

Economic analysis of potato yield production in Abu Ghraib

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Abstract: production function represented by production and its components, Therefore, this search aims to investigate the relationship among potato production as a dependent variable and area, seeds quality, fertilizer and hand working hours as explanatory variables. The study was conducted by a questionnaire form collected from farmers randomly in Abu Ghraib-Governorate of Baghdad, the data were analyzed statistically by SPSS program and least squares method then estimate the output function. The logarithmic formula was the best of the estimated functions in the statistical and standard tests. The results showed that the increase of area by 1% caused increase in production by 1.06%, while increase is 0.053% when fertilizer increasing by 1%, also the study of a variables explained 69% of the fluctuations of the dependent factor, other results indicated by the research the average productivity Donum was 4.6 Mg.D^{-1} and the production costs of ton were 270000 dinars. The growth rates of area and production were negatively during the period 2000 – 2015 which indicated this crop undergoes many problems due to be without any clear strategy to support this crop. It could be concluded that farmers were working by descending capacity gains. thus it could be recommended to maximize production efficiency and minimize hand working.

Key words: production function, growth rate, return scale, potato

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I. Introduction

Iraq possesses all agriculture basics which made it under self-sufficiency and exports superfluous, available water resource and fertile cultivated area gave this country privacy, further more geographical area and climate diversity resulted in crops diversity from north to south thus agriculture sector considered as very important special to build economy due to be as interested aspect in economic development when it is represented as food security reservoir and source living for most of population. It also is source of primary materials, vegetable crops are main crops in horticulture (Almehemdi, 1991) due it possessed nutritional value as enriched by minerals, salts, vitamins, proteins, carbohydrate and lipids moreover it daily consume from most important, one of the most important crops the potato crop considered as tuber crops which had essential economic importance in the world and represented forth best crops that cultivated after maize. potato be as cheap source of carbohydrate, vitamins, minerals and proteins (Khan and Akhtar 2006). potato crop became in the beginning of main food in world which called the second bread and source of making potatoes chips. while its waste resulted from starch industry used to feed cattle as supplementary material further more potato used to manufacture starch, glucose, lactic acid, weaving and leather tanning. it also source of medical alcohol (Albaldawi 2010). potato crop possesses main rule in world food and economy by supply suitable food with other crops to meet the growing requirements of people. when population grow up as 100000000 person in next to decades, 95% for developing countries. therefore the most challengers that face populations is the ability of food security achievement for next generations. thus increase production of potato crop is a part of efforts that would be done to face these challenges as side as wheat, rice and maize especially with world price increase (Alkaisy, 2014).

Research problem

The cultivation of potato under goes many technical and production problems and without scientific behavior in management of resources reflected on crop productivity and increase of productivity costs made budget weak, especially seed bought which was 68% from cost production per area unit.

Research objections

This research aimed to:

- 1- Study the situation of crop production and to investigate the most important indicators of productivity.
- 2- Access the potato production function in Baghdad and evaluate the productivity elasticity.

Research impotence

Potato is considered as main vegetable crops in many world countries due to its impotence economic and food crops where achieves high economic gains for farmers resulted from demand increase of this crop over year. The world production was recorded 329 million tons with increase of 4.8% over last ten years where grown areas in USA and UK were 462000,155000 hectares with production of 20.454 million , 6.423 million tons respectively. Asia consumed a half of world production from this crop , China represented the biggest producer during 2009 whose area was 8.977 million hectares for this crop with production of 156.491 million tons with average of 17.44 ton.hectare⁻¹ followed by India of 2.232 million hectares with production of 45.134 million tons with average of 22 ton.hectare⁻¹ (alzahawi ,2012). Concerning to Arab countries, Iraq is the fourth one after Egypt , Algeria and Morocco . thus , there is necessary to investigate the effective factors on production function.

II. Material and methods

Questionnaire list was used to get essential data by personal communication with potato farmers in Abu-ghraib 16 hectare belongs to Baghdad . The sample size was 50 farmers represented (9.65) % of crop farmers in the largest region. SPSS software and least squares method were used to access the relationship among potato production and effective factors.

III. Results and discussion

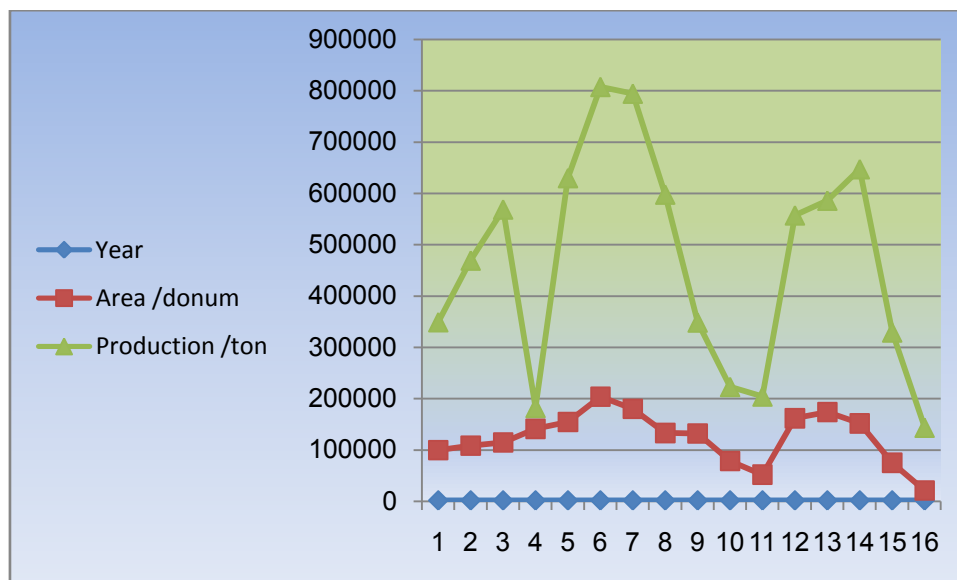
First: Potato production

Potato crop possessed special properties as its adaptability to various environments led to cultivate in different regions. this crop is cultivated twice in spring and fall. Fall cultivation begins in august until harvest after four months. While spring is applied in ending January . table 1 refers to fluctuate the cultivated area during 2000-2015 period where the cultivated was between highest of 203729 donum and lower of 21369 donum due to there is no clear strategy aimed to stability and development of this crop which expansion in potato crop depended on farmers ability and their response to market price . while production achieved average of 465033 kg in that period. The lowest production was of 143854 tons during 2006, the highest was of 794514 tons. This difference is due to fluctuation of area and weather conditions. The productivity is express as division of production on area .thus, increase or decrease one of them effect on production which was 3.9 ton.donum⁻¹ during 2015 due to be used high quality of varieties. as well as crop care operations and the support provided, such as recommended fertilizer quantities Table 1.

Table 1 the cultivated area and the productivity of the potato crop in Iraq for the period 2000-2015

productivity	Production /ton	Area /donum	Year
3.502652	349330	99733	2000
4.334254	469404	108301	2001
4.959003	568877	114716	2002
1.291893	182445	141223	2003
4.070949	629959	154745	2004
3.964021	807586	203729	2005
4.414457	794514	179980	2006
4.491192	597890	133125	2007
2.641539	348773	132034	2008
2.832642	223147	78777	2009
3.929495	204597	52067	2010
3.44549	557401	161777	2011
3.36894	586081	173966	2012
4.264997	647337	151779	2013
4.380588	329337	75181	2014
6.731901	143854	21369	2015

Resource :(ministry of Agriculture - Planning Sector).



Shape 1 the cultivated area and the productivity of the potato crop in Iraq for the period 2000-2015. Production, productivity and area growing up:

Many researches concerned on production development of agricultural production growth up. Three factors effected on growth up of production. First, magnitude of cultivated area expansion. Second, changes score of total production. Third, magnitude of productivity improvement to investigate growth up status and its trend reached prediction and plan economic strategy, it had to calculate yearly growth up using time series. In this research we obtained the data of the time series of the potato crop in Iraq, which included the area and production and time series that was divided into different periods according to the political and economic conditions in Iraq to give an accurate prediction of the nature of the growth of the studied indicators. The periods are divided according to the following table:

Table 2 ranges of yearly growth of area and production of potato crop 1981-2015.

Productivity %	Production %	Area %	Time period
2.1-	16.5	18.7	1990-1981
1.5-	10	9.9	2000-1991
1.4	2.9-	7.9-	2015-2000

Resource : (period from 1981-2000 MSc thesis Auf, period 2000-2015 by researcher according to table 1.

Yearly growth up was extended using equation

$$Y = Ae^{bt}$$

$$\ln Y = A + bt$$

Y = dependent variate (production, productivity, cultivated area)

t = explanatory variate (time)

b = yearly growth up

Table 2 stated that production and area growth up average during first and second period were positive due to beginning of crop concerning and its cultivation is widely adopted in second period. While achieved negative average in third due to determination in area. Productivity possessed negative average due to be used non high yield varieties.

Some indicators of potato production table 3 refers that most of farmers didn't use recommended quantity of growth input, were DAP and Urea average 200,400 kg respectively with increase of hand working, weakness of mechanization, financial shortage and reduction of cultivated area which were 10 donum as average that led to retard developed mechanization caused low donum productivity of 4.6 tons. If compared to the productivity of this crop in the developing countries, which amounted to 8 tons while in developed countries amounted to 12 tons per donum.

The main indicators of potato production

Index	units
DAP fertilizer kg/donum	200
Urea fertilizer kg/donum	320
Area (donum)	10

Human labor (hourse)	126
Mechanical labor (hourse)	2.4
Production cost IQD/ton	271000
Productivity ton/donumAverage of	4.6
Price average IQD/ton	470000

Reference by researcher according questionnaire list

Second- Potato crop production function:

Characterization and formulation of mathematical model:

The first and most important step of the econometrics when studying the relationship between many of variables must be to formulate this relationship in a mathematical form to obtain a model which through we can Studying economic phenomena in an applied manner and this step is called the formulation of confirmed hypotheses this step needs to specify the dependent variable and explanatory variables. second , predictive theoretical expectations about the significance and quantity of information, these expectations are theoreticalwe need it when evaluate results of models. Then mathematical form by number of equations, its characteristics whether linear or non-linear. (Koutsoyiannis, 1977).

Based on the above, the dependent variable can be specified and explanatory as follows:

The dependent variable: the amount of production of the potato crop that estimated by (ton).

Explanatory variable : the function included the following explanatory variables.

X1: Crop Area (donum)

X2: used seeds (kg)

X3: fertilizers (kg)

X4: hand working (hour)

ui : The random variable that did not include in form .

Model estimation :

Many models were constructed to represent the relationship among production as dependent variable and explanatory variables using OLS method by SPSS program , the logarithmic equation was the best estimated function in economic , statistical and standard tastes . table 4 . $\ln Y = b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4$

Table 4 .potato production function according to double logarithmic equation.

VIF	Level of significant	T value	Value basis	variable
	0.05	3.114	2.645	B0
1.71	0.01	4.656	1.065	Ln x_1
1.02	0.4	0.752	0.067	Ln x_2
1.72	0.7	0.354	0.053	Ln x_3
1.02	0.05	-1.885	-0.242	Ln x_4
	0.48	R ²	0.69	R ²
N=50	10.712	F	1.766	D.W

(reference by researcher using SPSS program)

Economic analysis:

Production function estimated by OLS method to calculate the model , this method considered one of many methods using to calculate standard economic model relationship due to it has standard properties as such as an unbiased and minimum variance. many models were constructed to represent the relationship among production as dependent variable and cultivated area , seeds quantity , fertilizer and working hours as explanatory variable. the function were liner , double log and semi – log functions to choose model that relies on to study function of production.result from analysis table4 showed that double log function was the most symmetrical function to economic logic as it exceeded from statistical and economical tastes . furthermore, results of analysis showed that sign of all variables was similar to economic logic except sign of hand working was different from economic logic due to surplus labor resulted in decreasing the production , especially with familiar labor . Moreover, it observed that cultivated area was the most effective factors on size of production .where production increased with area increase i.e. increase of area about 1% production would increase 1.065% while increase of seeds by 1% production increase 0.067% fertilizer 1% resulted in increase of 0.053% in production. The parameter is log function of production represented the flexibility which refered to locate the fertilizer and seed in the second stage which area on first stage due to its flexibility of 1.065% .the hand working

located on ending stage of production . The total flexibility is summation of partial flexibility which was 0.94% that means it (increasing returns to scale) , and increase amounts of productions inputs were descending about 1% led to decrease crop production by 0.9 % . it also means that inputs increase resulted in decreasing the production . therefore , it could be concluded that farmers produced in the second productivity stage of productivity law which critical production and production average are decreased.

Statistical and standard analysis:

The results of the T test indicated to significance of the variable area and work variable at a significant level 5% and work variable, as well as the fixed assets, while F value 10.712 refers to model significant as a whole and the realism of the function firstly, and the effect of all variables on other hand secondly. The coefficient of determination R^2 0.69, it refers studied variables X_1, X_2, X_3, X_4 explained 69% of volatility in dependent variable , it is known that there are many variables that affect the dependent variables some of them can not be calculated and some can be calculated but neglected because of the impact in the results of the standard function. Standard problems and second-class problems should be identified which including :

1- The problem of self-association:

It was detected using a Durbin-Watson statistic, the test refers to there is no problem in it because Durbin test was 1.766 which larger than du and smaller than $4-du$.

2- Problem of Multicollinearity:

Although this problem is rare in CT data, it has been detected using Variance Inflation Factor (VIF). which explained that the estimated function does not suffer from linear duplication.

3- The problem of instability of homogeneity of contrast:

This problem conceded accompany the CT data, it has been detected using Park test (Gujrati, 1978). Who showed that no problem of instability of homogeneity of contrast (table5).

Table 5 .Park test equations to detect the problem of instability of homogeneity of contrast

Equation test	T value
$Lnei^2 = 9.02 + 0.599LN X_1$	0.225
$Lnei^2 = 23.69 - 2.55 L_n X_2$	-0.820

Resource :Reference by researcher using SPSS program

IV. Conclusions

The study showed that the cultivated area of the crop fluctuated during the study period and decrease of production refers to there is no clear policy to develop crop production. and low level of technology and use of unknown origin imported seeds . Also the study showed that potato production effected by many factors and the most important factor is cultivated area, and all farming operations are traditionally, in addition, farmers are working on declining returns.

V. Recommendations

The research recommends changing the conditions for crop production through the adoption of a policy to provide the requirements of production, the most important seed and developed mechanization. and prevent import or reduce it at peak production time, as well as reducing manual labor and use the mechanization.

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