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# Investigating the Impact of Government's Performance on Agricultural Productivity in Iran

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**Abstract:** The purpose to study the impact of government's performance on agricultural productivity in Iran. The information regarding agricultural sector in the time period 2010-2012 is analyzed in order to test the relationship between the variables and examine the research hypotheses. The collected data is measured in MS Office Excel Software and analyzed using Eviews Software Ver.6. The coefficient of determination equals 0.810, which means 81% of variation in dependent variable can be explained by independent variables. The value of Durbin-Watson statistic is 2.25; the values close to 2 indicate lack of autocorrelation which is a prerequisite for regression analysis (hence, there is no autocorrelation between residuals). The value of t-statistic is 5.9 for GII (positive and significant), 3.4 for AGKL (positive and significant), 15.21 for AGLP (positive and significant), 7.49 for GOVEFF (positive and significant), 6.77 for REGQUA (positive and significant) and 0.47 for EDU (insignificant). The value of t-statistic for the intercept is 0.440 which at the 95% confidence level confirms the null hypothesis; therefore the intercept in not significan (Indices: agriculture capital equity, agricultural workforce productivity, total agricultural production, government effectiveness, political stability, regulation quality, government infrastructure; the index of education has a negative impact on agricultural productivity in Iran).

**Key words:** Performance, government, productivity, agriculture, Iran

## INTRODUCTION

It seems that due to its traditional approach, the agricultural section in Iran has not been able to make efficient and optimal use of its production capacities in recent years (Akbari, 2008). Agriculture plays a major part especially in the economy of third world countries; development of agriculture has a large role in overcoming poverty (Audinet and Haralambous, 2005). Diverse climates, relative and global advantage of our country in agriculture, provision of food security and achievement of sustainable development all necessitate the development of systematic agriculture. Due to agriculture's linkage to other sectors of the economy, investment in development of agriculture is the prerequisite for economic growth and development of other economic sectors (Nikoukar, 2002).

A part from employment of workforce in agricultural sector in many developing countries, supply of food needs is another important benefit is this sector which is always a human priority. However, what make this sector of economy crucially important are the population growth and its subsequent increase of demand for this sector. Therefore, production increase should be one of the concerns of policy-makers in this economic sector in order to overcome the existing problems and prevent future crises. The increasing demands for food supply can be responded by further investments and increased productivity in agricultural sector (Fan, 1991). Although, the use of factors of production in agriculture is a determining factor, yet too much use of such factors can put extensive pressure on agricultural lands and reduce the amount of production (Huang and Rozelle, 1995). Therefore, increasing the production factors may increase the production in the short-term but the only means of long-term production is to increase the productivity. The only way to improve life standards with regard to resource limitation is to maximize productivity (Acs, 1999). In agriculture as an important sector of economy, productivity is an important factor of economic growth. Total productivity is defined as the ratio of total product to total investments. Increase in productivity of factors of

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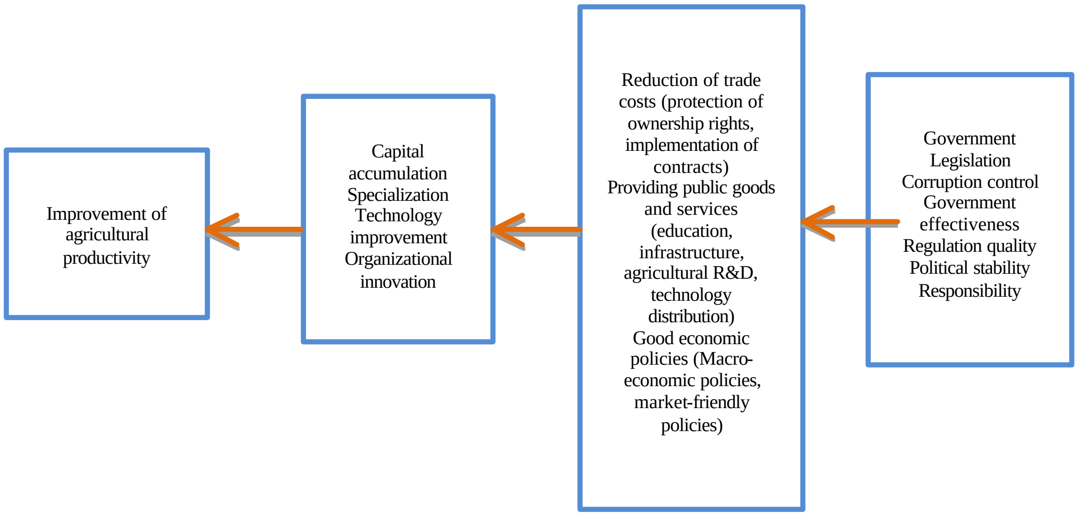


Fig. 1: Model for relationship between government's performance

production is measured as the ratio of product growth index to investment growth index. Change in productivity is originated from two sources: change in technical efficiency and technical advent (Spitzer, 1997). Nkamleu *et al*. (2006) provide a Metafrontier Analysis of Technology Gap and Productivity Difference in African Agriculture for the period 1971-2000. They conclude that technology gap has a great power to explain the difference between regions in terms of agricultural capacity. Their study also reveals that the average technical efficiency usually stays constant in time.

Nkamleu (2004) investigated the growth in agricultural total factor productivity of 16 African countries over the period 1970-2001. Using the data envelopment analysis he concluded that total factor productivity has experienced a positive evolution in sampled countries. This good performance of the agricultural sector was due to good progress in technical efficiency rather than technical progress. The findings also point out that technical change has been the main obstacle before achievement of high levels of total factor productivity in sub-Saharan Africa. Meanwhile, in Western countries, technological change has been the main element of productivity growth. Shahabinejad and Yaghoubi (2011) present an analysis of total productivity factor of agricultural sector in D-8 countries and Total Factor Productivity Growth (TFPG) using Data Envelopment Analysis (DEA). The results indicate that on an average, TPFG in these countries has increased by 10.1% in every period. The result of analysis of productivity in terms of technical progress and technical efficiency reveals that this fine performance has been due to technical progress rather than technical efficiency. Moreover, all D-8 countries have improved themselves technologically in terms of technological efficiency. Therefore, improvement of technical efficiency leads to better performance of investments in agricultural sector. Agriculture has an important place in Iran's economy, especially in comparison to developed countries. In this sense in 2004, agriculture has created 14% of GDP (gross domestic product), 25% of non-oil exports, 20% employment, 80% of food supply and 90% of raw materials in agricultural processing industry Abdollahi.

Lin (2007) study the impact of government-funded R and D and infrastructural factors on agricultural productivity in the United States. Their objective was to study the impact of other states' R and D investment on agricultural productivity in each state. The results indicate that the variable of other states' R and D capital has a positive impact on productivity almost in all areas. Therefore, in order to achieve national goals in agricultural research and development, the institutions must work in coordination.

The concept model for the relationship between government's performance and agricultural productivity (Fig. 1).

## MATERIALS AND METHODS

**Research methods:** In this study, the information regarding agricultural sector in the time period 2010-2012 is analyzed in order to test the relationship between the variables and examine the research hypotheses. The collected data is measured in MS Office Excel Software and analyzed using Eviews Software Ver.6.

**Research hypotheses:**

- Agricultural capital equity (loan) affects agricultural productivity in Iran
- Agricultural labor force productivity affects agricultural productivity in Iran
- Agricultural total product affects agricultural productivity in Iran
- Government effectiveness index affects agricultural productivity in Iran
- Political stability affects agricultural productivity in Iran
- Regulation quality index affects agricultural productivity in Iran
- Government infrastructure index affects agricultural productivity in Iran
- Education of farmers affects agricultural productivity in Iran

**Findings:** In order to examine the models panel analysis has been used. In these models, presence or absence of (random or fixed) effects is investigated and the most appropriate model has been estimated. The basis for inference is the level of significance in this manner is the $p<0.05$ the hypothesis is rejected at the 95% confidence level.

**Panel analysis:** We analyze the panel data without fixed effects with fixed effects and with random effects. In order to determine the appropriate model (with fixed or random effects), Limmer F-test (Chow) and Hausman test are used.

**The process of model selection:** Determination of the intercept and whether to test the model's fit with or without the intercept are among the most important issues in panel data analysis. If the model has an intercept, the next question is whether to use fixed effects or random effects. On this basis, the process of model selection is as follows.

**Stage 1:** Presence or absence of effects in the model (determined by Limmer or Chow test).

**Stage 2:** Model with random effects vs. model with fixed effects (determined by Hausman test). In the end, the most suitable of the three models, i.e., without fixed effects with fixed effects and with random effects is selected and the significance of each independent and control variable is tested.

Before testing the model's fit, each model is examined against Limmer (Chow) test and Hausman test, the suitable model is selected and then estimated.

In other words, the Chow test determines whether to use model with fixed effects or to use pooled model without effects. Chow test examines the following hypothesis:

- $H_0$: pooled model is suitable
- $H_1$: the model with (fixed or random) effects is suitable

If the $p<0.05$, then at the 95% confidence level the null hypothesis is rejected (that is, the model with fixed or random effects is suitable), otherwise it is confirmed (that is the pooled model is suitable). If the panel-data model is selected, the next question is whether to use fixed effects or random effects. To answer that, the model is examined against Hausman test. The null hypothesis and alternative hypothesis of the Hausman test are as follows:

- $H_0$: the model with random effects is suitable
- $H_1$: the model with fixed effects is suitable

If the $p<0.05$, then at the 95% confidence level the null hypothesis is rejected (that is the model with fixed effects is suitable), otherwise it is confirmed (that is the model with random effects is suitable). Next, the suitable model is selected and based on that the test of model's fit is carried out.

As it was mentioned earlier, first the most suitable of the three models, i.e., pooled model, model with fixed effects or the model with random effects is to be chosen. The results of Chow test are presented in Table 1.

The obtained $p = 0.74$. Therefore, the null hypothesis (use of pooled model) is confirmed, hence, the model without effects (or with pooled effects) is suitable. To examine the first and second hypotheses, the following model is used:

$$\ln AGTP = \beta_0 + \beta_1 \ln GIIi + \beta_2 \ln AGKLi + \beta_3 \ln AGLP\, i + \beta_4 \ln GOVEFFi + \beta_6 \ln POLSTA\, i + \beta_6 \ln REGQUA\, i + \beta_7 \ln EDUi + \varepsilon_t$$

Where:

| | | |
|---|---|---|
| AGKL | = | Agricultural capital equity (loan) |
| AGLP | = | Agricultural labor force productivity |
| AGTP | = | Agricultural total product |
| GOVEFF | = | Government's effectiveness |
| POLSTA | = | Political stability index |
| REGQUA | = | Regulation quality index |
| GII | = | Governmental infrastructure index |
| EDU | = | Education index |

Table 1: Chow test for model selection (pooled or panel data model)

| Effects test | Statistic | Prob. |
|---|---|---|
| Cross-section F | 0.830163 | 0.7493 |
| Cross-section Chi-square | 41.64236 | 0.4427 |

Table 2: Pooled model's fit

| Dependent variable: AGTP | Coefficient | SE | t-statistic | Prob. |
|---|---|---|---|---|
| C | 0.810606 | 18408.33 | 0.440382 | 0.6597 |
| GII | 0.338691 | 6468.532 | 5.981389 | 0.0000 |
| AGKL | 0.370607 | 10.79762 | 3.432307 | 0.0006 |
| AGLP | 0.412207 | 269.6207 | 15.21474 | 0.0000 |
| GOVEFF | 0.293008 | 3910.201 | 7.493440 | 0.0000 |
| REGQUA | 0.815284 | 12.02673 | 6.778934 | 0.0000 |
| EDU | 0.656069 | 1382.102 | 0.475223 | 0.6346 |

$R^2$, 0.810440; Mean dependent var, -3043.508; Adjusted $R^2$, 0.710263; S.D. dependent var, 331652.0; SE of regression, 329945.8; Akaike info criterion, 28.25145; sum squared resid, 3.65E+15; Schwarz criterion, 28.25321; Log likelihood, -473558.0; Hannan-Quinn criter, 28.25201; F-statistic, 58.93524; Durbin-Watson stat, 2.257460; Prob (F-statistic), 0.000000

The Table 2 demonstrates the results of panel analysis: The Table 2 summarizes the estimation of pooled model. The p-value of F-statistic is 0.000 which is <0.05. Therefore at the 95% confidence level, the null hypothesis is rejected; hence at the 95% confidence level, the model is significant. The value of the coefficient of determination is 0.810 which means 81% of variation in dependent variable is explained by independent variables. The value of Durbin-Watson statistic is 2.25; the values close to 2 indicate lack of autocorrelation, which is a prerequisite for regression analysis (hence, there is no autocorrelation between residuals). The value of t-statistic is 5.9 for GII (positive and significant), 3.4 for AGKL (positive and significant), 15.21 for AGLP (positive and significant), 7.49 for GOVEFF (positive and significant), 6.77 for REGQUA (positive and significant) and 0.47 for EDU (insignificant). The value of t-statistic for the intercept is 0.440 which at the 95% confidence level confirms the null hypothesis; therefore the intercept in not significant.

## CONCLUSION

Considering the existing defects and inadequacies in parameters, linear programming methods can be used to calculate the efficiency and productivity of economic units in order to find solutions for improvement of their productivity. To that end, the present study uses Tornqvist index to calculate the variance in agricultural sector. The results indicate that major part of variance in factors of agricultural sector are affected technology change in recent years; in comparison to technical change, technical efficiency has little to do with increase of productivity in agriculture. In this sense, the coefficient of determination equals 0.810 which means 81% of variation in dependent variable can be explained by independent variables. The value of Durbin-Watson statistic is 2.25; the values close to 2 indicate lack of autocorrelation, which is a prerequisite for regression analysis (hence, there is no autocorrelation between residuals). The value of t-statistic is 5.9 for GII (positive and significant), 3.4 for AGKL (positive and significant), 15.21 for AGLP (positive and significant), 7.49 for GOVEFF (positive and significant), 6.77 for REGQUA (positive and significant) and 0.47 for EDU (insignificant). The value of t-statistic for the intercept is 0.440 which at the 95% confidence level confirms the null hypothesis; therefore the intercept in not significant (Indices: agriculture capital equity, agricultural workforce productivity, total agricultural production, government effectiveness, political stability, regulation quality, government infrastructure; the index of education has a negative impact on agricultural productivity in Iran).

## SUGGESTIONS

- Increasing the number of agricultural capital equity
- Holding training sessions for education of agricultural labor force can increase the productivity in jobs related to agriculture
- Planning and programming for production of agricultural crops
- Tending to fallow agricultural lands and lands under permanent crops
- Improving the regulation quality index for improvement of agricultural productivity
- Improving the governmental infrastructure index for improvement of agricultural productivity
- Moving toward production of crops with higher added value such as garden products, animal products and marine products in order to increase the productivity of all factors for long-term development of agriculture
- Accelerating the implementation of the National Document of Development; mechanization and upgrade of agricultural sector which would be an effective step in improvement of technical efficiency and subsequently increase of total factor productivity in this economic sector
- Attention to the trend of change in factors of production and at the same time investigating related policies in the period 1971-2013 and following the policies which have led to growth of the Total Factor Productivity (TFP) index in agriculture

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