

AN ECONOMIC STUDY OF ESTIMATING COST FUNCTION DATES PRODUCTION IN MURZUQ, SOUTHWESTERN LIBYA

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Abstract

The results showed that fixed cost represented (41%) of the total cost of Murzuq, also the variable cost amounted to approximately (59%) the total cost of Murzuq, and that the optimal size of the production of dates amounted to approximately (2.01) tons per hectare for Murzuq, and that production was more than the average actual production of dates for the Murzuq by nearly (0.37) tons per hectare, while reported results that the production that maximize profit of dates have hit (4.25) tons per hectare for Murzuq, and for community sample as a whole and that production is more than the actual production of dates by (2.61) tons per hectare. It also showed the results of the field study that the average price per ton of harvest dates had been hit (1293.50) dinars for the total sample respectively.

Key words: cost function, economic study, production, South Western Lybia

INTRODUCTION

Dates are a nourishing food that can be preserved, stored, and carried easily over long distances, especially in dry climates. The date palm is one of the oldest plants cultivated by human beings and has been used as food for 6000 years (Hamidi-Esfahani, 2011, p. p.101). Date palms also provide a suitable place for the settling of nomadic people by creating shade and giving protection against desert winds. Dates are a particularly important product in arid and semi-arid regions of the world and play an important role in the economic and political life of the people in Islamic regions. Many products, including date syrup, alcohol, animal feed, date powder, different types of bread, marmalade, sweet candy, chocolate, date paste, and others, can be produced from dates. Not only does the date palm have an important role in the ecosystem of the desert, but it also has several agricultural and animal husbandry uses. Other parts of the date palm are also important in the agricultural economy in Arabic countries. For example, the trunk is used for making boats, covering the roofs of rural houses, paper and

wood industries, and making fiber. The foliage is also used for making handicrafts like fans and straw hats (Hamidi-Esfahani, 2011, p. p.101).

There are many environmental advantages to planting date palm trees. Previous studies have shown that date palms have the ability to create an environmental balance in many Arab countries, including, Libya. Firstly, they play a significant role in the fight against desertification; they also contribute to the appearance of rural communities (Sharif, 2010). Moreover, date palm trees that are established as forests and oases in desert areas lead to reduced temperatures, and limit the movement of sand dunes in coastal cities. This helps combat climate change (Hussen, 2010; Khairi, 2010; Sharif, 2010). Palm trees can be grown in areas that use less water particularly in the areas of desert and semi-desert in North African countries. Palm trees only need small amounts of water compared to other plants (Sharif, 2010). Palm fibers can be used in industry as an alternative to plastic materials due to rapid decomposition this also helps preserve the environment (Abu-Sharkh & Hamid, 2004). Finally, date palms can

grow in different soil types, because they can bear high salt concentration. For example, Jordan has reduced the problem of heavy metal pollution in urban areas by cultivating palm trees on road shoulders and in industrial and residential areas (Al-Khlaifat & Al-Khashman, 2007). In Libya, the presence of palm trees indicates the existence of ground water in that region. Cultivation of palm trees in many areas of Libya occurs because they can withstand adverse environmental conditions. There are palm trees in the coastal areas and scattered oases also on the Libyan desert (Edongali & Aboqilh, 2005).

MATERIALS AND METHODS

Date palm trees are most plentiful in the interior oases of Libya. Date palms are tolerant of harsh environmental conditions as they have the ability to withstand high temperatures, drought and salinity (Ali, 2010). Despite available environmental conditions, the production of date palm farms has remained low and productivity has also been variable (El-Juhany 2010). The production of dates increased to 7.17 tons/hectare in 2002. However, there was a decrease in date production in 2005, about to 5.97 tons/hectare (FAOSTAT, 2010).

The aims of this study are to:

1. To determine the productivity costs of date palm Murzuq region.
2. To assess the relationship between inputs and outputs, the cost factors used in production of dates in Murzuq South Libya.
3. To assess the efficient use of those factors in the amount produced by estimating the optimal size, size bulks for-profit and different averages of actual production of dates for optimal counterpart.
4. To assess the impact of the costs of the production of dates on the net return.

Description of the study population (date farmers) and the selection of the sample:

This study was conducted in the area of Murzuq in Southwestern Libya. There are many private date palm farms, oases and some government projects interested in production of dates in this area.

The sample was selected by using simple random sampling to give units equal probability of being included in the sample (Dorofeev, 2006; Thompson, 2002). A large sample provides more information than a small sample, so, statistics from a large sample size can reduce sampling errors.

According to Avauda (1994), a small sample size needs to be at least 30 samples, but large sample size has to at least 100 samples (AL-Faidi, 1994). In this study 1.5 per cent of the total farms, estimated at about 3619 (Minister of Agriculture in Murzuq, Libya, 2007, farms (Statistics, 2007), was sampled. Thus, a total of 53 farms were selected for the study from Murzuq. Data was collected between April 2007 and November 2007 from farmers in the study area.

RESULTS AND DISCUSSIONS

Economic indicators for farmer's dates sample study

The results of the field study show that the date crop production costs in Murzuq consist of fixed and variable costs which can be analyzed a compared as follows:

Fixed costs

Fixed costs for palm plantations sample study did not include investment costs that were paid on those farms since their inception, but were limited only to leased land, labor costs and depreciation of farm equipment, given that these investments are donated from the Libyan government to achieve the benefits in the study area.

The fixed costs do not change the volume of yield and include ground rent, labor and depreciation of farm equipment (McTaggart, Parkin, Parkin, & Findlay, 2006). The employees are family settled and who agricultural operations that serve the crop of dates, they estimated about 223766.90 dinars per sample farms in Murzuq.

Data also showed that the highest item of fixed costs is the value of the agricultural equipment, about 93982.10 thousand dinars per farmer in the sample an estimated (42%) of the total fixed costs.

The value of the fixed cost of labor was about 71605.4 dinars per farmer in the sample (an

estimated 32%) of the total costs. The cost of rent was about 58179.40 dinars (an estimated 26%) of the total fixed costs in the areas mentioned.

Table 1. Average Fixed costs for farms in Murzuq

Items	Costs	%
Agricultural equipment	93982.10	42
Labor	71605.40	32
Rent	58179.40	26
Total	223766.90	100

Source: - collected and calculated from questionnaire from field for the study sample.

Variable costs

Variable costs are costs that vary with the amount of production and are equal to zero in the absence of production (Horngren, Datar, & Foster 2005), variable costs include: the value of seedlings, organic fertilizers, chemical pesticides, irrigation, pruning, and employment. They are estimated about million and 322006.12 dinars in Murzuq.

As it turns out that the total variable costs in the average farm in Murzuq has been estimated at about 6192.4 dinars.

The relative importance of each of the fixed and variable costs to Total costs

Total overall costs of sample farms amounted to about 545773 dinars distributed to 223766.90 dinars for the total fixed costs, representing about 41 % of the total overall costs farms in Murzuq. While the variable costs estimated about 322006.12 thousand, representing about 59 % of the total overall costs for each of the farms in Murzuq.

Table 2. Average fixed and variable costs in Murzuq

Items	Costs	%
Fixed costs	223766.90	41
Variable costs	322006.12	59
Total	545773	100

Source: - collected and calculated from questionnaire from field for the study sample.

Average costs

The average estimate total costs for the harvest dates, average cost per ton, the average total cost of the space, farm and tree as shown in Table 3.

Revenue per season crop for the production of dates in Murzuq

Total revenue farm is a value farm production is the result of multiplying the quantity produced in the unit price of production, value of the total output farm are one of the indicators of the profitability of farm, especially, the total output is high, measured total output the number of units of the product but, this measure varies from one farm to another, where each farmer trying to get high profits by using modern methods either increase the size of the output or reduce costs even more than the value of the return.

Average production per hectare and per farm

The average productivity per hectare of crop dates in the field study amounted to about 1.64 tons per hectare.

Results, also showed that production by a single farm of dates on average was estimated about 12.34 tons, as shown in Table (4) below.

Table 3. Total overall costs, cultivated area of dates, average total costs per hectare and tree in Murzuq (2007-2008)

Data	Average costs	Units
Total overall costs	545773	Dinars
Total area	39200.0	Hectares
Average cost of production	1392.27	Hectare /Dinars
Number of sample farms	52.000	Farms
Total production	641.50	Tons
Average cost of production	850.70	Ton/ Dinars
Average cost of production of farm	10493.6	Dinars
Average size of each farm	7.5400	Hectares
Average number of trees	108.00	Hectare
Number of fruit palm trees for the farm	814.00	Trees
Average cost of production of the tree	12.890	Dinars

Source: - collected and calculated from questionnaire from field for the study sample.

The results showed the field study, which surveyed a sample level as a whole that the amount of production of dates amounted to about 641.50 tons (Table 4).

Table 4. Total production, average productivity per hectare and farm production for dates in Murzuq (2007-2008)

Data	Average	Units
Total production	641.00	Tons
Total area	392.00	Hectares
Average of production	1.64.00	Tons /Hectares
Number of trees	814.00	Tree
Number of farm	52.00	Farm
Average of production of farm	12.34	Tons
Average production of trees	15.16	kg

Source: - collected and calculated from questionnaire from field for the study sample.

While the total revenue nearly 830 thousand dinars farms in Murzuq.

The averages, total revenue from the crop of dates per ton to hectares and tree farm and in addition to net earnings are set out in Table 5.

Return on invested dinar of the crop of dates per hectare, tonne farm and tree

Table 5. Production, costs, revenues and averages samples farms dates in Murzuq (2007-2008)

Data	Average	Units
Average Area cultivated	392.00	Hectares
Average productivity	1.6365	Tons/ Hectares
Average cost	850.70	Dinars/Ton
Selling price	1293.50	Ton
Average net return	442.800	Dinars/Ton
Production of dates	641.500	Tons
Average cost	1392.20	Hectares
Average revenue	2116.81	Dinars/Hectare
Average net returns	724.61.0	Dinars/Hectare
Average farm production	12.34 .00	Tons
Average cost of production of farm	10495.60	Dinars
Average farm income	15961.79	Dinars
Average net revenue (revenue) of the farm	5466.19	Dinars
Average production kg/tree	15.16.00	Kg
Average cost of production of the tree	12.89.00	Dinars
Average revenue tree	19.61.00	Dinars
Average net revenue of the tree	6.72.00	Dinars

Source: - collected and calculated from questionnaire from field for the study sample.

Estimated return on invested dinar (dinar return date production costs) by dividing the average net return on average total overall costs (Table 6) where the return on invested

dinar of dates per hectare, per tonne and a farm about 0.52 in Murzuq.

Table 6. Net earnings and return on invested dinar for sample dates production farms in Murzuq (2007-2008)

Data	Average	Units
Average net returns dinars	724.50	Hectare
Average total overall costs	1392.20	Dinars/Hectare
Return on invested	0.52.00	Dinars/Hectare
Average net returns	442.80	Dinars/Ton
Average total overall costs	850.70	Dinars/Ton
Return on invested	0.52 .0	Dinars/Ton
Average net returns for the farm	5466.19	Dinars
Average total cost of the farm	10495.60	Dinars
Return on invested dinar for farm	0.52 .00	Dinars
Average net returns tree	6.72.00	Dinars
Average cost of production of the tree	12.890	Dinars
Return on invested dinar for tree	0.52.0	Dinars

Source: - collected and calculated from questionnaire from field for the study sample.

Statistical estimate of date's production costs function in Murzuq

Input and output functions costs

The dependent variable (TC) represents the total cost for the harvest dates of hectares, dinar.

Independent variable (Y) represents the amount of estimated production of the crop of dates in tons per hectare.

Functions production costs were estimated in linear, quadratic and cubic forms, by using all values representing the relationship between the total costs Libyan Dinars and productivity of dates in tons per hectare in (2007-2008). Selecting analyzing, presenting the best economically and statistically, the following presentation of the results of statistical estimates of production cost function dates:

Statistical estimate of date's production costs functions in Murzuq

Estimate functions total costs of production farms harvest dates in Murzuq and selecting between various forms (linear, quadratic and cubic). The result shows that the best from the standpoint of statistical and economic is the squared cost function, based on the value of

the coefficient of determination rate (R^2), test value (F) and (t), as described equation (1) the following:

$$TC_1 = 989.97 - 784.66Y_1 + 244.317Y_1^2 \dots (1)$$

$$(2.2) (-5.08) ** (2.19) **$$

$$F = 39.38 \quad R^2 = 0.60 \quad DW = 2.13 \quad N = 52$$

TC_1 = represents the total estimated total costs per hectare farm in Murzuq.

Y_1 = represents the amount of crop production dates, tons per hectare in sample farms in Murzuq (linear form).

Y_1^2 = represents the amount of crop production dates in tons per hectare in sample farms in Murzuq (quadratic form).

Figures in parentheses represent values t, ** statistically significant at the level of significance 0.01.

* Statistically significant at the 0.05 level of significance.

Show of the equation achieve significant (significance) statistical estimates obtained, indicates the value (F) calculated to moral model to express the relationship between the dependent and independent variables, the value indicates the coefficient of determination rate R^2 about 60 % of changes in the overall costs of production per hectare of this region explained by changes in production per hectare of dates from one farm to another, the remaining 40% refers to other variables.

The functions can be derived marginal costs and the middle of the equation (1) as follows:

$$ATC_1 = -784.66 + 989.97/Y_1 + 244.31Y_1 \dots (2)$$

$$MC_1 = -784.66 + 488.63Y_1 \dots (3)$$

When total costs average functions (ATC_1) per hectare Equality to equation (2) marginal cost functions (MC_1) equation (3). it can get on the amount of productivity best achieved than the lowest point on trend average total costs to date producers in the region, and that the optimal size of the production of dates amounted to approximately (2.01) tons per hectare for Murzuq, while the average productivity of the crop of dates in this region around 1.63 tons per hectare less than the average actual production of dates for the Murzuq by nearly (0.37) tons per hectare, as

seen there are nine farmers only achieved the optimal size of dates.

Through equality marginal costs function equation (3) with an average price production hectare about (1293.5) dinars per ton (assuming a constant price, crop is sold in the market fully competition), it is possible to obtain the production that maximize profit of dates have (4.25) tons per hectare for Murzuq, and for community sample as a whole and that production is more than the actual production of dates by (2.61) tons per hectare, there are also only seven farmers was reached to maximize profit of dates and low cost .

CONCLUSIONS

Results that have been obtained by descriptive and quantitative statistics from the questionnaire of date palms farmers in Murzuq, can provide some recommendations that may contribute to reducing the costs of production of dates in that region as following:

1. To provide inputs to farmers for example, pesticides and fertilization. Prices have increased significantly after adjusting the Libyan dinar exchange rate against foreign currencies, where they have had a negative impact on production costs.
2. To activate and expand the role of agricultural extension in Murzuq region to develop plans and possible solutions to avoid the problems of production costs more by encouraging farmers to grow varieties of date palms that cost less and are appropriate for the environment.
3. Establishment of a database for costs of production and income to improve the agricultural sector. This would lead to improved production and food security.
4. Encouraging economic studies to provide a baseline for database-related studies and research in date palm production, which will help researchers and authorities in applying field studies.

REFERENCES

- [1] Abu-Sharkh, B., Hamid, H., 2004, Degradation study of date palm fibre/polypropylene composites in natural and artificial weathering: mechanical and

thermal analysis. *Polymer Degradation and Stability*, 85(3), 967-973.

[2]Al-Khlaifat, A. L., Al-Khashman, O. A., 2007, Atmospheric heavy metal pollution in Aqaba city, Jordan, using *Phoenix dactylifera* L. leaves. *Atmospheric Environment*, 41(39), 8891-8897. doi: 10.1016/j.atmosenv.2007.08.028

[3]Ali, H. G., 2010, Development of Date Palm Cultivation and Its Role in Sustainability of Agriculture in Oman. Paper presented at the Proceedings of the Fourth International Date Palm Conference, Abu Dhabi, United Arab Emirates.

[4]AL-Faidi, M. A., 1994, Research Methods and Social Sciences (Applications on the Rural Community). El-beida-Libya: Omare Al- Mukhtar University.

[5]Dorofeev, S., 2006, Statistics for real-life sample surveys : non-simple-random samples and weighted data / Sergey Dorofeev and Peter Grant.: Cambridge : Cambridge University Press

[6]Edongali, E. A., Aboqilh, O., 2005, The economic implications of infection dates (the central region and Southern Libya). *Egyptian journal of applied sciences*, 20(11), 528-537.

[7]FAOSTAT, F., 2010, Statistical Databases: Food and Agriculture Organization of the United Nations: Rome, Italy.

[8]Hamidi-Esfahani, Z. A. a. Z., 2011, Date and Date Processing: A Review. *Food Reviews International*, 27(2), 101–133. doi: 10.1080/87559129.2010.535231

[9]Hussen, A., 2010, Potential of Date Palm Plantation in Afar Region, Ethiopia and Its Market.

[10]Horngren, C. Datar. S, Foster,G., 2005, Cost Accounting: Pearson Education Australia.

[11]Khairi, E., Bashab, 2010, The Status of Date Palm Cultivation and Date Production in Sudan. Paper presented at the Proceedings of the Fourth International Date Palm Conference, Abu Dhabi, United Arab Emirates.

[12]McTaggart, D. F., Parkin, M. T. F., Parkin, M., Findlay, C. C., 2006, *Microeconomics + MyEconLab*: Pearson Education Australia.

[13]Minister of Agriculture in Murzuq, Libya, 2007.

[14]Sharif, S. a. T. , 2010, The Date Palm and Its Role in Reducing Soil Salinity and Global Warming Paper presented at the Proceedings of the Forth International Date Palm Conference, Abu Dhabi, United Arab Emirates.

[15]Statistics, L., 2007, Atlas of the Final Results of the agricultural census in Libya. Tripoli - Libya.

[16]Thompson, S. K., 2002, *Sampling* Second Edition. Canada.