

Full Length Research Paper

A study on the economic feasibility of date palm cultivation in the Al-Hassa Oasis of Saudi Arabia

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The Kingdom of Saudi Arabia with an estimated 25 million date palms (*Phoenix dactylifera* L.) produces nearly a million tones of dates annually accounting for about 15% of the global date production. Our study on the economic feasibility of date palm cultivation in the Al-Hassa oasis of the Kingdom estimated the average annual yield of dates per palm to be 48.0 kg per palm with a selling price estimated at SR 4.00 per kg. The net income from date palm cultivation in the oasis was found to be SR 5800.00 / ha (SR 38.67 / palm). Significant number of farmers (23.00%) sell their produce in the farm itself, of which 57% is to known customers indicating sizeable “farmer-consumer” loyalty. Date palm farmers of Al-Hassa were also found to be quality conscious, and they adopt diverse measures (pre to post harvest) to ensure quality production of dates. SWOT analysis indicated spiritual attachment to the land by the farmers as a strength of the system, however; bureaucratic hurdles to obtain subsidies and lack of exploitation of facilities by traditional farmers, is a major threat to date farming in the oasis. There also exists a good possibility to develop logistics that support marketing of dates, especially through agricultural cooperatives, besides further enhancing exploitation of state subsidies for date palm cultivation.

Key words: Date palm cultivation, economic feasibility, marketing, SWOT analysis, Saudi Arabia.

INTRODUCTION

The date palm, *Phoenix dactylifera* L., is the main fruit crop of the Kingdom of Saudi Arabia (KSA), covering approximately 72% of the total area under permanent crops. With an estimated 25 million date, the Kingdom produces nearly a million tons annually accounting for about 15% of the global production. More than 400 different date palm cultivars are reported to exist in Saudi Arabia (Anonymous, 2006a; Anonymous, 2009). The date palm is a multipurpose tree, providing food, shelter, timber products. The date fruit is a good source of food providing, fibre, carbohydrates, minerals and vitamins besides having anti-mutagenic and anti-carcinogenic properties (Baloch et al., 2006; Al-Farsi et al., 2005; Ishurd and Kennedy, 2005; Vayalill, 2002; Mohamed, 2000). With an estimated three million palms the Al-Hassa oasis in the Eastern Province is the largest in the

Kingdom where El-Baker (1952) listed 15 date palm varieties of commercial importance, while Asif et al. (1982) listed 25 cultivars from the Al-Hassa oasis. Further, Asif et al. (1986) grouped the Al-Hassa date palm cultivars based on the season of production. Khalas a mid-season cultivar is widely cultivated in the Al-Hassa oasis and considered by many as the best date in the world, with mostly medium to big sized fruits that are consumed as both fresh (*rutab*) and dry (*tamar*) dates which store well. Although the date cultivar Reziz has traditionally been the ruling date palm cultivar in Al-Hassa, currently the cultivar Khalas is cultivated in more than 50% of the area (Al -Khatib et al., 2006; Al-Malha and Hussein, 2003).

Despite surplus production of dates in the Kingdom, marketing of the produce at the national level has been weak, which may have been influenced by the closing of some date processing factories in the Kingdom, besides exports have not been to the expected level. Also, the per capita consumption of dates in the Kingdom has

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Table 1. Estimates on cost of cultivation, production and price of produce of dates in the Al-Hassa oasis in Saudi Arabia

| | Size of plantation (m ²) | No. of palms | Depreciation of fixed assets (SR) | Cost of production (SR) | Total cost with depreciation (SR) | |
|--|--------------------------------------|--------------|-----------------------------------|-------------------------|-----------------------------------|------------------------|
| A. Estimates on cost of cultivation | | | | | | |
| Total | 754200 | 9889 | 3427937 | 1175155 | 4603092 | N= 30 |
| Mean | 25140 | 330 | 114265 | 39172 | 153436 | |
| | Size of plantation (m ²) | No. of palms | Value of produce sold (SR) | Production (kg) | Yield per palm (kg) | Mean price per kg (SR) |
| B. Estimates on production and price of produce | | | | | | |
| Total | 754200 | 9889 | 2029410 | 440790 | 1451 | 129.00 |
| Mean | 25140 | 330 | 67647 | 14693 | 48.38 | 4.00 |

Table 2. Cost of cultivation and income (per hectare and per palm) from date palm in Al-Hassa oasis of Saudi Arabia (2009).

| Cost / Income | Per hectare(SR) | Per palm (SR) |
|---------------|------------------|---------------|
| Fixed cost | 5193.86 | 34.63 |
| Variable cost | 17805.48 | 118.70 |
| Total cost | 23000.00 | 153.33 |
| Income | 28800.00 | 192.00 |
| Net income | 5800.00 | 38.67 |

significantly decreased over the years while the production has increased. This has impacted production of dates negatively, in spite of all support from the Government. The Kingdom currently has 64 date processing factories (Anonymous, 2006b, Anonymous, 2006c; Anonymous, 2009b; Al- Shuaiby and Ismael, 2007). The objective of this investigation is therefore to study the economic feasibility of date palm production in the Kingdom, by determining the cost of production and net income generated from the cultivation of date palm in 1 ha in the Al-Hassa oasis. This was achieved by carrying out economic analysis of descriptive and quantitative variables that influence date palm cultivation, through field surveys (questionnaires), analyzing Ministry of Agriculture, KSA data and taking up SWOT analysis to determine the strengths, weaknesses, opportunities and threats of date cultivation.

MATERIALS AND METHODS

Primary data on the cultivation of date palm in the Al-Hassa oasis was collected in the field through personal interviews of both farmers (producers) and also from the market (traders) that answered questions in a questionnaire prepared for the purpose. In the first model, questions pertaining to both fixed and variable costs were addressed and were based on an average of 150 palms per ha and the average annual production of dates per palm was estimated to be 48.0 kg. The selling price of 1 kg dates was estimated to be SR 4.00 per kg. In all, 30 respondents were interviewed in

different locations of Al-Hassa to gather basic data pertaining to the cost of cultivation, production and income from date plantation. Data collected for this study is presented in Table 1.

In the second model, the questionnaire of seven questions revolved around agricultural practices namely pest control, sorting of produce, storage of dates etc. that influenced the quality of dates. The fixed and variable costs were computed based on the formulae presented in Table 6. Further, some other formulae are:

Income per ha = Number of palms per ha x Average production per palm x selling price per kg of dates.

Net income per ha = Income per ha - Cost of production per ha.

Subsequently, based on the findings SWOT analysis was carried out to identify the strengths, weaknesses, opportunities and threats pertaining to the economic feasibility of the cultivation of dates in the Al-Hassa oasis.

RESULTS

Cost of cultivation and income

Data presented in Table 2 reveals that the cost of cultivating date palm in Al-Hassa was estimated to be SR23000.00/ha (SR 153.33/palm) which includes the fixed (SR 5193/ha) and variable costs (SR 17805/ha). The income generated was estimated to be SR 28800.00/ha (SR 192.00/palm). The net income from cultivating date palm in Al-Hassa was therefore SR

Table 3. Method of selling the produce (dates) in Al-Hassa oasis of Saudi Arabia.

| Method of selling dates | Percent of over all sale |
|-------------------------|--------------------------|
| In farm | 23.00 |
| In the market | 40.00 |
| Directly to factory | 37.00 |

5800.00/ha (SR 38.67/palm).

Marketing of dates

In Al-Hassa, date palm farmers were found to market their produce in three different ways (Table 3) ranging from disposing the produce directly in the farm (23%) to selling dates in the market (40%) and factories (37%). It is pertinent to mention that a sizeable number of farmers (57%) who sell the produce in the farm, sold dates to known customers, indicating a great degree of customer loyalty probably due to the quality of the produce.

Quality enhancing practices

Table 4 indicates that 100% of the date palm farmers studied were quality conscious and took care to incorporate measures in their farming practices (pre and post harvest) to enhance and safe guard the quality of their produce. Majority of the farmers (57%) practiced thinning of fruits. This practice is known to increase the fruit size and also prevent shriveling of dates. Results presented in Table 5 also reveal that 100.00% of the farmers discarded defective fruits from their produce thereby enhancing quality of the produce. However, only 20.00% of the respondents practiced sorting of dates according to fruit size. Further, 73.00% of the farmers in this study used chemicals (sulphur) for combating the menace of mites, *Oligonychus afrasiaticus* attacking date fruits. Table 4 also shows that 100.00% of the date palm farmers in Al-Hassa used a plastic film on the ground while harvesting, thereby preventing damage to the harvested dates and accumulation of foreign particles (sand, palm refuge etc) in the produce. However, none of the farmers practiced fumigation of produce to combat the menace of insect pests in stored dates.

Strengths, weaknesses, opportunities and threats of date production

Analyzing the strengths, weaknesses, opportunities and threats (SWOT) is fundamental to the success and profitability of any commercial venture and is a valuable tool in strategic planning for the future. Our study (Table 5) revealed that the date palm farmers are spiritually attached to their land/farm which is a significant strength

of the system. However, children of the farmers do not have such an attachment which is a weakness that may hamper date palm cultivation in the oasis in the future. Diverse markets to sell the produce with good infrastructure and Government support for date cultivation is a significant strength of date cultivation in the Al Hassa oasis. However, poor relationship between the farms and date processing factories and poor exploitation of facilities/in fracture to enhance production and marketing of dates is a weakness.

Although, the date cultivar Khalas is popular and suitable for cultivation in the oasis, relying on a single cultivar can pose a challenge in the future as a monoculture system of farming can pre-dispose date cultivation to attack and quick spread of pests and diseases in the future. Further, we found that there exists a good possibility to develop logistics that support marketing of dates, especially through agricultural cooperatives, besides the possibility of further enhancing exploitation of state subsidies for date palm cultivation. However, bureaucratic hurdles to obtain subsidies and lack of exploitation of facilities by traditional farmers were found to be a threat to date cultivation in the Al Hassa oasis (Table 5).

DISCUSSION

The Ministry of Agriculture, Kingdom of Saudi Arabia has estimated the cost of cultivation of date palm in Saudi Arabia to be SR 15179.90/ha on the basis of a study taken up in 13 regions of the Kingdom (Anonymous, 2006a) which includes both the fixed and variable costs. However, our study has revealed that the total cost of cultivation to be SR 23,000/ha in Al-Hassa in 2009. This increase in the cost of production can be attributed to the rise in the cost of several production factors including men and material during the last five years. The net annual income per hectare of date palm was estimated to be SR 39,436 by the Ministry of Agriculture, Kingdom of Saudi Arabia (Anonymous, 2006a). In contrast, our study indicates a fall (26.90 5) in the net income from 1 ha of date palm, which was estimated to be SR 28,800. This decrease in the net income is due to several factors including increase in production, low storage capacity of dates at farmers' level and decline in the per capita consumption of dates in the Kingdom.

Table 4. Importance attributed to quality date production at farmers level in Al- Hassa oasis of Saudi Arabia (Model –II).

| S/N | Care for quality | Quality improvement related functions | | | | | |
|---------|------------------|---------------------------------------|-----------------------------|------------------|--|-------------------|----------------------------------|
| | | Thinning of fruits | Removal of defective fruits | Use of chemicals | Plastic film on ground during harvesting | Sorting of fruits | Fumigation against storage pests |
| 1 | Yes | Yes | Yes | Not known | Yes | No | No |
| 2 | Yes | Yes | Yes | Sulphur | Yes | Yes | No |
| 3 | Yes | No | Yes | Not known | Yes | No | No |
| 4 | Yes | Yes | Yes | No | Yes | Yes | No |
| 5 | Yes | Yes | Yes | Sulphur | Yes | No | No |
| 6 | Yes | Yes | Yes | Sulphur | Yes | No | No |
| 7 | Yes | Yes | Yes | Sulphur | Yes | Yes | No |
| 8 | Yes | No | Yes | No | Yes | No | No |
| 9 | Yes | Yes | Yes | Sulphur | Yes | Yes | No |
| 10 | Yes | No | Yes | No | Yes | No | No |
| 11 | Yes | Yes | Yes | Sulphur | Yes | No | No |
| 12 | Yes | Yes | Yes | Sulphur | Yes | No | No |
| 13 | Yes | Yes | Yes | Mixed | Yes | No | No |
| 14 | Yes | No | Yes | - | Yes | No | No |
| 15 | Yes | No | Yes | Not known | Yes | No | No |
| 16 | Yes | No | Yes | Not known | Yes | No | No |
| 17 | Yes | No | Yes | No | Yes | Yes | No |
| 18 | Yes | No | Yes | Sulphur | Yes | No | No |
| 19 | Yes | Yes | Yes | Sulphur | Yes | Yes | No |
| 20 | Yes | Yes | Yes | Not known | Yes | No | No |
| 21 | Yes | No | Yes | Sulphur | Yes | No | No |
| 22 | Yes | Yes | Yes | Sulphur | Yes | No | No |
| 23 | Yes | Yes | Yes | Not known | Yes | No | No |
| 24 | Yes | Yes | Yes | Not known | Yes | No | No |
| 25 | Yes | No | Yes | Sulphur | Yes | No | No |
| 26 | Yes | Yes | Yes | No | Yes | No | No |
| 27 | Yes | No | Yes | No | Yes | No | No |
| 28 | Yes | Yes | Yes | No | Yes | No | No |
| 29 | Yes | No | Yes | No | Yes | No | No |
| 30 | Yes | No | Yes | Not known | Yes | No | No |
| Yes (%) | 100.00 | 57.00 | 100 | 73.00 | 100.00 | 20.00 | 0.00 |
| No (%) | 0.00 | 43.00 | 0.00 | 27.00 | 0.00 | 80.00 | 100.00 |

With regard to marketing of dates our study indicated that several farmers sold their produce to known customers, indicating a great degree of customer confidence and loyalty, probably due to the quality of the produce. This also assured the farmer a better price.

Further, only 23% of the date palm farmers in Al Hassa sold dates to the date factories, indicating lower prices offered by the factories for the produce. There is an urgent need to develop an export strategy for Saudi Arabian dates that would assure sale of surplus dates from the Kingdom, which in turn would result in better prices for the farmers which were estimated to be only SR 4.00 per kg in our study. El-Sabea (2010) proposed enhancing exports of Saudi Arabian dates through

marketing cooperatives. Quality production of dates was found to be an important criteria for the date farmers of Al-Hassa as 100% of the respondents were quality conscious and took care to incorporate measures in their farming practices (pre and post harvest) to enhance and safe guard the quality of their produce. These practices included thinning of fruits (57%). This practices has been recommended by several workers to improve the size of dates and also to prevent shriveling (Tahaer, 1983; Al-Darwish and Ben Abdallah, 2010). 100.00% of the farmers discarded defective fruits and used a plastic film on the ground while harvesting, which assured quality production. These practices have been recommended by the Ministry of Agriculture, Kingdom of Saudi Arabia to

Table 5. Strength, opportunities, weaknesses and threats (SWOT) related to date palm cultivation in Al Hassa oasis of Saudi Arabia.

| Strengths | Weaknesses |
|---|---|
| 1. Spiritual attachment to the land (farm) regardless of the economics. | 1. Children of the farmer do not feel the same way (children lack attachment to the farm). |
| 2. Diverse ways to market dates in the oasis. | 2. Poor relationship between the farms and date processing factories. |
| 3. The cultivar Khalas is suitable for cultivation in Al Hassa and other regions of the Kingdom. | 3. Significant increase in the production of the cultivar Khalas resulting in lower prices for this premier date. |
| 4. Good infrastructure for date production and marketing in terms of irrigation, electricity, motor able roads, agricultural research centers , Government support for date palm cultivation and marketing etc. | 4. Poor exploitation of facilities / in fracture to enhance production and marketing of dates. |
| Opportunities | Threats |
| 1. Possibility to develop logistics that support marketing of dates viz. agricultural cooperatives. | 1. Lack of awareness among farmers to join such associations / cooperatives. |
| 2. Possibility of exploiting state subsidies to enhance date cultivation in the oasis. | 2. Bureaucratic hurdles to obtain subsidies and lack of exploitation of facilities by traditional farmers. |

Table 6. Fixed and variable costs formulae.

| Cost | Formula |
|--------------------------------------|---|
| Average fixed cost per palm | Average fixed cost per hectare / Number of palms per hectare |
| Average variable cost per palm | Average variable cost per hectare / Number of palms per hectare |
| Total production cost per hectare | Average fixed cost per hectare +Average variable cost per hectare |
| Average cost of production per palm | Average fixed cost per palm + Average variable cost per palm |
| Average cost to produce one Kg dates | Average cost of production per palm / Average production per palm |

ensure quality production of dates in the Kingdom (Anonymous, 2009b; Anonymous 2006a). The damage caused by Mites, *O. afrasiaticus*, to date fruits reduces fruit quality considerably (Dhouibi, 2005). Date palm farmers (73%) of Al-Hassa were aware of this problem and used chemicals (sulphur) for combating this pest.

However, none of the farmers practiced fumigation of produce that is known (Al-Zumaiti, 1997) to combat the menace of pests in stored dates. SWOT analysis indicated strong attachment to the land as strength of date farming in the Al- Hassa oasis. Further, bureaucratic hurdles to obtain subsidies and lack of exploitation of facilities by traditional farmers were perceived as major threats to date farming in the oasis. There also exists a good possibility to develop logistics that support marketing of dates, especially through agricultural cooperatives, besides the possibility of further enhancing exploitation of state subsidies for date palm cultivation in the oasis.

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REFERENCES

- Al-Darwish ZS, Ben AA (2010). Effect of bunch removal and fruit thinning on shriveling of mature dates in Ghar Cultivar. Fourth International Date Palm Conference, Abu Dabhi, United Arab Emirates 15-17, March 2010. Acta Horticulture, In Press.
- Al-Farsi M, Alasalvar C, Morris A, Barron M, Shahidi F (2005). Compositional and sensory characteristics of three native sun-dried date (*Phoenix dactylifera* L) varieties grown in Oman. J. Agric. Food Chem., 53: 7586-7591.

- Al- Khatib AA, Al-Jaber MA, Al-Jabber A (2006). Date palm in the Kingdom of Saudi Arabia (Ed. National Agriculture Development Company (NADEC), Saudi Arabia), p. 136.
- Al- Malha J, Husseini AA (2003). Cost of cultivation of Khalas dates in the Al- Hassa oasis (Ed. King Saud University, Riyadh, Saudi Arabia, pp. 843-853.
- Al- Shuaiby AA, Ismael M (2007). Economic alternatives of dates as animal feed in Al- Hassa and Al- Qatif . Proceedings, Fourth Symposium on Date Palm in Saudi Arabia, 20-22 February, 2007, King Faisal University, Al Hassa, Saudi Arabia.
- Al-Zumaiti M (1997). Practices of IPM for agriculture (Ed. Dar Al-Fajr), p. 456.
- Anonymous (2009a). Annual statistical data (Ed. Department of studies, planning and statistics, Ministry of Agriculture, Kingdom of Saudi Arabia), p. 269.
- Anonymous (2009b). Statistics on processing of dates in the Kingdom of Saudi Arabia (Ed. Department of studies, planning and statistics, Ministry of Agriculture, Kingdom of Saudi Arabia), p. 6.
- Anonymous (2006a). The famous date varieties in the Kingdom of Saudi Arabia (Ed. Ministry of Agriculture, Kingdom of Saudi Arabia and Food and Agriculture Organization of the United Nations), p. 245.
- Anonymous (2006b). A review of the processing of dates in the Kingdom of Saudi Arabia: 1997 to 2005 (Ed. Ministry of Agriculture, Kingdom of Saudi Arabia), p. 25.
- Anonymous (2006c). Dates of Saudi Arabia: Status and Prospects (Ed. Ministry of Agriculture, Kingdom of Saudi Arabia), p. 129.
- Asif MI, Al-Tahir OA, Al-Kahtani MS (1982). Inter-regional and inter-cultivar variations in dates grown in the Kingdom of Saudi Arabia. In, proceedings of the first symposium on date palm. King Faisal University, Al- Hassa, pp. 22-94.
- Asif MI, Al-Ghamdi AS, Al-Tahir OA, Latif RAA (1986) Studies on the date palm cultivars of Al-Hassa oasis. In, proceedings of the second symposium on date palm in Saudi Arabia. King Faisal University, Al Hassa Saudi Arabia, pp. 405-413.
- Baloch MK, Saleem SA, Ahmad K, Baloch AK, Baloch WA (2006). Impact of controlled atmosphere on the stability of Dhakki dates. Swiss Soc. Food Sci. Tech., 39: 671-676.
- Dhouibi MH (2005). Experimental results (2004-5005) of the Integrated Pest Management Laboratory in Riyadh (FAO Project, Ministry of Agriculture, Saudi Arabia), p. 96.
- El-Baker AJ (1952). Date cultivation in Saudi Arabia. Report number 31. FAO ,Rome, Italy.
- El-Sabea AMR (2010). A comparative study for competitiveness of dates from the Kingdom of Saudi Arabia and the United Arab Emirates in the world markets. Proceedings (Ed. Zaid A and Alhadrami G) Fourth International Date Palm Conference, Abu Dabhi, United Arab Emirates 15-17, March 2010, p. 715.
- Ishurd O, Kennedy JF (2005). The anti-cancer activity of polysaccharide prepared from Libyan dates (*Phoenix dactylifera* L). Carbohydr. Polym., 59: 531-535.
- Mohamed AE (2000). Trace element levels in some kinds of dates. Food Chem., 49: 107-113.
- Tahar KH (1983). Date palms and dates in the Kingdom of Saudi Arabia, Ed. Ministry of Agriculture, Saudi Arabia, pp. 168-173.
- Vayalill PK (2002). Antioxidant and antimutagenic properties of aqueous extract of date fruit (*Phoenix dactylifera* L. Arecaceae). J. Agric. Food Chem., 50: 610-617.