An Estimation of Dates Production Function in Karbala Governorate For The Agricultural Season 2020 (Al-jadual Al-gharby District A case Study)

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Abstract

This study aimed to detect the most important factor that affects dates production. About 108 questionary forms collected from palm orchard farmers in Karbala to estimate the dates production function in Karbala governorate for the agricultural season 2021 (the district of Al-jadual Al-Gharby). The study distributed those forms for about 10% of the total palm orchards in Al-jadual Al-Gharby district of the holy governorate of Karbala. The study used the method of ordinary Least squares (OLS) to estimate the mathematical model of the function. The results showed that the double Logarithmic function in terms of its estimation of the estimated Coefficients by one unit leads to a corresponding change in the produced quality of dates and the same direction by (0.188 0.808) % respectively, and that the capital variable is more influently in production than the work variable. As for the total production elasticity (the sum of the partial elasticities of the resources used), which represents returns to scale, it amounted to about (0.996), which indicates a decrease in the return to scale.

Keywords: Production function, Return to scale, Al-gharby.

1.Introduction

Palm trees are a symbol of loftiness, survival, patience, and serenity. Since ancient times, they have said that people throw stones at the palm tree, but the palm tree gives the person the best fruits as food, medicine, and healing. Dates can be considered as one of the important fruits in Iraq, as they are presented in fresh form or entered into transformational industries that lead to a formal benefit or a temporal. Date fruit has a high nutritional value represented by vitamin B, as this vitamin has well-known benefits, some of which are in strengthening the muscles of the walls of blood vessels, reducing skin cracks and raising toxins and excess acidity in the blood [1].

Palm cultivation spreads in Iraq in numbers that are still competing with the global numbers, as the number of palm trees in Iraq is 18 million palm trees, of which about 13 million are fruitful [2], and it can be said that Iraq is one of the countries that God singled out with many blessings, starting from the blessing of oil to the blessing of water, and other blessings in its forefront is the production and export of dates, and it was an important economic tributary to bring in hard currency and supplement the local currency. This wealth was not the result of The moment, but it was since ancient times and before history in the civilization of Sumer, where the land of the Sumerians was known at that time (the land of palm forests). The palm tree can be considered a symbol of the desert environment due to its endurance of high temperatures, drought and salinity that may not be tolerated by many other plants, as the palm is a monocotyledonous plant and it is one of the fruits of the tropical region. Iraq, Saudi Arabia, Tunisia, Algeria, Iran, Libya, Egypt and Morocco are considered among The most important leading countries in palm cultivation.

The most important factors affecting the productivity of dates in Iraq are employment, agricultural service operations provided to the palm, the irrigation methods used, the quality of fertilization, attention to scientific research centres and the development of transportation and marketing methods [3]. The presence of groundwater is inferred through the growth of the palm tree, which has a high ability to withstand harsh conditions. Despite this, the cultivation and spread of palm suffer from problems and limitations, foremost of which is fluctuation in production and productivity in addition to the high production costs compared to revenues [4].
2. Research Problem

Despite the availability of suitable conditions for palm cultivation in Iraq and the presence of the guiding authorities represented by the technical staff represented by agricultural engineers and the encouragement of the responsible authorities, starting from the Ministry of Agriculture to the agricultural people in the provinces, there is a clear and great reluctance for farmers, and for a long time, from the interest in palm cultivation and production Dates, which caused a significant decline in the number of dates producers for various reasons, which led to a decrease in productivity and the retreat of Iraq from the leading position among the countries of the world in the production of dates.

3- Research Aims

- Estimation of the production function of dates in Karbala governorate for the agricultural season 2021 (Al-jadual Al-Gharby District).
- Knowing the most important factors that prompted farmers to abandon interest in palm trees and the production of dates.
- Estimating the flexibility of production and determining the productive factor that has the most impact on the production of dates.

4. Materials and Methods

4.1 The primary data

The primary data was obtained by obtaining cross-sectional data that serves the research from a sample of palm orchards according to a questionnaire prepared for this purpose, as 108 forms were obtained. 4 forms were excluded due to the appearance of some problems in the analysis. 10% of the total palm orchards in the western table district of Karbala governorate. The date production function was estimated by formulating several mathematical models to represent the appropriate relationship between the total output of dates as a dependent variable and the suppliers of labour and capital as independent variables to obtain a model characterized by BLUE specifications using the ordinary least squares (OLS) method.

Table 1. Estimated coefficients of dates production function in the holy governorate of Karbala for the agricultural season 2021 according to the double logarithmic formula estimated output function.

| Variable   | Coefficient | Std. Error | t-Statistic | Prob. |
|------------|-------------|------------|-------------|-------|
| C          | -5.26154    | 0.468868   | -11.2218    | 0     |
| LOG(L)     | 0.808743    | 0.077137   | 10.48453    | 0     |
| LOG(K)     | 0.188431    | 0.048951   | 3.849386    | 0.0002|
| R-squared  | 0.806615    | Mean dependent var | 2.221293 |
| Adjusted R-squared | 0.802627 | S.D. dependent var | 0.516295 |
| S.E. of regression | 0.229372    | Akaike info criterion | -0.0774 |
| Sum squared resid | 5.103336  | Schwarz criterion | 0.000756 |
| Log-likelihood | 6.869937 | Hannan-Quinn criteria. | -0.04577 |
| F-statistic | 202.2944    | Durbin-Watson stat | 1.684313 |
| Prob(F-statistic) | 0         |             |             |

5. Statistical Analysis

From Table (1), we note that the value of the limiting factor (R^2) was (0.80), indicating that about 80% of the fluctuations in the total output of the date crop were caused by the independent variables included in the model (labour and capital), while 20% of those The fluctuations are due to other variables that were not included in the estimated model, the effect of which was absorbed by the random variable (Ui) and through Table (1) it can also be noted the significance of all independent variables based on the (t) test at the level of significance (0.01). But when testing the function as a whole based on the (F)
test, which amounted to (202.29), where it was significant and at the level (0.01), and this indicates the importance of the independent variables included in the model and the quality of the regression line. As for the standard analysis, and for the model to be accepted and approved in the interpretation of the studied phenomenon, it is necessary to conduct the necessary standardized tests related to standard problems (second-order problems).

5.1 Autocorrelation problem

We note in the following figure, according to Jarco-Perra test, that the residuals of the estimated function are distributed normally, which is the first hypothesis of Durban Watson, in addition to the other hypotheses represented by the explanatory variables or the sloping non-random ones, since the regression models do not include values for the sloped variable in previous periods, which is an important hypothesis for the application of the Durban Watson test. If the estimated model includes values for the variable inclined to it in previous periods, then \( d \), in this case, is close to 2, which means that there is no autocorrelation (of the first degree) and finally, the models of this correlation never suffer from the problem of autocorrelation.

![Jarque-Bera test for normal distribution](image)

**Figure 1.** Jarque-Bera test to check the normal distribution of the residuals of a function.

We note from Table (2) that the calculated value of the Bruges-Codefrey test for serial correlation indicated that there is no correlation because the computed value of \( d \) is equal to (2) in any application. If \( p^* = 1 \), this means that there is a perfect correlation between the residuals, since \( d = 0 \), and as a general rule, the closer it gets, Table (2) Bruges-Codefrey Serial Correlation Test. Test ( lm ) no problem.

| F-statistic | 1.510202 | Prob. F(2,95) | 0.2261 |
|-------------|----------|---------------|--------|
| Obs*R-squared | 3.081404 | Prob. Chi-Square(2) | 0.2142 |

**Table 2.** Breusch-Godfrey Serial Correlation LM Test.

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/30/21   Time: 01:00
Sample: 1 100
Included observations: 100
Presample missing value lagged residuals set to zero.

| Variable       | Coefficient | Std. Error | t-Statistic | Prob. |
|----------------|-------------|------------|-------------|-------|
| C              | -0.15774    | 0.475262   | -0.3319     | 0.7407|
| LOG(L)         | -0.00815    | 0.076877   | -0.10603    | 0.9158|
| LOG(K)         | 0.014622    | 0.049421   | 0.295866    | 0.768 |
| RESID(-1)      | 0.14452     | 0.103851   | 1.391607    | 0.1673|
| RESID(-2)      | 0.086246    | 0.103919   | 0.829933    | 0.4087|
| R-squared      | 0.030814    | Mean dependent var | 8.03E-16 |
| Adjusted R-squared | -0.009999 | S.D. dependent var | 0.227044 |
| S.E. of regression | 0.228175    | Akaike info criterion | -0.0687 |
| Sum squared resid | 4.946081 | Schwarz criterion | 0.061561 |
| Log-likelihood | 8.434876    | Hannan-Quinn crit. | -0.01598 |
| F-statistic    | 0.755101    | Durbin-Watson stat | 2.016128 |
| Prob(F-statistic) | 0.557083 | |

Source: From the researcher’s work based on the estimated function.
5.2 Heteroscedasticity problem

Because the study adopts cross-section data, it is expected that there is a problem of heteroscedasticity, [5]. To test this phenomenon, the Breusch-Pagan-Godfrey Test (BPG) was adopted to detect it [6], and by using the statistical program reviews, the (BPG) test can be applied and the test results can be obtained quickly and accurately, and the test proved insignificant. Chi-square, and from it it can be concluded that the estimated model does not suffer from the problem of instability of homogeneity of variance as shown in Table (3).

Breusch-Pagan-Godfrey Test

Table 3. Heteroskedasticity Test: Breusch-Pagan-Godfrey.

| Variable       | Coefficient | Std. Error | t-Statistic | Prob.  |
|----------------|-------------|------------|-------------|--------|
| C              | -0.08098    | 0.118786   | -0.68175    | 0.497  |
| LOG(L)         | -0.03559    | 0.019542   | -1.82105    | 0.0717 |
| LOG(K)         | 0.02443     | 0.012402   | 1.969927    | 0.0517 |
| R-squared      | 0.041285    |            |             | 0.051033 |
| Adjusted R squared | 0.021517 |            |             | 0.058746 |
| S.E. of regression | 0.058111      |            |             | -2.82339 |
| Sum squared resid | 0.327556    |            |             | -2.74524 |
| Log-likelihood | 144.1695    |            |             | -2.79176 |
| F-statistic    | 2.088527    |            |             | 1.892183 |

Source: From the researcher’s work based on the estimated function

6. Economic Analysis of Dates Production Function

From the double logarithmic production function of date farmers in the holy governorate of Karbala (Al-jadual Al-Gharby district Cultivation Division), as the natural logarithm of the independent variables came in agreement with the economic logic in terms of the positive sign during the study period for the agricultural season (2020), which means that it is in a state of change (increase or decrease) capital and labour by 1%, which leads to a corresponding change in the produced quantity of dates in the same direction, at a rate of (0.188, 0.808)%, respectively. Through estimated transactions, we note that the labour variable has more influence on production than the capital variable. Since the coefficient value of the variable in the double logarithmic function represents the partial productivity elasticity of this variable, so the productivity elasticity of work amounted to about (0.808)%, which is a positive value and is higher than its value in the capital resource. It also indicates that the production of dates depends mainly on the availability of work, followed by the capital, whose flexibility amounted to about (0.188)%, which came in second place.

As for the total production elasticity (the sum of the partial elasticities of the resources used), which represents the value of capacity returns, it amounted to less than one (0.996), which indicates a diminishing return to capacity. In the sense that an increase in production resources by 1% leads to a decrease in production by (0.996)%, meaning that an increase in resources by a certain percentage is accompanied by an increase in total output by a lesser rate. That is, there is no possibility of expanding production by increasing the quantities used by labour and capital suppliers.

Estimation Equation:

\[ \text{LS LOG(Q) C LOG(L) LOG(K)} \]

Substituted Coefficients:

\[ \text{LOG(Q)} = -5.2615406466 + 0.808742646642 \times \text{LOG(L)} + 0.188430537456 \times \text{LOG(K)} \]

The estimated function has no problems.
7. Results and Conclusions

- It was found from the analysis that the estimated coefficients of the two variables (labour and capital) which represent the elasticities in the Cobb-Duclas function that the partial productivity elasticity of the labour resource amounted to about (0.808), while the partial productivity elasticity of the capital resource amounted to (0.188), which means that production falls within The second economic stage (the rational stage) of production.
- As for the total elasticity, which is the sum of the partial elasticities of the productive suppliers (labour, capital), it reached about (0.996), which is less than the correct one.
- It was found from the production function that the labour variable is more influential on production than the capital, and this means that farmers depend on labour more than the capital variable.

Recommendations

- Paying attention to palm trees by holding training courses for farmers and introducing modern technologies appropriate to the size of the orchards to raise the productivity of palm trees.
- Supporting and encouraging the owners of palm orchards by providing agricultural loans to establish new palm orchards, repairing old orchards and providing production requirements whose prices have increased as a result of the state’s policy of devaluing the Iraqi dinar against foreign currencies.
- Establishing special factories for packing and wrapping dates while providing refrigerated places for storage.
- Facilitating the export process so that there is a role for the state in setting prices and preventing middlemen who trade with the efforts of farmers. The prices at which the farmer sells do not cover the costs, which prompted the agricultural workers to leave agricultural work and go to search for a source of livelihood that is guaranteed at least to make ends meet. The decline in the number of palms was alarming, as the number of palms fell by half, not to mention the quality and quality of dates, which also declined due to the exposure of important and high-quality varieties to death due to the outbreak of plant diseases that killed all types of palms in general and rare varieties in particular.
- Protecting the product and producers by following a tight policy by facilitating the marketing process for dates and paying the farmers after receiving the crop from them.
- Due to the economic and nutritional importance of dates, the responsible authorities have to pay attention to this product and include it within the strategic crops.

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