, S. (1999). The impact of corruption on investment: Predictability matters. *World development*, 27(6), 1059-1067.

Duncan, R. (2003). Agricultural and resource economics and economic development in Aboriginal communities. *Australian Journal of Agricultural and Resource Economics*, 47(3), 307-324.

Daily Dawn, (April 2017) Govt for smart agriculture policies. (2017, 27th April 27). Retrieved form https://profit.pakistantoday.com.pk/2017/04/27/govt-encourages-adoption-of-smart-agriculture-policies/

Huntington, S. (1968). Political order in changing societies New Haven: Yale University Press London.

Kawagoe, T., Hayami, Y., & Ruttan, V. W. (1985). The intercountry agricultural production function and productivity differences among countries. *Journal of Development economics*, 19(1-2), 113-132.

Lio, M. C., & Hu, J. L. (2009). Governance and Agricultural Production Efficiency: A Cross-Country Aggregate Frontier Analysis. *Journal of Agricultural Economics*, 60(1), 40-61.

Méon, P.-G., & Weill, L. (2005). Does better governance foster efficiency? An aggregate frontier analysis. *Economics of Governance*, 6(1), 75-90.

Millan, J. A., & Aldaz, N. (1998). Agricultural productivity of the Spanish regions: a non-parametric Malmquist Analysis. *Applied economics*, 30(7), 875-884.

Minh, N. K., & Long, G. T. (2008). Measuring agricultural production efficiency in Vietnam: An application of data envelopment analysis (DEA). VDF Working Paper No. 0813.

Méon, P.-G., & Weill, L. (2005). Does better governance foster efficiency? An aggregate frontier analysis. *Economics of Governance*, 6(1), 75-90.

Millan, J. A., & Aldaz, N. (1998). Agricultural productivity of the Spanish regions: a non-parametric Malmquist Analysis. *Applied economics*, 30(7), 875-884.

Majeed, W., & Saifullah, A. (2014). Agriculture Changes in Pakistan: An In-Depth Analysis of Agricultural Policies Comparing Military and Civil Governments (1971-1989), *Developing Country Studies*, 4(14), 97-103.

Nadia, B. H. (2007). Technical Efficiency in The Mediterranean Countries' Agricultural Sector. Région et Développement, 27-44.

Naeem, T. (2007). Musharraf’s Economic Deception. Retrieved from https://teeth.com.pk/blog/2007/12/05/musharraf%E2%80%99s-economic-deception-part-1/

Olson, M. (1996). Distinguished lecture on economics in government: big bills left on the sidewalk: why some nations are rich, and others poor. *Journal of economic perspectives*, 10(2), 3-24.

Rodrik, D. (1999). Democracies Pay Higher Wages. *Quarterly Journal of Economics*, 114, pp. 707-738.

Schultz, T. W. (1964). Transforming traditional agriculture. Transforming traditional agriculture. *The Economic Journal*, 74 (296), 996-999

Serrao, A. (2003). Agricultural Productivity Analysis of European Union and Eastern Regions. Paper presented at the presentation at the American Agricultural Economics Association (AAEA) Annual Meeting, Montreal, Canada, July.

Appendix

Table 5: Estimates of Technical Efficiency in Pakistan's Agriculture during--Democracy

Year	Technical Efficiency	Year	Technical Efficiency	Year	Technical Efficiency
1972	0.963	1992	0.925	2009	0.709
1973	0.787	1993	0.859	2010	0.894
1974	0.933	1994	0.971	2011	0.971
1975	0.831	1995	0.903	2012	0.946
1976	0.942	1996	0.966	2013	0.806
1977	0.424	1997	0.837	2014	0.821
1988	0.937	1998	0.973	2015	0.982
1989	0.828	1999	0.794	2016	0.838
1990	0.908	2000	0.979	2009	0.709
1991	0.933	2001	0.858	2010	0.894
Mean Technical Efficiency			0.876164		

Table 6: Estimates of Technical Efficiency in Pakistan's Agriculture during Non - Democracy

Year	Technical Efficiency	Year	Technical Efficiency	Year	Technical Efficiency	Year	Technical Efficiency
1960	0.967	1968	0.696	1982	0.999	2004	0.667
1961	0.935	1969	0.439	1983	0.781	2005	0.841
1962	0.954	1970	0.512	1984	0.807	2006	0.978
1963	0.627	1971	0.486	1985	0.688	2007	0.851
1964	0.750	1978	0.480	1986	0.604	2008	0.980
1965	0.985	1979	0.529	1987	0.617		
1966	0.739	1980	0.605	2002	0.670		
1967	0.632	1981	0.709	2003	0.740		