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Comparison of The Change in Total Agricultural Productivity Between the Groups of Developing and Developed Countries Using the Malmquist Method for The Period (1990-2017)

ABSTRACT

The economic disparity between developed and developing countries, and the gap between them, which were and still represent the interest of specialists and change in total agricultural productivity (TFP) is one of the most important measures of comparison to find out this difference. Therefore, the research aims at achieving a set of goals which, in aggregate, constitute an agricultural policy related to measuring the growth in total agricultural productivity (TFP) for both developing and developed countries (Jordan, Saudi Arabia, Canada, Australia) DEAP data Growth in total agricultural productivity in developing countries (Jordan, Saudi Arabia) declined by an average of (0.45 , 0.59)% respectively compared to developed countries (Canada, Australia) which reached (0.82 , 0.88)% respectively. The study has a set of conclusions, the most important being the low capacity Competitiveness in most developing countries and low production and low quality may be due to high costs resulting from high input production prices. Therefore, the study recommends optimal utilization of human, natural and financial resources to increase productivity in agriculture, which is the main input in the development of the agricultural sector of these countries.

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INTRODUCTION:

The productivity as a term in general occupies a distinct and influential position in the overall economic activities as an important tool in the redistribution of wealth and directing resources in the right direction and achieving idealism. It has more than one meaning and concept and more than formulation, meaning and method of measurement and appreciation. And those interested in economic and social development, It is rare to find in modern economic literature an argument received from the attention and circulation as much as it happened to the statement of productivity, but this statement as much as the attention and spread as much as the definition of the ambiguity, disagreement and disagreement, that productivity in general means the efficient exploitation of economic resources contribute to the production process is a relationship between Input and output, and can be expressed to the total output elements in the production process or to a single output factor, Agricultural productivity is an important indicator both for agricultural producers and for the national economy in general. Experiences and experiences in many developed and developing countries alike

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have shown that development economies that adopt technical development and raise productivity levels are less expensive than horizontal expansion economies that rely on the introduction of resources. In addition to the introduction of additional resources, the costs of preparing and preparing the resource for use, within the framework of the foregoing it can be said that the increase in productivity in the sector Agriculture is the main input and the main axis in the process of agricultural development and achieve better conditions for the food security of any developing and developed economy.

Research problem:

The majority of developing countries are based on ways of avoiding the application of modern technology in their infrastructure which is characterized by inefficiency and development in a way that is commensurate with their needs on the one hand and the resources and small technical capabilities on the other, which have not yet been exploited optimally compared to developed and developing countries.

Search Goal:

The objective of the research is to monitor and measure growth in agricultural productivity of developing and developed countries alike, to compare them temporally and spatially, and to identify the reasons for the low growth in agricultural productivity of developing countries as compared to developed countries and ways of raising them.

Search Hypothesis:

The hypothesis of research lies in the assumption that infrastructure and its degradation are the cause of slow and low growth in agricultural productivity of developing countries compared to developed countries and research is sought to prove the validity of this hypothesis or not.

Research importance:

The question before us is: What is the importance of productivity analysis and growth of the agricultural sector? It may seem obvious and does not require analysis or justification to demonstrate the importance of increasing productivity. In some cases, however, things do not stand up to the obvious or logical importance of analysis and justification. In this regard, many reasons and elements can be mobilized to increase productivity in the sector. And productivity measures are used as a tool to analyze and evaluate the efficiency and trends of human and non-human resources in the production process. In any case, the level of productivity is an indicator of improvement in productive efficiency and therefore better allocation of resources towards their alternative uses.

Theoretical side and reference review:

The increase in production may not necessarily mean productivity increase. In some areas, productivity decreases despite the increase in production. The opposite may also occur. Perhaps the most important feature of the idea of productivity is simplicity and ease of measurement. It expresses the relationship between the achieved product and all the production elements used in obtaining. In other words, the ratio between the quantity of inputs and the quantity of outputs (Albert Aftalion, 1998: 5). In this sense, it is only a measure of the efficiency of the administration in the process of converting the various inputs from land, labor and capital to outputs in products and services. Productivity is a means to compare the performance of the economic unit or project through different time periods so as to discover the general trend. For the efficiency of performance, which reflects the quantitative and qualitative development in the productivity of economic unity during a certain period of time without resorting to multiply the elements of production (Shabib, 2005: 3), a relative concept that is influenced by economic, social, technical and environmental factors and

considerations as well as the specific circumstances of each organization or society. This concept is also influenced by the interests and disciplines of writers and researchers interested in this field.

In an attempt to present some of the products of others who have been productive in their research, including a study by the researchers (Bayarsaihan T and Coelli, 2003) measured total productivity of grain and potato cultivation in 1990 using SFA and DEAP analysis. The results indicate that the average annual change in total production of TFP was 1.7% for cereals and 0.8% For the potato in 14 years "since the growth of total productivity of the elements in this period has increased by about 7% per year" in the latter half of this period due to policies, including improvement of education and management and incentives provided in this period, (Lisa M.pfeiffer, 2003) for determining productivity in the states of Indiana, Bolivia, Ecuador, Colombia, Peru, and Venezuela for the period (1972-2000) using productivity measures such as Stochastic Frontier Fixed Effect and Index Malmaquist. The study indicates that there has been a positive growth in agricultural productivity during the past 29 years, especially during the past 15 years, with a change of 1.7% In and Stochastic Frontier, either in terms of the fixed effect method and the Malmaquist index, the growth in total agricultural productivity was 1.52% and 1.3%, respectively.

In his study, (Coelli ,2003) examined the levels and trends of agricultural and production in 93 developed and developing countries, which represent a large part of the world population, using the DEAP analysis to derive the Malmaquist productivity index and reach the convergence of agricultural productivity of some developed countries Developing countries. In the study (Al-Jalili, 2010), the objective of measuring the total productivity in the Iraqi agricultural sector for the period (1977-2007). The study included determining the components of productivity, namely technical change and change in technical efficiency in order to measure Change in Total Farm Productivity (TFP) The study showed that there was a growth in total agricultural productivity (TFP) throughout the study period and that the bulk of this growth was due to an increase in production technologies and the rest was due to a change in technological efficiency. In the study (Zidane, 2017), it measured the change in the total productivity of (Iraq, Syria, Turkey, Iran) for the years (1980-2012) and the use of DEAP analysis to derive the Malmquist productivity index and the Fixed Effect and Stochastic Frontier The research found that the overall productivity of the TFP in Iraq declined during the study period. This decline is due to the decrease in the efficiency of the use of agricultural resources. The growth in agricultural output was due to the multiplication of the production elements and not because of the improvement in their efficiency. Which amounted to about 43%, while in Syria has increased the total productivity of factors (TFP) and amounted to 63% This increase is due to the increase in the irrigated area, the reclamation of the rocky land and the cultivation of crops and trees suitable for the environment. In Turkey, the total productivity of the factors reached 60%. In Iran, the total productivity of the factors (TFP) reached about 71% In the field of agricultural production through accumulated experience and the appropriate environment and thus managed through the development of its governmental institutions and its private sector to create a lot of employment opportunities.

WORK AND METHODS OF RESEARCH:

The mathematical model will focus on measuring total agricultural productivity using the Malmquist index program, which is defined as a measure of the change in the overall productivity of elements (TFP) between two time periods or between two farms or between two or more establishments. This indicator is used to calculate the percentage of distance between the base period and the duration of the comparison on the distance function and the method of analysis of the data envelope DEAP by Orientated output Measures or by Oriented Input Measures In this study we used

to measure the change in the total productivity of the elements on the model used by (Fare.1993: 4) and (Coelli et al., 1998: 11) by the outputs which takes the following formula:

$$Mi(y^t, x^t, y^{t+1}, x^{t+1}) = \left[\left(\frac{d_i^t(y_i^{t+1}, x_i^{t+1})}{d_i^t(y_i^t, x_i^t)} \right) \times \left(\frac{d_i^{t+1}(y_i^{t+1}, x_i^{t+1})}{d_i^{t+1}(y_i^t, x_i^t)} \right) \right]^{1/2} \dots\dots(1)$$

whereas:

Y_i^t, x_i^t = Input vector and output in duration t

d_i^t, d_i^{t+1} = indicates that the function depends on the technologies in period t and duration t + 1, respectively.

y_i^{t+1}, x_i^{t+1} = Input and output vector in duration t + 1

$d_i^{t+1}(y_i^{t+1}, x_i^{t+1})$ = Production efficiency in duration (t + 1)

The Malmquist index consists of two parts: the change in technical efficiency (TEC) and the technical change (TC) (Lovell, 2003). As in Equation:

$$TFP = TEC \cdot TC \dots\dots(2)$$

$$Mi(y_t, x_t, y_{t+1}, x_{t+1}) = \frac{d_i^{t+1}(y_i^{t+1}, x_i^{t+1})}{d_i^t(y_i^t, x_i^t)} \times \left[\frac{d_i^{t+1}(y_i^{t+1}, x_i^{t+1})}{d_i^{t+1}(y_i^t, x_i^t)} \times \frac{d_i^t(y_i^t, x_i^t)}{d_i^t(y_i^t, x_i^t)} \right]^{\frac{1}{2}} \dots\dots(3)$$

Technical Efficiency Technical Change = Mi

In other words, the change in Total Productivity (TFP) on the Malmquist index is due to the value of TEC and technical change (TC). These components for the change in the total productivity of the elements will be adopted by the following equation:

To achieve this, the technical efficiency of the data envelope (DEAP) will be measured using the following inputs:

- X₁ Area of cultivated land (thousand hectares)
- X₂ Agricultural workers (thousand inhabitants)
- X₃ Total agricultural capital accumulation (million dollars) at constant prices
- X₄ Mechanical Technology (thousand horsepower)
- X₅ Chemical technology (quantity of fertilizers consumed per kg / Agricultural Land)

Data Sources and Sample Search:

(Canada, Australia) Representatives from developed countries (Jordan, Saudi Arabia) were accredited by representatives of developing countries and adopted data published in specialized international organizations such as FAO, ASIAAD and the Arab Organization For agricultural development and local publications approved by the sample countries for the period (1990-2017).

RESULTS AND DISCUSSION:

The Malmaquist Productivity Index, based on the DEAP method, was used to obtain the change in productivity by using explanatory output function variables, from which the change in technical efficiency (TEC) was obtained, as well as the amount of technical change (TC) By multiplying the change in technical efficiency with technical change we obtain the amount of change in the total productivity of the factors as follows:

$$TFP = TC \times TEC$$

The value of the Malmquist Productivity Index is usually greater than or equal to or less than the correct one. If this value is greater than one, it means an improvement in productivity and vice versa when the value is less than one, indicating a decrease in total productivity. The results obtained for the change in total productivity Of the elements in Table (1).

Change in Total Productivity in Jordan:

The change in the total productivity of elements (TFP) is between a high of about 0.854 for 2017 and a minimum of about 0.233 for 1998 and an average for the first period of 1990-1998 is 0.494. The average for the second period from 1999-2007 is 0.657, The average for the Third period from 2009-2017 is 0.628 and The average of the total period (1990-2017) was about 0.592, which is the result of the change in technical efficiency which reached 1.000 and the weakness of the technical change which 0.592.

The above mentioned analysis shows that the agricultural sector in Jordan has achieved a low growth rate due to its suffering from water shortage and irrigation projects. It depends on rainfall which is difficult to control in terms of quantities and dates. In addition, the inefficiency of the agricultural extension agencies which work on developing agriculture and developing its methods and providing the requirements and inputs To the farmers at the right time and at the right price and the lack of sufficient resources or funds to promote an integrated program of agricultural lending benefiting the majority of farmers to obtain agricultural loans on affordable terms and other factors that led to the reduction agricultural productivity. However, several factors have contributed to the creation of a favorable environment for investment in the sector in recent years (2007-2017): the establishment of agricultural projects on a wide commercial scale, as well as the removal of the basic obstacles to Jordanian agricultural exports to the traditional and new markets, which led to increased agricultural production during that period, Where the agricultural sector contributes 2.8% of GDP and employs 3.5% of the total labor force. Agricultural exports constitute 11% of the Kingdom's total exports. Finally, Jordan succeeded in achieving self-sufficiency in a number of agricultural products such as olive oil and milk. However, many basic foodstuffs such as wheat, dairy products, sugar, red meat and vegetables are imported from abroad.

Change in Total Productivity in Saudi Arabia:

Table (1) shows that the change in the total productivity of elements (TFP) is between a high of around 120.9 for 2014 and a minimum of about 0.200 for 1990 and an average of the first period of 1990-1998 is 0.420. The average for the second period from 1999 2007) was 0.582 and an average of the third period (2008-2017) reached about 0.628, The total average period (1990-2017) was about 0.543, which was the result of the change in technical efficiency which reached 1.000 and the weakness of the technical change which reached 0.543 because most of the arable land is desert or rocky, Lost their fertility due to neglect and mismanagement, and the land is not suitable for agriculture, in addition to the lack of price and financial policies have led to the inability to attract funds necessary to invest in the agricultural sector for profitable agricultural production. The above analysis shows a significant improvement in agriculture, especially in the third period compared to previous decades. Although Saudi Arabia accounts for a large part of its deserts, there are many areas that represent a climate and fertile land for agriculture. The Government has contributed to this process by transforming large areas of the Sahara into arable land through the implementation of major irrigation projects and the widespread adoption of such a mechanism. Therefore, agricultural development in the Kingdom of Saudi Arabia has achieved significant development in a short period despite the many constraints such as rainfall and limited groundwater, The scarcity of national agricultural labor, and the dispersal of agricultural land between sand dunes, desert plateaus, highlands and valleys. However, vigorous efforts have been made to revive the agricultural sector, such as free distribution of land to agricultural investors, long-term interest-free agricultural loans (Mohammad, 2005: 164), and the state's purchase of strategic crops, All these efforts have moved the country from the stage of importing most of its food needs into the self-sufficiency and external export

stages of some types of food commodities such as wheat. Its wheat production in 1991 was about 3.8 million tons.

Table (1) Total Productivity of Factors in Developing Countries (Jordan, Saudi Arabia) for the period 1990-2017

Jordan			Saudi Arabia			
Years	Technical change (TC)	technical efficiency change (TEC)	Total Factor Productivity (TFP)	Technical change (TC)	technical efficiency change (TEC)	Total Factor (TFP)Productivity
1990	0.690	1.000	0.690	0.200	1.000	0.200
1991	0.677	1.000	0.677	0.520	1.000	0.520
1992	0.527	1.000	0.527	0.630	1.000	0.630
1993	0.617	1.000	0.617	0.620	1.000	0.620
1994	0.627	1.000	0.627	0.420	1.000	0.420
1995	0.655	1.000	0.655	0.337	1.000	0.337
1996	0.422	1.000	0.422	0.496	1.000	0.496
1997	0.400	1.000	0.400	0.263	1.000	0.263
1998	0.233	1.000	0.233	0.521	1.000	0.521
Average First Period (1998-1990)	0.494	1.000	0.494	0.420	1.000	0.420
1999	0.749	1.000	0.749	0.813	1.000	0.813
2000	0.788	1.000	0.788	0.687	1.000	0.687
2001	0.603	1.000	0.603	0.523	1.000	0.523
2002	0.664	1.000	0.664	0.700	1.000	0.700
2003	0.622	1.000	0.622	0.722	1.000	0.722
2004	0.654	1.000	0.654	0.614	1.000	0.614
2005	0.859	1.000	0.859	0.306	1.000	0.306
2006	0.567	1.000	0.567	0.311	1.000	0.311
2007	0.412	1.000	0.412	0.569	1.000	0.569
Average Second Period (2007-1999)	0.657	1.000	0.657	0.582	1.000	0.582
2008	0.412	1.000	0.412	0.754	1.000	0.754
2009	0.434	1.000	0.434	0.465	1.000	0.465
2010	0.481	1.000	0.481	0.546	1.000	0.546
2011	0.606	1.000	0.606	0.654	1.000	0.654
2012	0.760	1.000	0.760	0.833	1.000	0.833
2013	0.812	1.000	0.812	0.800	1.000	0.800
2014	0.574	1.000	0.574	0.912	1.000	0.912
2015	0.624	1.000	0.624	0.689	1.000	0.689
2016	0.694	1.000	0.694	0.897	1.000	0.897
2017	0.854	1.000	0.854	0.787	1.000	0.787
Average third Period (2017-2009)	0.625	1.000	0.625	0.628	1.000	0.628
Total -1990)average (2017	0.592	1.000	0.592	0.543	1.000	0.543

Source: Prepared by researchers based on the outputs of the DEAP program.

The area under cultivation increased fourfold in 17 years and more than half of the cultivated area (57%) was concentrated in the central region of Riyadh and Qassim, followed by the southwestern region (19%) in the Emirate of Jazan, Asir, Najran and Al Baha, And the rest of the cultivated area (11%) is distributed to the western and eastern regions respectively. The per capita agricultural GDP reached 408 dollars in 2011, which is more than the equivalent of the Arab world of 295 dollars and the equivalent of the world level of 260 dollars, While the productivity of the

agricultural worker in the Kingdom in 2011 amounted to about 24.073 dollars, which exceeds the productivity of the worker in the Arab world of \$ 2963 and the world level of 1194 dollars. Thus, the Kingdom of Saudi Arabia exported food commodities such as wheat, dates, eggs, poultry meat, dairy and some vegetables, but also to other positive returns related to social matters, which provided stability for the children of Badia and rural development and health care and education for them and their children.

For the comparison of developing countries with developed countries, Canada and Australia were shown and the results in (Table 2) were confirmed. In Canada, we observe that the change in the total productivity of elements (TFP) falls between a high of about 0.965 percent in 2016 and a minimum of about 0.715 in 1993 and an average of the first period of 1990-1998 is 0.871. The average for the second period from (1999-2007) reached 0.883 and the average for the third period from (2008-2017) reached about 0.901, The total average period (1990-2017) was about 0.885, which is the result of the change in technical efficiency which reached 1.000 and the technical change reached 0.885. The agricultural sector in Canada accounts for only 3% of the total domestic production. Canada has about 280,000 farms, with an average farm size of 242 hectares, with wheat, cattle and milk contributing more than half the value of agricultural income.

Canada's agriculture can be summarized in five main agricultural production sectors (wheat, oats, barley, rye, flaxseed, canola, soybeans, rice and maize). The Canadian agricultural revolution has developed livestock and meat production. Livestock includes cattle Pigs, calves and sheep).

Total Productivity in Australia:

The results obtained were shown in Table (2), showing that the change in the total productivity of the elements (TFP) was between a high of about 0.925 for 2017 and a minimum of about 0.709 for 2001 and an average of the first period of 1990-1998 of 0.786. For the second period from (1999-2007) reached 0.811 and an average of the third period from (2008-2017) reached about 0.869, while the average of the total period (1990-2017) the total productivity was about 0.822 which is the result of the change in Technical competence amounted to 1,000 And technical change of 0.822. The plantations vary in Australia to extend to various climatic zones, including temperate, subtropical and tropical plantations. However, the vastness of the dry desert valleys in the tropical region, and the fact that most of the farmers are of English origin limit the diversity of tropical crops except for sugarcane, while for wheat it occupies about half the area of agricultural land. It is one of the most important exports for export. Australia is the world's fourth-largest wheat exporter after Canada, the United States and Argentina.

Table (2) Total Factor Productivity in Developed Countries (Canada, Australia) for the period (1990-2017)

Canada			Australia			
Years	Technical change (TC)	technical efficiency change (TEC)	Total Factor Productivity (TFP)	Technical change (TC)	technical efficiency change (TEC)	Total Factor Productivity (TFP)
1990	0.947	1.000	0.947	0.802	1.000	0.802
1991	0.896	1.000	0.896	0.883	1.000	0.883
1992	0.867	1.000	0.867	0.723	1.000	0.723
1993	0.715	1.000	0.715	0.754	1.000	0.754
1994	0.854	1.000	0.854	0.722	1.000	0.722
1995	0.915	1.000	0.915	0.732	1.000	0.732
1996	0.864	1.000	0.864	0.779	1.000	0.779
1997	0.900	1.000	0.900	0.833	1.000	0.833
1998	0.888	1.000	0.888	0.854	1.000	0.854
Average First Period 1998-1990)	0.871	1.000	0.871	0.786	1.000	0.786
1999	0.865	1.000	0.865	0.732	1.000	0.732
2000	0.854	1.000	0.854	0.833	1.000	0.833
2001	0.854	1.000	0.854	0.709	1.000	0.709
2002	0.906	1.000	0.906	0.775	1.000	0.775
2003	0.854	1.000	0.854	0.821	1.000	0.821
2004	0.887	1.000	0.887	0.864	1.000	0.864
2005	0.888	1.000	0.888	0.848	1.000	0.848
2006	0.875	1.000	0.875	0.856	1.000	0.856
2007	0.965	1.000	0.965	0.869	1.000	0.869
Average Second Period -1999) (2007	0.883	1.000	0.883	0.811	1.000	0.811
2008	0.963	1.000	0.963	0.904	1.000	0.904
2009	0.868	1.000	0.868	0.854	1.000	0.854
2010	0.935	1.000	0.935	0.888	1.000	0.888
2011	0.815	1.000	0.815	0.902	1.000	0.902
2012	0.900	1.000	0.900	0.878	1.000	0.878
2013	0.865	1.000	0.865	0.825	1.000	0.825
2014	0.854	1.000	0.854	0.798	1.000	0.798
2015	0.909	1.000	0.909	0.858	1.000	0.858
2016	0.965	1.000	0.965	0.865	1.000	0.865
2017	0.945	1.000	0.945	0.925	1.000	0.925
Average third Period -2009) (2017	0.901	1.000	0.901	0.869	1.000	0.869
Total average -1990) (2017	0.885	1.000	0.885	0.822	1.000	0.822

Source: Prepared by researchers based on the outputs of the DEAP program

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

A set of conclusions has been reached for both developing and developed countries, including:

1. The decline in the total productivity of the factors in the developing countries, namely (Jordan, Saudi Arabia) where the TPF reached (0.59,0.54)%, respectively, although agriculture in these countries is the cornerstone of the economy but it is still lagging behind and Sophisticated, due to many problems and difficulties facing agriculture and agricultural production, Which we presented in the Metn, which concludes the validity of the hypothesis adopted by the research and the validity of his prediction in the absence of the 2.total volume of agricultural productivity of developing countries similar to developed countries.
- 2.The total productivity of the developed countries in the developed countries is Canada, Australia, with TPF (0.88,0.82%) respectively, which reflects the impact of advanced technology in these countries, including biological, chemical and mechanical technology, And increased agricultural productivity in those countries.

Recommendations

The study recommends developing countries to develop through:

- 1- The optimal utilization of human, natural and financial resources to increase productivity in agriculture is the main input in the development of the agricultural sector of these countries and diversification of productivity, which leads to increasing the quantities available for internal consumption and export in order to face the situations of agricultural competition and achieve better food security.
- 2- Work on increasing the agricultural labor force by following training programs and courses in various fields to train farmers and farmers to play their active role in the development process and use modern practical methods to raise agricultural productivity in general and labor productivity in particular.
- 3- The need to direct investments to the agricultural sector and equal to other sectors in terms of the relative importance of investment because of the role of this sector in providing food and raw materials for local industries.
- 4- The need to coordinate and intensify the effort among developing countries in order to formulate economic development policies in line with their feasibility and potential to take into account international variables politically, economically and technologically.
- 5- Send scientific competencies of experts, scientists and technicians from developing countries to developed countries in order to acquire scientific knowledge in the field of mechanical and chemical industries.
- 6- A national center for productivity should be established in each country to study and develop practical solutions to the problems of low productivity in each country, and to help the economic units in that country to address their production problems in order to improve the level of production in each country to the level reached by developed countries.

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مقارنة التغير في الانتاجية الكلية الزراعية بين مجاميع دول نامية ومتقدمة باستخدام اسلوب مالمكويست للمدة

(2017-1990)

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المستخلص

يعتبر التفاوت الاقتصادي ما بين الدول المتقدمة والنامية، والفجوة فيما بينهما من الموضوعات التي كانت ومازالت تمثل اهتمام المختصين والتغير في الانتاجية الكلية الزراعية (TFP) أحد اهم مقاييس المقارنة للوقوف على هذا الفارق. لذلك يهدف البحث إلى تحقيق جملة اهداف تشكل في مجموعها سياسة زراعية ترتبط بقياس النمو في الانتاجية الكلية الزراعية (TFP) لكل من الدول النامية والمتقدمة (الاردن، المملكة العربية السعودية، كندا، استراليا)، ووضحت نتائج التحليل بأستخدام برنامج مالمكويست المعتمد على طريقة تحليل مغلف البياناتDEAPانخفاض النمو في الانتاجية الكلية الزراعية في الدول النامية (الاردن، المملكة العربية السعودية) حيث بلغ متوسط للمدة الإجمالية (0.59,0.45) % على التوالي، مقارنة بالدول المتقدمة (كندا، استراليا) والتي بلغ (0.88,0.82) % على التوالي. وخلصت الدراسة إلى مجموعة من الاستنتاجات اهمها انخفاض القدرات التنافسية في معظم البلدان النامية وانخفاض الانتاج وتدني الجودة قد يكون بسبب ارتفاع التكاليف الناجمة عن ارتفاع اسعار مدخلات الانتاج، لذلك توصي الدراسة بالاستغلال الأمثل للموارد البشرية والطبيعية والمالية لزيادة الإنتاجية في الزراعة والذي يمثل المدخل الأساسي في تطوير القطاع الزراعي لتلك البلدان.

الكلمات المفتاحية: الانتاجية الكلية للعناصر، التغير التقني، التغير في الكفاءة التقنية.