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Adoption of palm tree cultivation techniques by farmers in Anbar Province: Iraq

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Abstract

This study aimed to identify the level of adoption of modern agricultural techniques in palm tree cultivation by farmers in Anbar Province. The study sample consisted of 345 farmers who were randomly selected from different areas of the province. The results showed that the majority of farmers belong to the middle age group and have a good level of education, but most of their orchards are small in size. There was also an acceptable level of awareness of commercial and local varieties, but adherence to some basic practices such as timely pollination and grafting remained limited, along with continued reliance on traditional irrigation at a high rate despite a gradual shift towards drip irrigation. On the other hand, farmers showed good adherence to irrigation during critical periods and after harvest, as well as high adherence to recommended cultivation methods. The results also showed a marked improvement in the use of organic fertilizers, and the study recommended the need to intensify practical extension programs to address weaknesses and support farmers with modern irrigation techniques and mechanical harvesting tools.

Keywords: Modern techniques, adoption, palm cultivation

Introduction

Introduction and research problem

The agricultural sector in Iraq is one of the most important economic and social sectors that form a main pillar for the country's stability and development. Iraq has a long history in agriculture1, as it was considered one of the most prominent agricultural regions in the area thanks to the diversity of agricultural crops that were grown there, from grains and vegetables to fruits and palm trees [2]. Despite the challenges it faces, the agricultural sector in Iraq continues to play a vital role in providing food security and achieving self-sufficiency in many agricultural products [3]. The agricultural sector in Iraq accounts for about 20% of the gross domestic product [4]. Agricultural development is one of the most important pillars for the development of the economies of countries around the world, especially developing countries, given the important position of the agricultural sector in their national economies [5] and its direct link to their food security, in addition to its direct role in rural development and the achievement of economic, social, and cultural transformations in large areas of those countries [6]. Date palm trees (*Phoenix dactylifera*) are one of the most important and oldest fruit trees, as they are of great economic importance [7]. It is believed that date palm trees originated in Mesopotamia (Iraq) more than 6,000 years [8]. Palm trees are characterized by their high productivity, low production costs, and high nutritional value of their fruits when compared to other crops. The desert environment in the Arab countries is one of the most suitable environments for palm tree growth [9]. Dates are considered a fruit with high nutritional value, as they are rich in many nutrients that promote good health. [10]. Palm cultivation is widespread in hot, dry, and semi-dry areas between latitudes 15-30 north of the equator. Iraq is one of the most important areas of cultivation in the world, with 32 million palm trees [11]. Anbar Governorate in Iraq is one of the agricultural regions with distinctive natural resources, where palm cultivation is widespread and forms an essential part of the region's agricultural and economic heritage [12]. Dates are considered a strategic agricultural product that contributes to supporting the local economy and provides extensive employment opportunities in rural communities in the governorate [13].

One of the most significant factors affecting palm production in Anbar province, as in other provinces, is pests and diseases. The spread of the red palm weevil, for example, has caused serious damage to palm trees, affecting production quality. Water shortages and irregular irrigation also have a negative impact on palm health, especially [14] in dry areas. Climate change, such as rising temperatures and drought, increases the stress on palm trees, leading to lower production. In addition, poor farm management and the use of traditional agricultural techniques have reduced the productivity of palm trees. Economic factors such as high farming costs, lack of government support, and poor marketing affect farmers' ability to invest in improving production. Therefore, attention to integrated pest management, improved irrigation methods, and support for farmers can contribute to the sustainable enhancement of date production [15]. The palm cultivation sector in Anbar province, as in the rest of Iraq's provinces, has seen a significant decline in date production in recent years. This is due to several factors, most notably the lack of attention to agricultural infrastructure, such as modern irrigation

systems, and water scarcity, which affects tree growth [16]. The deterioration of agricultural land due to traditional practices and the absence of modern agricultural technology have also contributed to the decline in production. In addition, many farmers face challenges in combating pests and diseases that affect the health of palm trees. This decline in production threatens Iraq's position as one of the world's largest date producers [17].

Area of the study

Anbar province was selected for this research, including all its areas from Fallujah in the east to Rutba in the west and from Rawa in the north to Al-Nukhayb in the south. The province is bordered by Nineveh province to the north, Najaf province to the south, Baghdad, Babil, and Karbala provinces to the east, and the Kingdom of Jordan to the west, as shown in the image (Administrative Map of Anbar). [18], the total area suitable for agriculture in Anbar Province is 138,288 dunams, and the area planted with palm trees is 27,196 dunams, constituting 20% of the agricultural area of Anbar Province.

Research community

The research community included all palm grove owners within the agricultural divisions affiliated with the Anbar Agriculture Directorate, numbering 12,842 farmers distributed across the agricultural divisions in Anbar province. To calculate a research sample representative of the total community, the Stigman-Thompson equation was used, with a sample size of 345 respondents representing 2.68% of the study population.

Data collection tool

A questionnaire was used to collect data and information related to this study. The questionnaire was designed to be administered directly to farmers and included a set of basic topics covering various aspects of the adoption of palm tree cultivation techniques. The questions covered the following areas orchard planning, seedling cultivation methods, grafting, pollination, irrigation, and fertilization, with the aim of obtaining accurate and comprehensive data reflecting the actual level of adoption of agricultural recommendations for each area, in line with the objectives and problem of the research.

Results and Discussion

1.1. Age: Table (1) shows that (41.4%) of farmers are in the age group (39-56), while (33%) are in the age group (21-38). The remaining farmers (25.6%) are in the 57-75 age group. Many previous studies have shown that age plays a significant role in the adoption of new agricultural technologies, as younger farmers are always more inclined to adopt agricultural innovations than older farmers.

Table 1: Distribution of farmers by age group

T	Age	Frequency	Percentage	Average age
1	(21-38) years	114	33.0	32.75
2	(39-56) years	143	41.4	47.18
3	(57-75) years	88	25.6	63.93
Total		345	100	Sd=12.72

1.2. Educational level

Table (2) shows that most farmers are educated (76.5%), while 18.3% have completed primary school and the rest (5.2%) are illiterate. Many studies have shown that the educational level of farmers plays a positive role in their adoption of agricultural innovations.

Table 2: Distribution of farmers by educational level

T	Educational level	Frequency	Percentage
1	Mother	18	5.2
2	Elementary	63	18.3
3	Secondary	65	18.8
4	Preparatory	57	16.5
5	Institute	43	12.5
6	College	71	20.6
7	Higher	28	8.1
Total		345	100

1.3. Palm grove area

The results in Table 3 show that most of the orchards (83.3%) fall into the first category of small area, followed by the medium area category (12.8%) and then the large area category (2.9%).

Table 3: Distribution of farmers by orchard area

T	Number of individuals	Frequency	Percentage	Average
1	Small (1-9) Dunam	291	84.3	3.25
2	Medium (10-18) dunums	44	12.8	12.11
3	Large (19-28) dunams	10	2.9	23.20
Total		345	100	Sd=4.79

1.4. Type: Table (4) shows that the majority of farmers are men (93%), while female farmers account for 7%.

Table 4: Distribution of farmers by gender

T	Gender	Frequency	Percentage
1	Male	321	93.0
2	Female	24	7.0
Total		345	100

1.5. Farmers' knowledge of the best commercial palm varieties

Table (5) shows that the highest percentage of farmers (62%) know the best commercial palm varieties according to agricultural research recommendations, while the remaining 38% are unable to identify or recognize the best commercial palm varieties.

Table 5: Distribution of farmers according to their knowledge of the best commercial palm varieties

T	Knowledge categories	Frequency	%	Average
1	Known	214	62.0	0.61
2	Don't know	131	38.0	
Total		213	100	Sd=0.48

1.6. Respondents' knowledge of local palm varieties

Table (6) shows that 51% of farmers are familiar with local palm varieties according to agricultural research recommendations, while 49% are not familiar with them.

Table 6: Distribution of farmers according to their knowledge of local palm varieties

T	Knowledge categories	Frequency	%	Average
1	Known	176	51.0	0.51
2	Don't know	169	49	
Total		345	100	Sd=0.50

1.7. Application of irrigation method used

Table (7) shows that 35.6% of farmers use sprinkler irrigation to irrigate trees, while 29.7% use drip irrigation and 34.7% use both methods. According to agricultural research recommendations

Table 7: Distribution of farmers according to their application of the irrigation method used

T	Knowledge categories	Frequency	%	Average
1	Christian	123	35.6	0.61
2	Droplet	102	29.7	
3	Both types	120	34.7	
Total		345	100	Sd=0.49

1.8. Farming method used

The results in Table 8 show that the majority of farmers (89.6%) used the cultivation method recommended by agricultural research in order to provide sufficient and regular space between palm trees for growth and spread of fronds without interference between trees and to allow light to enter between trees. while the rest (10.4%) did not do so.

Table 8: Distribution of farmers according to the farming method used

T	Categories	Frequency	%	Average
1	Applied	309	89.6	0.89
2	Not applied	36	10.4	
Total		345	100	Sd=0.30

1.9. Appropriate timing for grafting

Table (9) shows that 52.8% of farmers did not graft at the appropriate time as recommended by agricultural research to avoid grafting during the flowering or fruit setting period, while 47.2% grafted at the appropriate time as recommended by agricultural research.

Table 9: Distribution of farmers according to the appropriate timing of grafting

T	Application categories	Frequency	%	Average
1	Applied	163	47.2	0.47
2	Not applied	182	52.8	
Total		345	100	Sd=0.49

1.10. Appropriate timing for pollination:

Table (10) shows that most farmers (67%) did not adhere to the appropriate timing for re-pollination as recommended by agricultural research, while 33% adhered to this recommendation.

Table 10: Distribution of farmers according to the appropriate timing for pollination

T	Application categories	Frequency	%	Average
1	Applied	114	33.0	0.33
2	Not applied	231	67.0	
Total		345	100	Sd=0.47

1.11. Number of times organic fertilizer is applied during the year

The results in Table (11) show that the majority of farmers (60.6%) add organic fertilizer according to the number of times recommended per year by agricultural research, while 39.4% did not follow this recommendation.

Table 11: Distribution of farmers according to the number of times organic fertilization is applied during the year

T	Application categories	Frequency	%	Average
1	Applied	209	60.6	0.60
2	Not applied	136	39.4	
Total		345	100	Sd=0.48

1.12 Time of pruning

Table (12) shows that only 38.8% of farmers prune at the time recommended by agricultural research, while the majority (61.2%) do not follow this recommendation.

Table 12: Distribution of farmers according to pruning time

T	Application categories	Frequency	%	Average
1	Applied	134	38.8	0.38
2	Not applied	211	61.2	
Total		345	100	Sd=0.48

1.13. Spraying trees with fungicides and insecticides to prevent palm weevils

Table (13) shows that the majority of farmers (77.4%) spray palm trees with fungicides and insecticides to prevent palm weevils, as recommended by agricultural research, and (21.4%) do so to some extent, while the rest (1.2%) do not follow this recommendation.

Table 13: Distribution of farmers according to spraying trees with fungicides and insecticides to prevent palm weevils

T	Application categories	Frequency	%	Average
1	Applied	267	77.4	1.76
2	Applied to some extent	74	21.4	
3	Not applied	4	1.2	
Total		345	100%	Sd=0.45

1.14. The right time to thin the fruit

Table (14) shows that the majority of farmers (71.3%) did not adhere to the recommended timing for fruit thinning according to agricultural research recommendations, while the rest (28.7%) did adhere to it.

Table 14: Distribution of farmers according to the appropriate time for thinning fruit

T	Application categories	Frequency	%	Average
1	Applied	99	28.7	0.28
2	Not applied	246	71.3	
Total		345	100	Sd=0.45

1.15. Method used for harvesting fruit

Table (4.21) shows that the majority of farmers (75.1%) use traditional manual harvesting methods, while 24.9% use modern techniques recommended by agricultural research.

Table 15: Distribution of farmers according to the method used to harvest fruit

T	Harvesting application categories	Frequency	%	Average
1	Use of modern technologies	86	24.9	0.75
2	Manual harvesting	259	75.1	
Total		345	100	Sd=0.43

Conclusion and Recommendations

From this study, we conclude that palm farmers in Anbar have relatively good levels of education, but most of their orchards are small in size. and there is a clear disparity in their adoption of agricultural recommendations, as they adhered to recommended cultivation and preventive spraying, while adherence was weak in pollination, pruning, and fruit thinning., the study recommends intensifying practical extension programs to address weaknesses, supporting farmers with modern irrigation techniques and mechanical harvesting tools, establishing demonstration fields, and involving rural women to promote the adoption of recommended practices and achieve sustainable agricultural development.

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