

An Economic Study: Date Palm Farmers in Al Ahsa Oasis-Kingdom of Saudi Arabia

Ghada Alkhaldi¹, Abda Emam^{1,2,*}, Ezzeddine Mosbah^{1,2}

¹Department of Agribusiness and Consumer Sciences, College of Agriculture and Food Sciences, King Faisal University, Al-Ahsa 31982, Kingdom of Saudi Arabia

²Department of Agricultural Economics, Faculty of Agricultural Studies, Sudan University of Science and Technology, Sudan

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Abstract The study mainly aimed to discover the factors impacting the production and profits of date palm farmers in Al Ahsa Oasis in Kingdom of Saudi Arabia for seasons 2020/2021. The study's secondary goals are represented in studying the social characteristics of date palm farmers, and the most important factors impacting the production and profits of date palm farmers in Ah Ahsa Oasis, in addition to identifying the obstacles faced by farmers. The study relied mainly on the preliminary information collected through questionnaires, and secondary information collected from different sources relevant to the research subject. Data analysis was conducted through descriptive statistics for economic and social variables, regression analysis, and Likert scale. Study results showed that farmers aged from 51 to 61 are the majority with 37%, most of whom are married with 95.4%. They have more than 10 years of experience with 81.82%, and their income is around 10000 riyals as those represent a percentage of 48.86%. The regression analysis has also showed that the production cost and the farm's area have a positive and significant effect on production quantities. The most important obstacles faced by farmers are the low productivity, the increase of damage date percentage, and low prices. The study recommends using modern technologies, hiring skilled labor that may increase profits, and encouraging exportation in order to raise local prices.

Keywords Production, Profit, Dates, Obstacles

1. Introduction

Agricultural development represents an important element among the economic and social development strategies, especially for developed countries. Kingdom of Saudi Arabia is considered one of the major oil-producing countries, yet it pays great attention to the agricultural sector as one of the elements of the national development strategy in line with the 2030 vision. In that regard, the agricultural plan aims to raise the resources' efficiency in the sector, achieve integration between the agricultural sector and other sectors, enhance the production value, and raise the standard of living for farmers and working force in that sector [1]. This strategic vision is different from previous visions in line with the sector's position regarding the development of its techniques, its climate and location, whereas the sector's movement effects are affected by a number of social, economic, and technical factors.

Kingdom of Saudi Arabia is distinguished by date palm agriculture [2]. The percentage of cultivated area and the production of date equal to 33.2% and 27.4%, respectively, in Saudi [3]. Also, the percentage of date produced to total fruit production equals to 75% [4]. In addition, Saudi has approximately 30 million palm trees that produce more than 1.5 million tons of date [5]. The area is distinguished by its own type of dates which all

have different importance and consumption approach. For example, there are types that could be eaten in the soft phase, and other types are eaten as whole dates. The Kingdom also has various types of high-quality dates, some of which are: Sukkary Dates in the Central Region, Ajwa Dates Madinah in Madinah, but Khalas and Raziz Dates are the most distinguished types planted in Al Ahsa Oasis, which is located in Al Ahsa Governorate, at the southern coastal part of the eastern region in Kingdom of Saudi Arabia. The Oasis coordinates are E⁰19 37⁰49 Longitude, and 25⁰ 25'46" N Latitude [6]. The Oasis represents 76% of Al Ahsa Governorate. It is famous for its water spring which ranges between sixty and seventy springs. This is the reason behind the agricultural flourish of the Oasis, as the number of landholders is estimated by around 25 thousand, on an agriculture space that is estimated by 16 thousand hectares. Date palms are considered the main vegetation cover in the Oasis, as there are around 2.5 million palms [7].

A study aimed to identify the economic and social importance of dates' local production in Sudan [8]. The study explored the factors that affected production as it also relied on preliminary data that were collected through a questionnaire, in addition to secondary data that were collected from relevant sources. The study used the Stratified Random Sampling method. The locality was distributed into three sectors, Abuhmed 30 farmers, alshrek 30 farmers, maugrat 30 framers, total random samples consisting of 90 farmers in the various communities. Data were analyzed by descriptive analysis and illustrations based on results showing that farmers in the area are homogeneous and the proportion of 77.7% of them fall within the active age groups. As for social status, about 86.7% are married, 13.3% are not married, and the level of education is high as there is 5% illiterate, 28.8% elementary, 20% intermediate, 28.8% secondary and 16.6% university. We find the number of family members between (5-10) people at a rate of 78.7% and this rating indicates families' large size. The study showed that the proportion 83.3% of farmers grow more than 6 feddan of palm crops, and 91.2% of the farmers own agricultural land, and 83.3% of the farmers do not rely on palm cultivation, but they grow other crops. The study showed that the proportion of 18.8% planted improved seedlings, and the proportion of 88.8% from farmers intercrop palm, and the most difficult stage of production which is irrigation is 53.3%.

The study shows that 91% of farmers sort dates and discard the spoiled and infected dates. Regarding income, it has been showed that 61.2% of farmers do not have dates as the main source of farm income and the proportion of 91.2% benefit from the remaining palm. The study recommended that there is a need for the use and application of technical packages, including the selection of improved seedlings, removing obstacles such as the cost of irrigation and improving seedlings which are the most proportion of the costs of production and utilization of

irrigation water and agricultural land by intercropping palm with other crops, and striving toward mastering marketing operations such as sorting, grading, and packing complying with quality standards.

A study was conducted to examine the results of the breakdown of agricultural landholders, and data were collected from a sample that consisted of 300 farmers for the year 2013 [7]. The study used the inductive approach, and data were collected through a questionnaire and personal interviews. The study found that landholdings through inheritance and selling have contributed to changing the land usage from agricultural usage to usage in other sectors, as around 45% of the land has changed towards tourism and social services, 38% towards urbanization, 12% towards the trade, and 5% towards the industry.

A previous study was conducted to express the importance of water conservation and saving, as it is the most essential and important foundation for the continuous development and sustainable water management [9]. It mentioned the arid climate and environmental conditions in Kingdom of Saudi Arabia, therefore the lack of water in the Kingdom is considered the most important problem that faces the economic and social development process as it faces the limitation of natural water resources and the high cost of obtaining it from untraditional resources. This is immediately reflected on the decrease in the cultivated land area in the Kingdom as it represents around only 0.50% from total land in the Kingdom which is estimated by 2.25 million square kilometers. Based on that, the study mainly aimed to estimate the technical production efficiency and the capacity competency to produce the most important crops included in the study sample, the most important of which are winter tomatoes and clover in different irrigation methods including center-pivot irrigation and drip irrigation, although center-pivot irrigation affected positively the crops of winter tomatoes and clover. Center-pivot irrigation is a method of modern irrigation and for sure it has a positive effect on preventing wasting water, as 44.32% of Al Ahsa Oasis farmers use modern irrigation methods, which indicates their awareness of the matter, but educational courses for farmers on water conservation must be increased.

A study was conducted to disclose the urban sprawl on agricultural areas and its environmental impact in Al Ahsa Governorate [10]. The study used remote sensor technology and geographical information systems specifically, identified urbanization in the region and prepared new maps for this urbanization for the years 1987 and 2018, whereas the results of this study have confirmed that urbanization in Al Ahsa Oasis went on the wrong direction which led to the regression of agricultural lands. The study has also showed the role and importance of using remote sensor technology as it helps decision makers in making proper urban planning and at the same time protects agricultural lands and takes into consideration the natural and social characteristics of the Oasis and its

population.

On the other hand, Reference [11] focuses on the reality of dates in Iraq, the challenges and development aspects, as the study addressed the economic situation of date production, studied the environment affecting its cultivation and identified the real reasons behind its production decrease and its low percentage in domestic production. The study also aimed to address the most important issues that date palms face, and it also attempted to find appropriate solutions for it. Study results have indicated that dates have economic importance, even though the domestic competitiveness of dates is very weak, due to the high cost of its cultivation, and the absence of the state's role in supporting cultivating date palms. The study has recommended that the state shall take appropriate actions to support date palm farmers in all aspects whether it was technical guidance, or technical support by establishing advanced laboratories to take on the task of analyzing dates and guarantee the increase of its production.

Another study Reference [12] demonstrates the historical, cultural, and environmental importance of date palms in North Sinai Governorate. Therefore, the research has aimed to study the production efficiency for fruitful date palms. Economic production efficiency results for date palms from the study sample in North Sinai Governorate have showed, during an average production season (2017, 2018), that the revenue to cost ratio has reached its lowest point with a value of 1.74 within the first landholding category (less than one feddan) when the highest value it reached was 1.89 within the second landholding category (two feddan or more) with an annual average of around 1.74. The invested pound revenue has reached its lowest point with a value of 73.6% within the first landholding category while the highest value it reached was 88.7% within the third landholding category with an annual average of around 78%. The product profit margin has reached its lowest point with a value of 42.4% within the first landholding category, while the highest value it reached was 47% within the third landholding category with an annual average of around 43.8%. Not only that but also the relative profitability ratio has reached a value of 72.6% within the first landholding category, compared to the highest value which is 75.5% within the third category, with an annual average of around 73.5%. Production efficiency estimates indicate reaching a value of 1.94% as the highest percentage of the first landholding category, compared to around 1.73% as the lowest percentage of the third landholding category, with an annual percentage of around 1.63. Studying the replacement and renewal of the study sample, it has been recognized that net revenue increases as the age levels increase, then it tends to decrease in the category of old-aged date palms. Based on what is previously mentioned, it demonstrates the necessity of conducting replacement and renewal for date palms in old age, which has reached a percentage of 20% of total study sample

farms. Concerning types of dates, it is clear that there is a need to expand in growing Al Amri types, which is represented in 5.2% and is used in making dates, this is according to two types bent Esha and Medjool, meanwhile preserving the availability of Hayani Dates that is used in making Ajwa. While measuring the production statistical significance for the total sample, results have revealed that the total production flexibility has reached an amount of 1.341 which is more than one. This indicates the increasing result of revenue to capacity, and that farmers are producing dates in the first phase of The Law of Diminishing Returns. Focusing on statistical measuring for cost significance, it showed that the ideal production volume is about 3.67 tons, which is more than the actual volume by around 3.48 tons. This confirms the decrease in production.

This study aimed to enrich the research aspect of date palm landholdings in Al Ahsa Oasis, by focusing on studying the social and economic factors for date palm farmers, in addition to identifying the factors that affect the production, profits, and obstacles faced by farmers for seasons 2020/2021.

2. Materials and Methods

2.1. Methods of Data Collecting

1- Research Location

The study location is Al Ahsa Oasis (coordinates are 90°37'19"E 4 Longitude, and N°46'25'25" Latitude). AL Ahsa Oasis is located in the Eastern Province in Kingdom of Saudi Arabia.

2- Tools and Methods of Data Collecting

The study relied mainly on the preliminary data that were collected through questionnaires, and personal interviews with farmers, in addition to secondary data that were collected from relevant sources such as Irrigation and Drainage Authority, General Authority for Statistics, Al Ahsa Municipality represented in King Abdullah City for dates, and other resources. The study also covered the agriculture season 2020.

3- Study Community

Landholding farmers in Al Ahsa Oasis.

4- Study Sample

The size of the research sample was identified by the following "(1)" [13]:

$$n = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P(1-P)} \quad (1)$$

Whereas:

n: Sample size, N: Community size, X: Standard score corresponding to the level of significance (0.95), equals (1.96), d: Percentage error, equals (0.05) and P: Equals (0.50)

2.2. Methods of Data Analyzing

The following analyzing methods have been used

- 1- Descriptive statistics to prepare the best indicators for social, economic, and agricultural characteristics.
- 2- Calculation of average profit through the following "(2)":

$$P = R - C \tag{2}$$

Whereas:

P = average profit (riyal/m²).

R = average revenues (riyal/m²).

C = average cost (riyal/m²).

- 3- Multiple Regression analysis is used to identify the most important factors affecting the production quantities of the date palm farmers in Al Ahsa Oasis. This could be done by applying the following "(3)":

$$LY = \alpha_1 + B_1 LX_1 + B_2 LX_2 + B_3 LX_3 + B_4 LX_4 + B_5 LX_5 + B_6 LX_6 + B_7 LX_7 \tag{3}$$

Whereas:

Y is production quantities (ton).

X₁, X₂, X₃, X₄, X₅, X₆, X₇ and α_1 represent production cost (riyal/m²), farm's area (m²), age, marital status, education level, family size and experience, respectively.

B₁, B₂, B₃, B₄, B₅, B₆ and B₇ are the coefficients of variables. All the variables were transferred to logarithm form.

- 4- Multiple Regression analysis is used to identify the most important factors affecting the profits of the date palm farmers in Al Ahsa Oasis. This could be done by applying the following "(4)":

$$P = \alpha_2 + b_1 LX_1 + b_2 LX_2 + b_3 LX_3 + b_4 LX_4 + b_5 LX_5 + b_6 LX_6 + b_8 LX_8 \tag{4}$$

Whereas:

P is profitability (riyal/m²).

X₁, X₂, X₃, X₄, X₅, X₆, X₈, and α_2 represent production cost (riyal/m²), farm's area (m²), age, marital status, education level, family size and production quantities, respectively.

b₁, b₂, b₃, b₄, b₅, b₆, b₈ and α_2 represent coefficients of variables.

- 5- Likert Scale was used to identify the obstacles faced by date palm farmers in Al Ahsa Oasis. Likert Scale used only two options of answers.

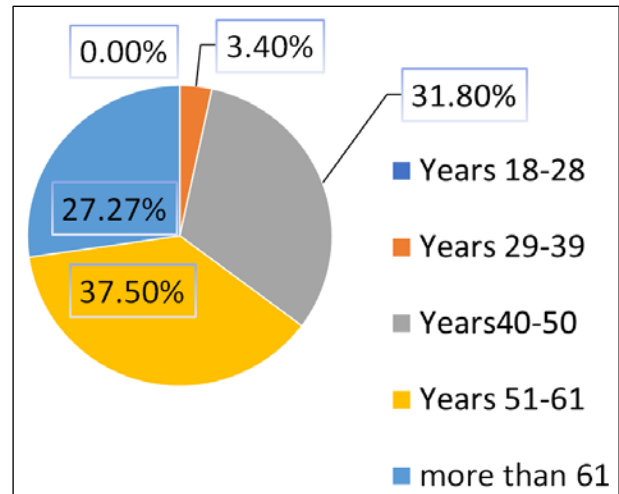
3. Results and Discussion

3.1. Results of Analyzing the Social and Economic Factors for Date Palm Farmers in Al Ahsa Oasis

This part indicates the results of analyzing the social and economic factors for date palm farmers in Al Ahsa Oasis.

3.1.1. Age

Figure 1 indicated that there is no age group for farmers between 18-28 years old, although the age group between 29-39 represented 3.40% which is a very low percentage compared to the age group 51-61 which is the majority with a percentage of 37%, followed by age group 40-50 years old with a percentage of 31.8% and the age group above 61 years old is 27.27%. These results show that the youth are unwilling to be farmers and have taken a direction toward other businesses. This result is different from the results of a previous study [8]. The study indicated that the majority of farmers in the economically active group are a percentage of 77% of the study sample.

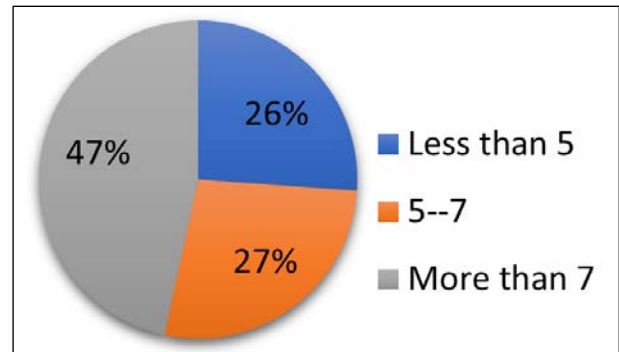


Source: Data were collected and manipulated

Figure 1. Age

3.1.2. Family Size

The results show that the majority of date palm farmers have more than 7 family members with a percentage of 46.59%, and 27.27% percent have family members of 5-7 people, but families with less than 5 people represent 26.14% (Figure 2). Results indicated that families are characterized by their large numbers. This result agrees with other results of a previous study [8]. Reference [8] shows that family sizes ranged from 5 to 10 members with a percentage of 78.7% of sample size.



Source: Data were collected and manipulated

Figure 2. Family size

3.1.3. Marital Status

Table 1 showed that the marital status data for date palm farmers clarified that the majority of farmers were married with a percentage of 95.4% followed in order by widowers with 2.27%, divorced, and single with a percentage of 1.14%. Results showed that the majority of the farmers are married, and this result agreed with the results of a previous study [8]. Reference [8] displays that the majority of farmers with a percentage of 86.7% belonging to the married category.

Table 1. Percentage of farmers’ marital status in Al Ahsa Oasis

Years of experience		
Variable	Repetition	Percentage
Less than 5 years	10	1.140%
From 5 to 10 years	15	17.05%
More than 10 years	72	81.82%
Total	88	100%

Source: Data were collected and manipulated

3.1.4. Years of Experience

Table 2 shows that the majority of date palm landholders in the Oasis have more than 10 years of experience with a percentage of 81.82%, those with experience from 5 to 10 years represent a percentage of 17.05%, and others with 5 years of experience or less are 1.14%.

Table 2. Percentage of farmers’ experience years in Al Ahsa Oasis

Marital status		
Variable	onRepetiti	Percentage
Single	10	1.140%
Married	84	95.45%
Divorced	10	1.140%
Widower	20	2.270%
Total	88	100%

Source: Data were collected and manipulated

3.1.5. Education Level

Table 3 indicated variation in the educational level for date palm farmers in Al Ahsa Oasis, as the percentages (25%, 20.45%, 19.32%, 14.77%, 11.36%, 6.82%, and 2.27%) represent illiterate, undergraduate, can read and write, secondary, primary, average education, and postgraduate, respectively. These results show that the majority of farmers are at the illiterate education level.

3.1.6. Annual Income

Table 4 indicated that the average annual income for date palm farmers in Al Ahsa Oasis is around 10000 riyals with a percentage of 48.86% of farmers who are the majority, followed by farmers with 10000 to 15000 riyals of income in a percentage of 19.32%. Farmers whose income is between 16000 to 20000 riyals are in an equal

percentage with those whose income is 21000 or more as they represent 15.91% of farmers.

Table 3. Percentage of farmers’ educational level in Al Ahsa Oasis

level Education		
Variable	Repetition	Percentage
illiterate	22	25.00%
Read and write	17	19.32%
Primary	10	11.36%
Intermediate	60	6.820%
Secondary	13	14.77%
Graduate	18	20.45%
Postgraduate	02	2.270%
Total	88	100%

Source: Data was collected and manipulated

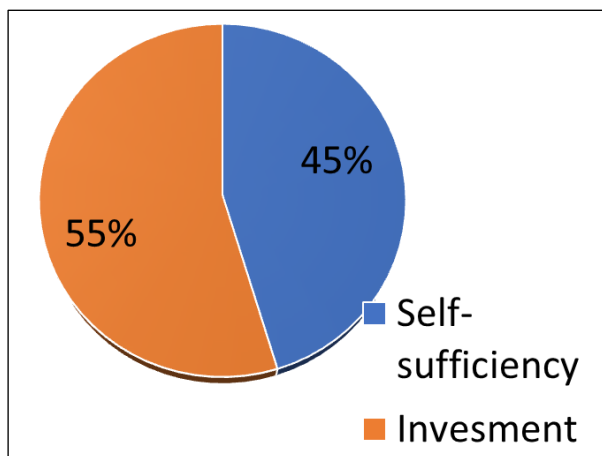
Table 4. Percentage of farmers’ annual income in Al Ahsa Oasis

Income (riyal/year)		
Variable	Repetition	Percentage
Less than 10000	43	48.86%
From 10000 to 15000	17	19.32%
From 16000 to 20000	14	15.91%
21000 and more	14	15.91%
Less than 10000	43	48.86%
Total	88	100%

Source: Data were collected and manipulated

3.1.7. Agriculture Goal

Figure 3 showed that 54.55% of date farmers were interested in investment, although 43.18% of farmers leaned towards self-sufficiency, and 02.27% of them had other goals such as gifting and others.

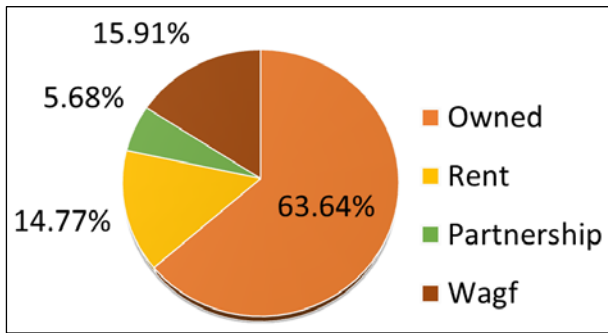


Source: Data were collected and manipulated

Figure 3. Goal of agriculture

3.1.8. Landholding Type

Results listed in Figure 4 show that percentages of 63.64%, 15.91%, 14.77%, and 5.68% of palm holdings are owned, endowment, rented, and partnerships, respectively. Results showed that the majority of landholdings are owned with a percentage of (63.64%). This result agrees with the previous study [8]. Reference [8] shows that 91.2% of farmers own the lands.

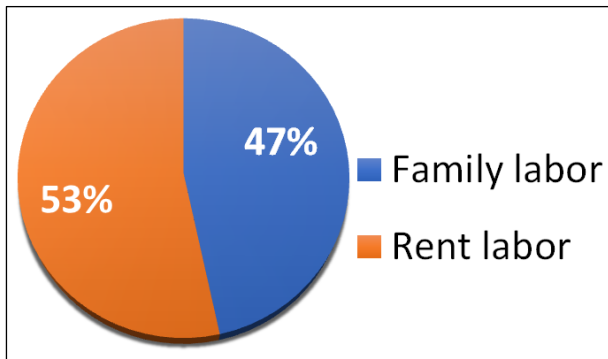


Source: Data were collected and manipulated

Figure 4. Holding types

3.1.9. Labor Types

Figure 5 addressed the type of labor for date palm landholdings in Al-Ahsa Oasis. It showed that hired labor was more than family labor with a low difference as the first labor type represented 53.40% and the second represented 46.59%.



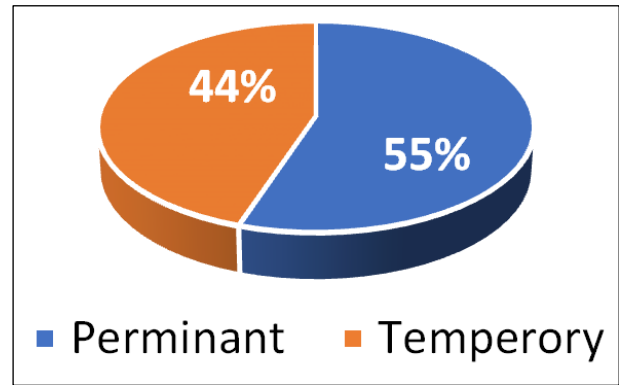
Source: Data were collected and manipulated

Figure 5. Labor types

3.1.10. Nature of Labors

The results indicated permanent employment in the Oasis landholdings which represented a large percentage of 54.54%, but it can also be noticed that the temporary employment percentage is not small which is 44.31% (Figure 6), and this is explained in the 4 phases that growing date palms go through, which are in the following order, planting, rotab production, tamer production, and the resting phase for preparation and readiness for the next season. Therefore the need for temporary employment

increases in the previously mentioned phases.



Source: Data were collected and manipulated

Figure 6. Nature of labor

3.1.11. Types of Used Fertilizer

Results in Table 5 showed that the majority of date palm farmers in Al Ahsa Oasis use organic fertilizer with a percentage of 55.68%, Results also showed that a percentage of 1.14% and 43.18% of the farmers use chemical fertilizer or both chemical fertilizer and organic fertilizer together, respectively.

Table 5. Percentage of farmers' types of used fertilizer in Al Ahsa Oasis

Education level		
Variable	Repetition	Percentage
Organic	49	55.68%
Chemical	10	1.140%
Organic and chemical	38	43.18%
Total	88	100%

Source: Data were collected and manipulated

3.1.12. Irrigation Methods

Table 6. Percentage of farmers' according to irrigation Methods in Al Ahsa Oasis

Irrigation methods		
Modern irrigation method	39	44.32%
Traditional irrigation method	32	36.36%
Modern and traditional irrigation methods	15	17.05%
Others	02	02.27%
Total	88	100%

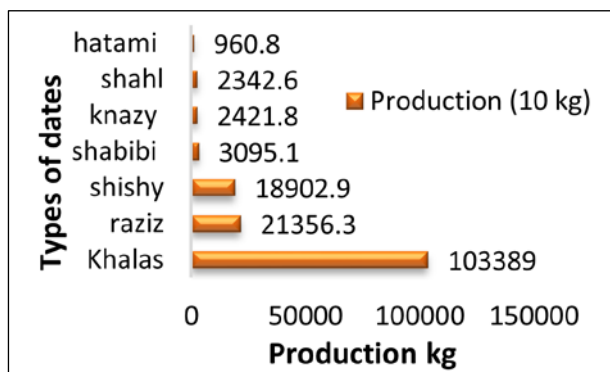
Source: Data were collected and manipulated

Results in Table 6 show that a percentage of 44.32% of date farmers use modern irrigation methods such as (sprinklers, dripping, and improved surface irrigation systems). Results also showed that a percentage of 36.36% use traditional irrigation methods, the most important of

which is surface irrigation, and that a percentage of 17.05% use both methods together (modern and traditional). Lastly, 2.27% use other methods. The results of this study agree with the results of a previous study [9] that the majority of farmers use modern irrigation methods.

3.2. Date Palm Types: Production, Percentage of Different Types of Products and the Number of Trees in Al Ahsa Oasis

Figure 7 indicated that Al Khalas dates represent the greatest date production in Al Ahsa Oasis, followed by Shishy dates, Al Shabibi dates, Al Khunaizi dates, All Shahl dates, Al Hatmi dates, and Al Waseele dates. Also, Tables 7a and 7b indicated that date types such as Al Duealij, Al Kabukaab, Al Khadaj, and Al Mihamahi were not present in the production quantities of the study sample. The Table shows that date production percentage among total production of various types is high compared to other date types (rotab) with around more than 90%. Al Khalas date trees are more than other types in Al Ahsa Oasis.



Source: Data were collected and calculated from field survey 2020

Figure 7. Total production (10 Kg) for different date types in Al Ahsa Oasis

Table 7a. Total production for different types of date types in Al Ahsa Oasis

Type of date palm	Production (kg)	Dry dates (kg)	rotab (kg)
Khalas	1033890	971160	62730
Raziz	213563	212280	1283
Shishy	189029	182472	6557
Shabibi	30951	30216	735
Knazy	24218	21120	3098
Shahl	23426	22080	1346
Hatami	9608	8768	840
Waseele	2037	1952	85
Duealij	0	0	0
Kabukaab	0	0	0
Khadaj	0	0	0
Mihamahi	0	0	0

Source: Data were collected and calculated from field survey 2020

Table 7b. Number of trees and % of production (Different types of date palms in Al Ahsa Oasis)

Type of date palm	Number of trees	% of dry dates to total production	% of rotab total production
Khalas	10776	94%	6%
Raziz	4758	99%	1
Shishy	1274	97	4
Shabibi	253	98	2
Knazy	300	87	15
Shahl	181	94	6
Hatami	134	91	10
Waseele	17	96	4
Duealij	0	0	0
Kabukaab	0	0	0
Khadaj	0	0	0
Mihamahi	0	0	0

Source: Data were collected and calculated from field survey 2020

3.3. Factor Affecting Date Production in Al Ahsa Oasis

Different scenarios were conducted to pick the appropriate model. Table 8 showed multiple regression analysis results. The Table disclosed the most important factors affecting the production of the date palms in Al Ahsa Oasis. Production represents the dependent variable and production cost (Riyal), farm area, age, marital status, education level, family size and experience years as independents variables.

Table 8. Factors affecting date production in Al Ahsa Oasis

Variable (all variables in logarithm form)	Coefficient	t-statistic	Prob.
Production cost (X ₁)	0.175	10810	0.074
Area (X ₂)	0.762	7.102	0.000
Age (X ₃)	-0.064	-0.484	0.630
Marital status (X ₄)	-0.192	-0.659	0.512
Education level (X ₅)	0.009	0.169	0.866
Family Size (X ₆)	0.085	0.615	0.540
Experience (X ₇)	0.093	0.387	0.700
Constant (a ₁)	0.702	0.608	0.545

R-squared = 0.52 Adjusted R-squared = 0.48
 F-statistic= 12.135 Prob. (F-statistic) = 0.000
 Durbin Watson (Autocorrelation)= 1.8

Source: Data were collected and calculated from field survey 2020

$$LY = 0.702 + 0.175 LX_1 + 0.762 LX_2 - 0.064 LX_3 - 0.192 X_4 + 0.009 X_5 + 0.085 X_6 + 0.093 X_7 \quad (5)$$

From the Table R-square value showed that 52% of the variations in production are explained by the independent's variables. The value of F-statistics proves a highly

significant level for the model. It is concluded that the independent variables are jointly essential in explaining the variation of production. Also, the Table illustrates that the coefficients of production cost and farm area are positive and highly significant in explaining the variability of the production. Reference to these results, one percentage increase in production cost will increase production by 18%, and this result coincided with heretical notation. In addition, the results showed that the age, marital status, education level, family size and experience have statistical insignificant effect on production "(5)":

3.4. Calculation Results of Average Profit

Profit calculation results have indicated that the average revenues (R) equal 0.269 (Riyal\m²), and average cost (C) equals 0.012 (Riyal\m²). Using "Equation (4)", it was found that the average profit (P) equals 0.257 (Riyal\m²) "(6)":

$$P = 0.269 - 0.012 = 0.257 \text{Riyal} \quad (6)$$

3.5. Factors Affecting the Profit of Date Palm Farmers in Al Ahsa Oasis (results of multiple regression analysis)

Table 9. Factors affecting farmers' profit in Al Ahsa Oasis

Variable	Coefficient	t-statistic	Prob.
Production cost (X ₁)	-0.854	-3.191	0.002
Area (X ₂)	4.513	8.419	.000
Age (X ₃)	572.506	.107	.915
Marital status (X ₄)	-11048.209	-.937	.351
Education level (X ₅)	-2180.387	-1.003	.319
Family Size (X ₆)	-6556.199	-1.187	.239
Production (X ₈)	.561	3.831	0.000
Constant (a ₂)	13398.404	.635	.527

R-squared = 0.68 Adjusted R-squared = 0.65
 F-statistic= 23.706 Prob. (F-statistic) = 0.000
 Durbin Watson (Autocorrelation)= 2.492

Source: Data were collected and calculated from field survey 2020

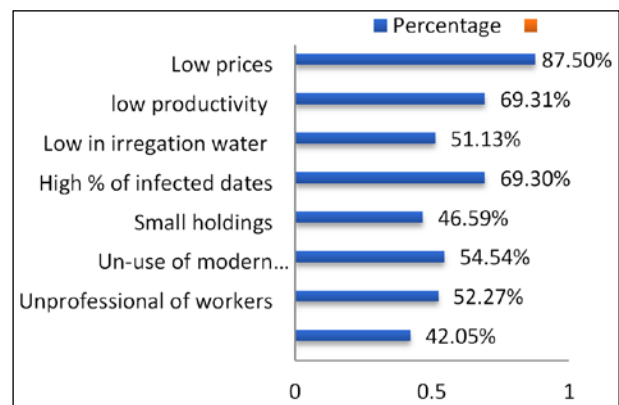
$$P = 13398.404 - 0.854 X_1 + 4.513 X_2 + 572.506 X_3 - 11048.209 X_4 - 2180.387 X_5 - 6556.199 X_6 + 0.561 X_8 \quad (7)$$

Table 9 presented the appropriate model that was picked after different scenarios. The results showed that the value of R² equals 68%, meaning that 68% of the dependent variable change is explained by the independent variables' change, whereas 32% of the changes may be traced back to unknown variables. The value of F-statistics verifies a highly significant level for the model, concluding that the independent variables are together crucial in explaining the variation in profit. Production cost, area and date production (independent variables) are statistically and

highly significant in explaining the variability of profit at 1% level of significant. Based on the result, one riyal increase in production cost will decrease profit by 0.85 riyal "Equation (6)", concluding that there is considerable amount of production which is not marketed (gift). This result is supported by previous study [14]. Emam, et al. [14] found that date is negative and highly significant in explaining the unpredictability of the agricultural growth of domestic products. Also, the results showed that as farm area (m²) and production quantities (ton) increase by one unit, it leads to increasing profit by 4.51 riyal and 0.56 riyal, respectively "(7)". The rest of independent variables (farm age, marital status, education level and farm family size) are insignificant in explaining the variability of profit (dependent variable).

3.6. Obstacles Faced by Date Palm Farmers in Al Ahsa Oasis

Figure 8 shows the obstacles faced by date palm farmers in Al Ahsa Oasis. The reduction of product prices in a percentage of 87.50% is considered one of the most important obstacles, followed by low productivity and increase of infected dates with a percentage of 69.30%. This result agrees with - low productivity and low prices- the previous study [11]. Results also showed that other obstacles are represented in failure to use modern technology in a percentage of 54.54%, non- availability of workforce in a percentage of 52.27%, then comes in last lack of water required for agriculture in a percentage of 51.13%.



Source: Data were collected and calculated from field survey, 2020

Figure 8. Obstacles faced by date palm farmers in Al-Ahsa Oasis

4. Conclusions and Recommendations

The study focused on knowing the factors affecting the production of dates and profits for farmers of date palm holdings in the Al-Ahsa Oasis in the Kingdom of Saudi Arabia for the season 2020/2021 as a main objective. The sub-objectives were to study the social and economic

characteristics of date palm farmers, the most important factors affecting production and profitability of date palm farmers in the Al-Ahsa Oasis, and knowledge of the obstacles faced by farmers. The study relied mainly on preliminary information, which was collected through a questionnaire. Data was analyzed through descriptive statistics for economic and social variables, regression analysis, and Likert scale. The results of the study showed that farmers aged 51-61 years are the majority with a percentage of 37%, most of them are married with a percentage of 95.4%, and most of them are illiterate with a percentage of 20.45%, and the majority of date palm farmers (46.59%) whose family members are more than 7 members, and they have more than 10 years of experience at a rate of 81.82%, and their annual income is about 10,000 riyals, representing 48.86%.

The results also showed that the majority of holdings are owned (63.64%), and 54.55% of farmers aim to invest in agriculture. The type of employment (rented) constituted the majority at 53.40%, and the majority of date farmers in Al-Ahsa Oasis with 55.68% use organic fertilizers, and 44.32% of the date farmers use modern irrigation methods. As for the results of the multiple regression analysis, production costs and holding area have a positive and significant effect on production (dependent variable) at significant levels of 10% and 1%, respectively. If production costs increase by 1%, production increases by about 18%. Likewise, if the holding area increases by about 1%, the production will increase by about 76%. The results of multiple regression analysis found out the factors affecting the profitability of date palm farmers in the Al-Ahsa Oasis, where the results indicated that the value of R² is 68%. This means that 68% of the change in the dependent variable is explained by the change in the independent variables, and 32% can be attributed to unknown variables. The results showed that the statistical value of F (23.706) was significant at the 1% level of significance, explaining the effect of the independent variables combined on the dependent variable (profits). The results also showed that the value of Durbin Watson (1.8) shows that there is no autocorrelation between errors of the regression model. The independent variables (production costs, farm area and production) are statistically significant, and at a significant level of 1%. If production costs increase by one riyal, the profit decreases by 0.85 riyals. Also, if the area of the farm increases by 1 m², the profit increases by 4.51 riyals. The results also indicate that an increase in production by one kilogram leads to an increase in profit by 0.56 riyals. Among the most important obstacles faced by farmers are the lack of productivity, the high percentage of spoilage, and the low prices. The study recommended the introduction of modern technologies and the use of skilled labor that would increase profitability and encourage exports, with the aim of raising local prices and reducing spoilage by encouraging the manufacture of dates. The study also recommended working on increasing the profitability of

the date palm cultivators by increasing the cultivated area and using skilled and trained labor.

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REFERENCES

- [1] Ministry of Economy and Planning, "The 9th Development Plan, Kingdom of Saudi Arabia," 2017.
- [2] Aleid, S. M., Al-Khayri, J. M., & Al-Bahrany, A. M. (2015). "Date palm status and perspective in Saudi Arabia," In *Date Palm genetic resources and utilization*, Springer, Dordrecht, 2015, pp. 49-95 https://link.springer.com/chapter/10.1007/978-94-017-9707-8_3
- [3] FAO. 2022. <https://www.fao.org/faostat/ar/#data/QCL> (Accessed Sep. 20, 2022).
- [4] Elfeky, A., & J. Elfaki, "A Review: Date Palm Irrigation Methods and Water Resources in the Kingdom of Saudi Arabia," *Journal of Engineering Research and Reports*, 2019, <https://doi.org/10.9734/jerr/2019/v9i217012>
- [5] Rahman, S., Begum, I. A., M. J. Alam, "Livestock in Bangladesh: distribution, growth, performance and Potential," *Livestock Research for Rural Development*, vol.26, no. 10, pp. 233-238, 2014
- [6] UNESCO. (2018). <https://www.unesco.org/ar> (accessed March 20, 2022).
- [7] Hayati, O. A. A., A. A. Omer, "Effects of the fragmentation of agricultural holdings in the Al-Ahsa Oasis," *King Abdulaziz House*, vol. 39, no. 2, pp. 117-153, 2013 [in Arabic]
- [8] Al-Amin, A., F. Bahja, "The economic and social importance of date production in the Nile River State, a case study of the Abu Hamad area," *Doctoral dissertation*, 2016 [in Arabic]
- [9] Al-Rasoul, A. A., I. S. Al-Omar, "Analytical economic study of the efficiency of the use of water resources in irrigation - a field study in the Qassim region farms," *Journal of King Saud University for Agricultural Sciences*, Vol. 24, No. 1, pp.39-70, 2012 [in Arabic]
- [10] Al-Mubarak, H. A., Z. R. M. Al-Haji, "Urban sprawl on agricultural areas and its environmental effects in Al-Ahsa Governorate using remote sensing technology and geographic information systems," *Faculty of Arts Research Journal. Menoufia University*, vol. 30, no.117, pp. 2213-2240, 2019 [in Arabic]
- [11] Ali, H., F. B. Ali, "Reality of The Dates Production in Iraq Challenges and Prospects for Development: Economic Analytical Study," *Al Kut Journal of Economics and*

Administrative Sciences, vol.1, no. 20, pp. 4-24, 2015 [In Arabic language]

[12] Alsayd, M. A., "An economic study of the date palm production system in North Sinai Governorate," Journal of Agricultural Economics and Social Sciences, vol.10, no. 5, pp. 285-293, 2019 [in Arabic]

[13] Krejcie, R. V., D. W. Morgan, "Determining sample size for

research activities," Educational and psychological measurement, vol. 30, no. 3, pp. 607-610, 1970
<https://doi.org/10.1177/001316447003000308>

[14] Emam, A. A., Abass, A. S., Elmulthum, N. A., M. Elrasheed, "Status and prospects of agricultural growth domestic product in the kingdom of Saudi Arabia," Sage Open Journal, vol.11, no. 1, pp. 1-10, 2021
<https://doi.org/10.1177/21582440211005451>