



DATE SECTOR REPORT AND VALUE CHAIN DEVELOPMENT PROGRAM



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IRAQ DATE SECTOR REPORT AND VALUE CHAIN DEVELOPMENT PROGRAM

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I. EXECUTIVE SUMMARY

The Iraqi date industry has a long history of producing dates to serve the local market and to export to global markets. Beginning in the early 1990s, Iraqi date production and exports began to decline dramatically due to the Iran-Iraq war, draining of the southern marshes, UN sanctions, initiation of a new government, and civil unrest. At the same time, countries such as Egypt, Iran, Saudi Arabia, UAE, and Tunisia have expanded and modernized their date industries, producing varieties suitable for both the fresh and industrial markets.

The principal varieties produced in Iraq – Zahidi and Sayer – are primarily suitable as raw material for processing into industrial date products such as date syrup (dibis), macerated and pressed dates, and date paste. Like dates destined for the fresh markets, these industrial dates must be processed, fumigated, graded, stored, and properly packaged in order to sell at a high price.

In order to utilize existing varieties, facilities are needed to collect, preserve, and manufacture date products. This requires a combination of rural development programs providing technical assistance and properly equipped collection points, coupled with one or more centralized processing plants that meet global quality and phytosanitary standards. This will allow Iraqi date producers and marketers to compete in both the local and global markets.

Date Market

A market exists both in Iraq and in export markets for dates and date products. Raw dates that currently have a value of USD 75 to 150 per ton can be converted to processed products that have a value of USD 700 to 1,000 per ton provided the proper procedures are followed in collection and processing. Raw dates need to be stabilized and stored in a sanitary and controlled environment in order to be commercially marketed.

Iraq has the potential to be the low-cost producer of dates in the Middle East due to excellent climatic conditions, abundant land, established date orchards, and low-cost labor.

Date Value Chain

Iraq is now in a position to modernize the date industry by moving up the value chain, from production to the end market. The value chain divides into four key elements or stages in the handling of dates:

- Production and Farming Practices
- Post-Harvest Handling
- Processing
- Marketing

Interventions, Structure, and Industry Support

A variety of interventions and improved practices are needed within each stage of the date value chain. The core of the program is the formation of rural collection centers that can purchase the appropriate variety and quality of date and provide basic grading, fumigation, and disposal of lower-grade fruit. The other critical element for the program is the establishment of one or two central processing plants that can produce a variety of products to meet local and export markets.

Production and Farming Practices

Key factors for increased production and disease control include: 1) pollen processing and application improvements; and 2) control of disease through IPM programs. Agricultural service teams (extension workers) can work from the Rural Collection Centers. Iraqi development institutions and the university can be of assistance in developing training programs for date farmers.

Post-Harvest Handling

Harvesting dates at the proper ripeness, followed by grading and fumigating dates to maintain quality and control insect infestations are important steps to creating raw material that can be stored and processed into other products. Establishment of Rural Collection Centers in selected regions, particularly in the South, can be achieved by contracting with experienced date packers or entrepreneurs. Providing finance for the proper facilities is critical to the success of the program.

Processing

Dates need to be processed into other products that can be stored and are suitable for both fresh and industrial uses. Fresh dates are an important part of the diet, particularly in the Middle East. However, given the prominence of industrial-grade dates in Iraq, our program's emphasis will be on industrial uses for dates.

Date products, often used as an ingredient in the confectionary and baking industry include:

- Date paste and date bricks (pressed dates)
Date syrup (dibis)
Date chunks and bits

Pressed dates are also sold in local markets and used in meal preparation. Advanced products such as the sugar, fructose, low-calorie sweeteners, and retail products such as date-based nutrition bars have been produced in other countries and can be produced in the processing plant.

Marketing

The domestic market can best be served with uniform products that are available throughout the year. Dates and date products are an important part of the Iraqi diet as an important source of calories and nutrients. Most of the production in the early years of the program can be marketed internally. Export markets can be developed gradually and provide an opportunity to earn higher prices on Iraqi dates.

Date Improvement Program

It is estimated that a date improvement program initially targeted on centrally processing 25,000 tonnes of an estimated 250,000 tonne crop can be created. The estimated cost for equipment for the first phase is 5 to 6 million USD.

The next step is the preparation of a prefeasibility analysis for a model Date Collection Center and a Central Processing Plant. Annex A contains a brief summary of information collected for the pre-feasibility study from meetings in UAE and Italy. Annex B includes selected brochures from date equipment companies in UAE, Italy, and USA. Finally, Annex C contains the agenda from an ICARDA workshop on date postharvest handling and processing held in Dubai, UAE.

II. OVERVIEW OF THE DATE SECTOR IN IRAQ

2.1 Date Production in Iraq

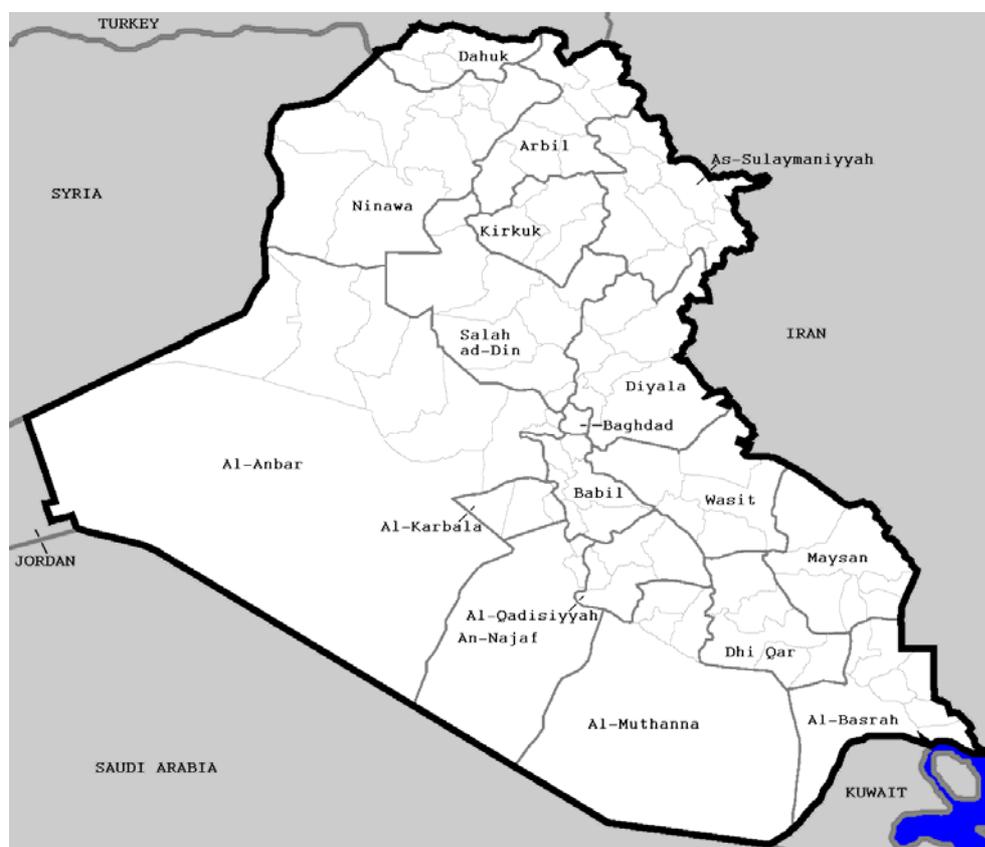
Iraq has historically been one of the major date-producing countries in the world. In the 1980s and mid-1990s, Iraq was consistently among the top five date-producing countries in the world and often ranked number one in terms of production by volume. Into the 1990s, Iraq had 22 million date palms planted over 120,000 hectares. The production of dates in Iraq has long been a matter of national pride.

Date Production by Governorate

Dates have always been grown nationwide in Iraq; however, commercial production of in-demand varieties has always been centered in the southern governorates, with Basrah renowned as the virtual center of the date industry worldwide. Due primarily to the Iran-Iraq war (1980 to 1988) and Saddam Hussein's draining of the southern marshes (early 1990s), some of the commercial production has shifted north of Basrah, but much still remains in the southern governorates.

According to the most up-to-date information available, in 2001 the top five governorates in terms of date production by volume are Babil (Babylon), Karbala, Diyala, Baghdad, and Basrah

Figure 1. Map of Governorates of Iraq



Source: http://upload.wikimedia.org/wikipedia/en/e/e3/Iraq_Dist.png

The following table is the most up-to-date information on date production and productivity by governorate.

Table 1. Date Palm Trees, Production, and Productivity by Governorate in 2001

Governorate	Total no. of trees	No. of fruiting trees	Production (tons)	Yield (kg/tree)
Babil (Babylon)	3,370,800	3,012,500	227,060	75.4
Karbala	2,079,500	1,894,000	128,840	68.0
Diyala	1,982,400	1,710,300	123,670	72.3
Baghdad	1,506,900	1,347,700	108,830	80.8
Basrah	2,697,600	2,108,600	73,280	34.8
Anbar	680,600	634,400	50,990	80.4
Qadissya	822,400	765,300	49,650	64.9
Dhi-Qar	814,500	770,600	47,050	61.1
Wasit	640,900	540,000	39,600	73.3
Najaf	626,300	604,300	24,170	40.0
Salah al-Din	273,900	231,800	17,160	74.0
Maysan	194,800	168,700	8,770	52.0
Muthanna	219,800	154,800	7,720	49.9
Kirkuk (Tamim)	400	-		
Total	15,910,800	13,943,000	906,790	-

Source: <http://www.usaid.gov/iraq/contracts/pdf/ARDI14-IraqiDateIndustry.pdf>

Date Production in Iraq by Variety

Dates can be identified by their characteristic appearance and texture and fall into three types: soft, semi-dry, and dry. The type of fruit depends on the glucose, fructose, and sucrose content. This division is based on the texture or consistency of fruit under normal conditions of ripening.

- Fresh Dates boast a soft flesh, high moisture content with high sugar content.
 - e.g. Khastawi and Barhee varieties
- Semi-Dry Dates feature a firm flesh, fairly low moisture content, and high sugar content.
 - e.g. Halawi and Khadrawy varieties
- Dry Dates have a high sugar content, low moisture content and dry, hard flesh.
 - e.g. Zahidi and Sayer varieties

There are well over 400 varieties grown in Iraq, although the exact number of varieties of dates is not known. Production is dominated by the Zahidi variety (dry) followed distantly by Khastawi (fresh), Sayer (dry), and Khadrawy (semi-dry). These include the following:

Variety	Description
Zahidi	Semi-dry date from Iraq. Medium size, cylindrical, light golden-brown, very sugary, and sold as soft, medium-hard and hard. Distinguished by its large seed in proportion to the fruit itself. This date lends itself well to processing and softening by steam hydration. This date is known for its high invert sugar level and is widely used to make diced dates and date sugar products. It features a crunchy and fibrous flesh. Industrial uses.
Khastawi or Khusatawi	Leading fresh date in Iraq; it is syrupy and small in size, prized for dessert. For fresh market.
Sayer or Sayir	Dry. Dark orange-brown, medium size, soft and syrupy. Industrial uses.
Khadrawy	A cultivar favored by many Arabs, it is a soft, very dark date. Originally from Iraq, it has many desirable qualities. It cures well, it ripens to amber, then cured to a reddish brown, with a caramel like texture and a sweet flavor. Industrial uses for export and fresh consumption locally.
Halawi or Halawy	Semi-dry. Extremely sweet, small to medium in size. Thick flesh, caramel taste, and sweet, is somewhat wrinkled in appearance, with a yellow color ripening to a light amber and then to a golden brown. Originally from Iraq. Fresh or industrial markets.
Barhee	Carmel taste, sweet, wrinkled in appearance, fresh market.

The following table is the most current information available in regards to date palm trees, production, and productivity by variety.

Table 2. Date Palm Trees, Production, and Productivity by Variety in 2001

Variety	No. of Palms	Total No. Bearing	Total No. Non-Bearing	Production (tons)	Production (%)
Zahidi	10,309,500	9,412,600	121,000	654,240	72.1
Khastawi	1,285,400	1,047,300	38,900	63,310	7.0
Sayer	957,200	864,000	56,700	31,780	3.5
Khadrawy	666,800	584,000	29,400	24,800	2.7
Halawi	829,100	721,000	90,100	22,300	2.5
Barhee	289,400	84,800	192,700	5,800	0.6
Other	1,573,400	1,229,300	141,300	104,560	11.5
Total	15,910,800	13,943,000	670,100	906,790	100

Source: <http://www.usaid.gov/iraq/contracts/pdf/ARDI14-IraqiDateIndustry.pdf>

Dates ripen in four stages, which are known throughout the world by their Arabic names kimri or chimri (unripe), khalal (full-size, crunchy), rutab (ripe, soft), tamer (ripe, sun-dried). These stages of ripening can be described as follows:

- Kimri (Chimri): first 17 weeks after pollination. The dates are green, hard, bitter, and are 80 percent moisture
- Khalal: next 6 weeks when dates become full grown, although they are still very hard. The color changes to yellow, orange or red, and sugar levels increase
- Rutab: next 4 weeks the dates become half-ripe, soft, and turn to a light brown color, and the sucrose turns to invert sugars
- Tamer: dates are ripe in the last two weeks of development. The dates become soft and sugar becomes mostly invert. Dates at this stage of development - semi-dry and dry dates - will contain about 50 percent sucrose and invert sugar.

Dry/semi-dry dates may be picked early when their color is still light and are not fully ripe and semi-dry dates may be picked as soon as they are soft. After picking dates can be further ripened at temperatures of 80 to 95 degrees F. Dry dates are generally left on the palm until they are ripe.

The principal varieties in demand for Western markets are Sayer and Zahidi dates. Halawi and Barhee are consumed as fresh, table fruit. However, the Barhee variety has limited shelf life of no more than one month and could not be feasibly shipped outside the Middle East. According to European food safety standards, all other varieties are classified as common dates when shipped to other countries. The definition of “common dates,” means that they are not distinguished from all other varieties. Limited amounts of Barhee are produced.

Sayer and Zahidi are the principal varieties for “industrial grade” dates. These dates are classified as “dry” or “semi-dry” dates due to their relatively low moisture content which ranges from 10 to 14 percent.

Market Players for Fresh and Industrial Dates

Iraq is very capable of producing large quantities of premium “industrial grade” dates, namely Sayer and Zahidi. Iraq’s main competitors in producing “industrial grade” dates are Iran and Pakistan. Iran grows both Sayers and Zahidis, especially Sayers. Pakistan grows the Aseel and BJ, dry varieties that compete with Sayers and Zahidis.

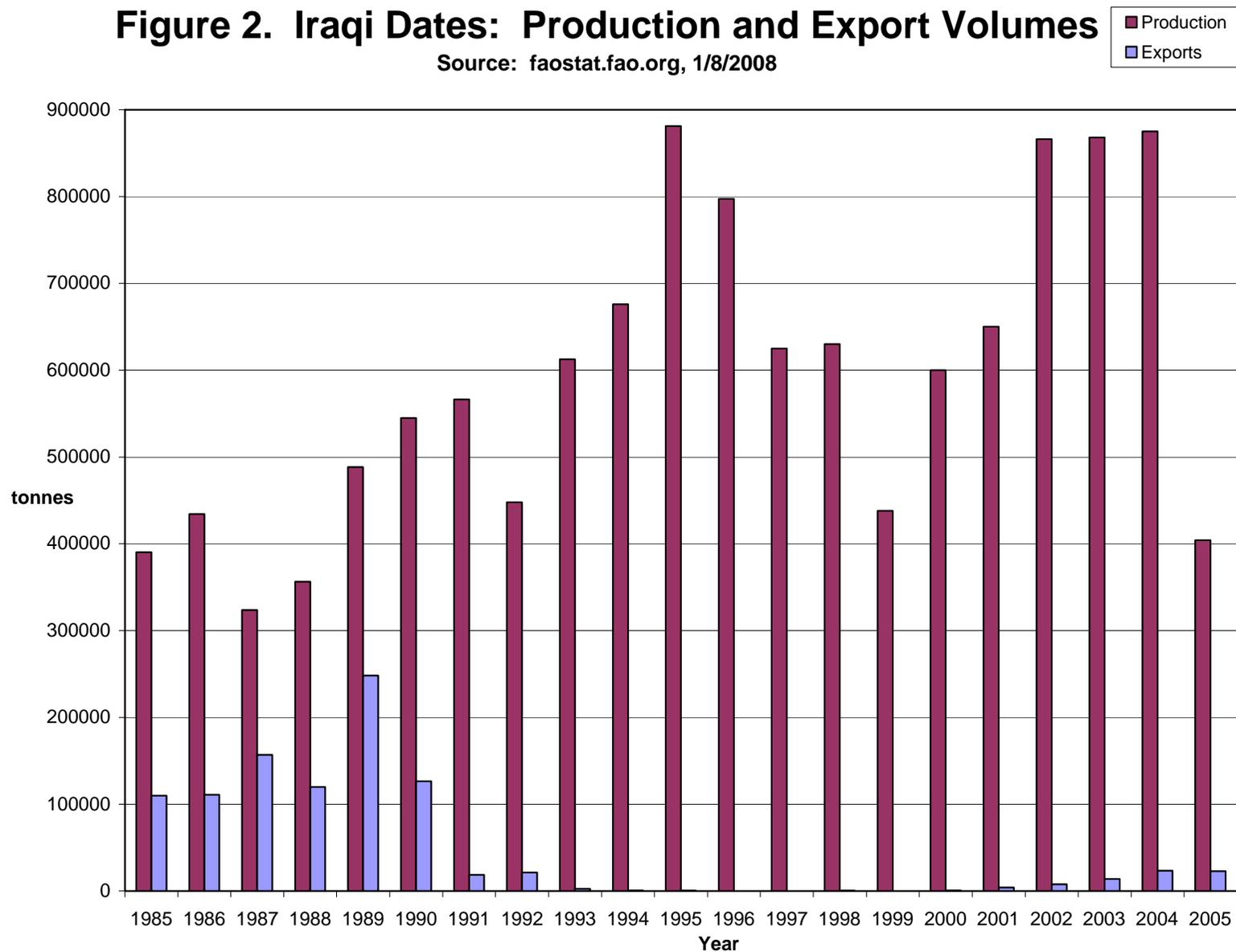
Historical Date Production

Producing up to 900,000 metric tons annually, Iraq has often had a surplus of dates to export. Iraq was a major player in the international market through the early 1990s, commanding a significant portion of the world market share. But production and quality waned in the 1990’s, due to a combination of the Iran-Iraq war, draining of the southern marshes, and UN-imposed sanctions. Beginning in the early 1990s, Iraqi date exports declined dramatically and Iraq began to lose market share.

The following table illustrates the sudden and significant decrease of Iraqi date exports.

Figure 2. Iraqi Dates: Production and Export Volumes

Source: faostat.fao.org, 1/8/2008



2.2 Marketing Systems

Domestic Consumption

Dates are a staple of the Iraqi diet and per capita consumption is considered high. Figures on domestic consumption run from 100,000 to 350,000 tons, although there are no reliable figures by market share or by total domestic consumption.

Dates are an important traditional crop in Iraq. Dates can be eaten out-of-hand, added to cereals, puddings, cakes, ice cream, and breads. Dry or soft dates are eaten out-of-hand, or may be pitted and stuffed with various fillings. Dates can be processed into cubes, paste, spreads, date syrup or dibis, powder (date sugar), vinegar or alcohol. Dates can also be dehydrated, ground and mixed with grain to form a nutritious livestock feed.

Higher-end, fresh dates are sold in bulk in local markets in Iraq. The prices for fresh dates in the domestic market have not been reliably collected but can be roughly estimated to be USD 200 to 400 per ton bulk. The prices of fresh, processed, value-added dates (pitted, stuffed, packaged) would be considerably higher.

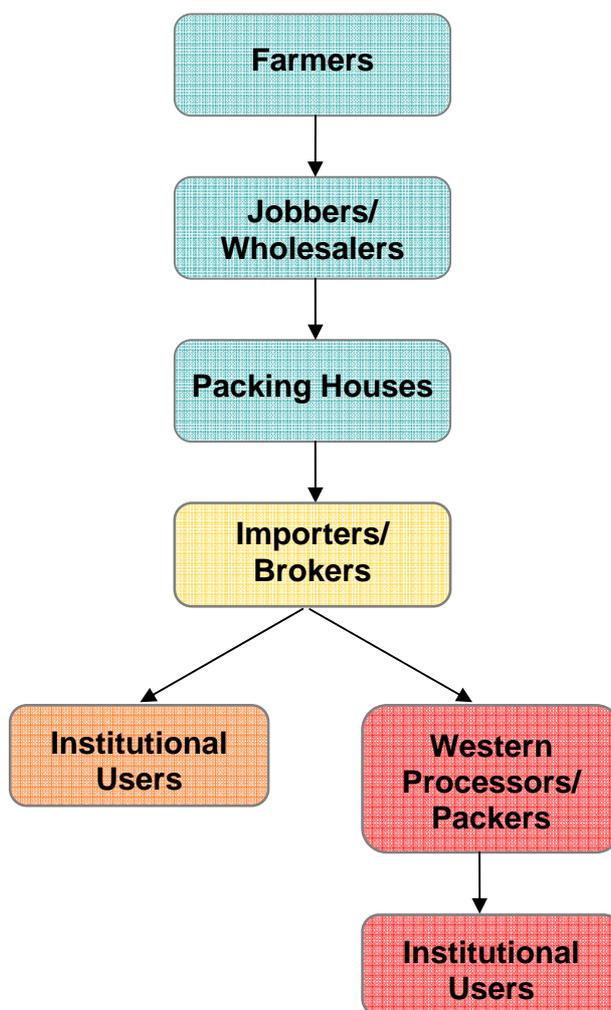
The lowest-quality dates are sold as animal feed to the dairies, sheep herders, and companies making dibis (date syrup) and other fermented products. Low-quality dates are sold in the domestic market for approximately USD 100 per ton. Low-quality dates are also exported at prices of USD 75 to 150 per ton.

Domestic Market Channels and Structure

Roadside vendors, small shops, and markets of all sizes sell packaged and bulk date products throughout Iraq. The following is a diagram of the marketing chain of dried dates (tamer) in Iraq.



Figure 3. Marketing Chain of Dried Dates (Tamer) in Iraq



Export Market Channels—Current and Historical

Under Saddam’s regime, the government formed the Iraqi Date Agency, which controlled the export of all dates. An “agency” was awarded to a given broker or importer for a particular marketing area, i.e. North America, Europe, Asia, etc.

Following Operation Iraqi Freedom (OIF), this government entity ceased to exist and Iraqi date packers/shippers had to face the reality of the world trading system. Iraqi packers/shippers lack the benefit of experience in this regard and were also limited by the low-quality dates and minimal processing capabilities. The industry currently exports little and relies mainly on two Palestinian brokers in Dubai.

2.3 Issues and Constraints

The current condition of the Iraq date industry and the principal issues and constraints facing the Iraqi date industry divide into topics related to:

- Farming and production practices
- Harvesting and post-harvest handling
- Processing and processed products
- Marketing

Farming and Production Practices

It is reported that there are 150,000 date farmers in Iraq. The number of commercial date farmers is indefinite, but we estimate that some 20,000 to 25,000 date farmers could be classed as “commercial producers.” The majority of Iraq’s farmers do not own the land they farm. Most of the landowners are absentee, living in Baghdad and increasingly out of the country altogether. The majority of date farmers are essentially sharecroppers: in exchange for tending to an orchard, they receive a percentage of the crop and are often allowed to live on the land. The majority of date farmers also grow other cash crops.

In Iraq, the average size of a date farm is 3 to 10 acres. Date farms are rarely more than 10 acres. By comparison, in California 20 acres is a very small orchard and larger orchards are in excess of 100 acres. In Iraq there are larger commercial date farms, mainly in the south. Most dates grown in the north, east, and west are not commercial. Commercial date farming remains mostly in the southern governorates. The size and number of commercial date farms in Iraq is unknown.

Farmers themselves do not have money for fertilizers, insecticides, tools, or equipment. Given that the sharecroppers are without funds for farm inputs and are lacking supervision or oversight, they often pay little to no attention to the condition of the date trees. More money is made by allowing herders to graze sheep in the orchards and growing row crops such as tomatoes, cucumbers, and onions, which can be sold in local markets. Consequently, date orchards suffer tremendously in terms of quality of fruit produced and yield per hectare. Presumably the commercial date farmers to have some tie to a date buyer or packer.

Harvesting Methods and Post-Harvest Handling

Lacking even the most fundamental knowledge of harvesting practices, sharecroppers revert to the easiest way of harvesting fruit, if they even harvest at all.

Typically whole clusters of ripening or ripe fruit are simply cut off at the stem and allowed to drop 20 or more feet to the ground. Fruit on the bottom and outside of the clusters is destroyed outright and much of the remaining fruit is engulfed in a cloud of sand and dust that becomes embedded in the fruit. Fruit in this condition cannot be processed for export to Western markets regardless of the technology or equipment in the processing plant.

Minimal effort is made to properly store the harvest. Fruit is sometimes stored in sheds or porous concrete buildings. More often the fruit is stored uncovered in open areas, although it is

sometimes stored under plastic sheeting. Under such conditions, the fruit quickly becomes infested by insects, rapidly ferments in the hot climate and quickly deteriorates.

Processing and Processed Products

There is currently no date processing facility in Iraq that meets Western standards. The current facilities lack the capacity to process and store dates in a hygienic and suitable environment: there are no vacuum fumigation chambers, sorting equipment, grading equipment, machine-pitting equipment, macerating equipment, paste-making equipment, dicing equipment, or cold storage adjoining processing facilities in which to store dates.

If date packers do fumigate, they simply stack boxes of dates in an enclosed room and use Fostoxin pellets. Fostoxin requires a minimum of 48 hours to be effective. Use of Fostoxin pellets is simply not reliable under the best of conditions—a scenario that is often not the case in Iraq.

No processor has a modern, efficient cold-storage room. In a makeshift effort, a few processors use Chinese AC units mounted in enclosed concrete rooms. All of Iraq is in desperate need of cold storage. Without adequate and proper cold storage, fruit is exposed to the elements and pest infestation occurs within a few days, more often within several hours.

It is reported that most of the packing is done by women working in unsanitary conditions. Workers do not wear hairnets or latex gloves and there is no overhead lighting. Fruit is simply scattered over tables, mostly made of wood. No effort is made to grade or sort the fruit according to size, color, or characteristics. Pitting is by hand with small rusty knives. Workers often nick or cut themselves in the process of removing the pit.

In packaging dates, women dip their hands in a bowl of often unclean water and sprinkle the hand-pitted fruit with water. The dates are then pressed into 250 mg, 350 mg, and 500 mg blocks or bricks of pressed dates using rusty, antiquated, hand-operated presses circa 1950s. These blocks are then vacuum-wrapped in cellophane and labeled. Hand-pitted fruit is also stuffed with nuts such as almonds, walnuts, pistachios, peanuts, and cashews. The stuffing also takes place in unsanitary and less than ideal conditions. This type of activity would traditionally take place at a packing shed.

Iraq has not exported fruit meeting Western standards in nearly twenty years. As previously noted, much of the low-quality fruit is exported to other countries such as India for conversion to animal feed or as raw material for fermentation. Under existing conditions, there is little opportunity that Iraq will be able to ship any fruit to lucrative Western markets where quality products receive premium prices.

Marketing

In addition to whole fruit that is sold in bulk in the local markets, cellophane-packed brick or pressed dates seem to be the most popular retail product produced by packers. There is some attempt by packers to “brand” their product with the family name on the label.

Hand-pitted fruit is also stuffed with nuts, such as almonds, walnuts, pistachios, peanuts, and cashews. At times this fruit can be packaged nicely and sold under the family name of the packer.

Dates of all varieties in various state of ripeness (khalal, rutab, tamer), are packed in 60 kg plastic bags and taken by Dhows to Dubai. Currently two Palestinian traders sell the dates to brokers and importers in China, India, and Malaysia. This fruit is only fit for animal consumption and fermentation into date syrup and alcohol.

According to Mohammad Suleiman Hasan, Director General of the Iraqi Date Processing & Marketing Company, in the 2007 season just over 50,000 metric tons of low quality dates were exported. The profit margin on these sales ranges from a USD 10 per ton loss to a maximum of a USD 20 per ton profit.

III. WORLD DATE MARKETS AND OPPORTUNITIES

3.1 World Date Production and Trade

World production of dates varies from one year to the next for a number of reasons. These include political instability in the major producing countries, trade embargos, and most significantly, changes in growing conditions from one growing season to the next.

Although world figures of world date production and trade are imperfect, the best available estimates are provided by the Food and Agriculture Organization of the United Nations (FAO) through FAOSTAT. This information serves as the basis for the following comments.

Top World Date Producers

A number of countries have consistently ranked among the top five date-producing countries in the world. These include Iraq, Egypt, Iran, Saudi Arabia, and Pakistan. Other significant date-producing countries include the United Arab Emirates (UAE), Algeria, Sudan, and Oman. Additional information can be found in the Table 3 “World Date Production by Volume: Top 10 Producing Countries in the World in 1985, 1990, 1995, 2000, and 2005.”

Top World Date Exporters

Date exports rarely account for more than twenty percent of total production for date-producing countries. Overall date exports have been steadily increasing over the past twenty years. In the 1980s and early 1990s, Iraq’s date exports by volume were an entire order of magnitude greater than its closest competitor. However, by the mid-1990s Iran surpassed Iraq and all other date-exporting countries to become the world’s major date-exporting country. By 2001, Iraq resumed measurable quantities of date exports, although exports in recent years account for only a fraction of what was formerly exported in the 1980s and early 1990s. Other significant date-exporting countries include Pakistan, Saudi Arabia, United Arab Emirates, and Tunisia. These Iraqi and world date export dynamics can be observed in Figure 2, “Iraqi Dates: Production and Export Volumes” and Table 4, “World Date Exports by Volume.”

Table 3. World Date Production by Volume: Top 10 Producing Countries in the World in 1985, 1990, 1995, 2000, and 2005

Rank	1985		1990		1995		2000		2005	
	Country	Tonnes	Country	Tonnes	Country	Tonnes	Country	Tonnes	Country	Tonnes
1	Egypt	509,000	Iraq	544,930	Iraq	881,020	Egypt	1,006,710	Egypt	1,170,000
2	Sda. Arabia	455,730	Egypt	541,963	Iran	780,010	Iran	869,573	Iran	996,770
3	Iran	396,935	Sda. Arabia	527,881	Egypt	677,934	UAE	757,601	Sda. Arabia	970,488
4	Iraq	390,200	Iran	516,295	Sda. Arabia	589,261	Sda. Arabia	734,844	UAE	859,159
5	Pakistan	268,600	Pakistan	287,300	Pakistan	532,531	Pakistan	612,482	Algeria	516,293
6	Algeria	198,800	Algeria	205,907	Algeria	285,155	Iraq	600,000	Pakistan	496,576
7	Sudan	116,000	UAE	141,463	UAE	236,965	Algeria	365,616	Iraq	404,000
8	Libya	92,000	Oman	120,000	Oman	173,000	Sudan	332,320	Sudan	328,200
9	Oman	80,000	Morocco	120,000	Sudan	160,000	Oman	280,030	Oman	247,331
10	Tunisia	71,000	Sudan	110,000	Libya	125,000	China	128,229	Libya	180,727

Note: Sda. Arabia is an abbreviation for Saudi Arabia.

Source: faostat.fao.org, viewed 1/8/2008.

Table 4. World Date Exports by Volume: Top 10 Exporting Countries in the World in 1985, 1990, 1995, 2000, and 2005

Rank	1985		1990		1995		2000		2005	
	Country	Tonnes								
1	Iraq	110,000	Iraq	126,600	Iran	100,440	Iran	107,850	Iran	117,060
2	Sda. Arabia	27,430	UAE	67,580	Pakistan	34,320	Pakistan	78,660	Pakistan	84,060
3	Pakistan	20,620	Pakistan	50,880	UAE	31,970	UAE	65,890	Sda. Arabia	51,450
4	Tunisia	15,210	Iran	20,430	Algeria	21,850	Sda. Arabia	30,900	Tunisia	50,180
5	Iran	15,080	Tunisia	18,040	Tunisia	20,880	Tunisia	22,440	UAE	23,880
6	China	9,360	Sda. Arabia	12,500	Sda. Arabia	15,000	Algeria	10,780	Iraq	22,910
7	Algeria	6,720	Algeria	8,620	Israel	7,400	France	9,580	Algeria	10,860
8	France	6,150	Malaysia	7,880	USA	5,820	Oman	8,360	Israel	9,120
9	Singapore	4,070	China	7,860	Oman	5,700	USA	3,190	France	8,970
10	Oman	3,650	France	7,200	France	5,480	Niger	3,160	Egypt	8,880

Source: *ibid.*

Top Date Importers by Volume

In terms of imports, based on the best information available, India has by far been the most important date importer in the world in recent years. United Arab Emirates, Morocco, Yemen, Pakistan, and France have all been consistent date importers in the past five years. Table 5, “World Date Imports by Volume,” summarizes the top 10 importing countries in recent years.

It is important to note that the quality of dates being imported is not necessarily equal and is reflected in the value per ton.. For example, high volumes of low-price, low-grade dates are exported from Iraq, Iran, Pakistan, UAE, and Egypt to countries like India, Malaysia, and China for industrial purposes (i.e. animal feed and fermentation into alcohol-related products). By contrast, premium prices are paid for fruit that is of table quality being exported from countries like Tunisia and Algeria. The combined factors of volume and value should be considered together when determining the desirability of an end market for dates.

Top Date Importers by Value

In terms of value, the top importing countries is quite different from the top importing countries by volume. This reinforces the assertion that higher volumes of dates that are industrial grade are imported at lower prices, while premium prices are paid for fruit that is of table quality. More specifically, France, India, United Kingdom, Morocco, Germany, and Italy lead the world in terms of date imports by value. The value of date imports by country in recent years can be found in Table 6, “World Date Imports by Value.”

The following is an estimate of the demand in four key, profitable EU markets.

Table 7. Estimated monthly profitable demand (tons) in four key EU markets

Month	UK	Germany	France	Netherlands	Total
January	1,579	928	1,598	242	4,276
February	1,653	568	1,810	195	4,225
March	1,508	544	757	133	3,012
April	1,429	904	1,598	308	4,239
May	1,877	908	1,715	310	4,810
June	0	962	1,783	262	3,006
July	1,697	1,019	1,780	254	4,750
August	1,929	898	1,981	249	5,056
September	1,735	538	1,923	118	4,313
October	1,192	630	1,365	201	3,388
November	1,491	95	0	192	1,778
December	967	280	0	330	1,577
Total	17,057	8,268	16,310	2,795	44,430

Source: <http://www.usaid.gov/iraq/contracts/pdf/ARDI14-IraqiDateIndustry.pdf>

By examining both volume and value factors, the Inma Date Sector Improvement Program can target the most appropriate dates for long-term project benefit and sustainability.

Table 5. World Date Imports by Volume: Top 10 Importing Countries in the World, 2000 to 2005

Rank	2001		2002		2003		2004		2005	
	Country	Tonnes	Country	Tonnes	Country	Tonnes	Country	Tonnes	Country	Tonnes
1	India	244,370	India	171,520	India	193,760	India	247,880	India	240,410
2	UAE	49,750	Pakistan	38,150	UAE	50,780	Pakistan	51,090	Morocco	37,520
3	Pakistan	37,810	UAE	36,560	Bangladesh	26,080	Yemen	33,190	UAE	32,440
4	Yemen	21,870	Morocco	35,040	Morocco	25,460	Morocco	30,390	Yemen	25,950
5	France	20,860	Yemen	31,20	France	22,830	UAE	26,870	France	25,610
6	UK	12,770	France	23,780	Russia	20,800	Russia	25,120	Russia	21,000
7	Malaysia	12,230	Russia	18,080	Pakistan	18,340	France	24,140	UK	15,680
8	Niger	11,620	Bangladesh	17,610	Yemen	17,370	Syria	17,840	Pakistan	14,950
9	Morocco	11,510	Niger	16,010	Malaysia	13,690	Malaysia	13,100	Malaysia	14,540
10	Russia	11,020	Malaysia	14,090	Niger	13,010	UK	12,750	China	13,200

Source: *ibid.*

Table 6. World Date Imports by Value: Top 10 Importing Countries in the World, 2000 to 2005

Rank	2001		2002		2003		2004		2005	
	Country	USD (1,000)								
1	India	52,785	France	40,618	France	48,090	France	51,529	India	55,753
2	France	32,819	India	27,797	India	33,010	India	46,406	France	54,394
3	UK	17,019	UK	20,475	UK	24,426	UK	26,327	UK	32,352
4	Italy	12,158	Morocco	16,003	Germany	17,067	Germany	18,520	Morocco	23,477
5	UAE	11,639	Germany	13,020	Italy	16,411	Italy	17,091	Germany	22,450
6	Germany	10,578	Italy	12,631	Spain	13,735	Spain	15,880	Italy	17,706
7	Morocco	10,438	Yemen	12,416	Malaysia	12,240	Morocco	15,133	Spain	16,499
8	Malaysia	10,122	Malaysia	12,049	Morocco	11,229	Yemen	13,919	Malaysia	15,134
9	Spain	8,958	Spain	11,132	Canada	10,023	Malaysia	13,041	UAE	13,465
10	China	8,345	Canada	8,285	China	8,515	Canada	10,117	Canada	11,971

Source: *ibid.*

3.2 Market Opportunities for Iraqi Dates

Overview: Fresh and Industrial Dates

The market for dates is divided into dates consumed fresh, which are usually the highest quality dates and the dates found in retail packs in Western markets, and dates that are destined for further processing as ingredients in bakery, confectionary, and other products.

Sayer and Zahidi are the principal varieties for “industrial grade” dates. These dates are classified as “dry” or “semi-dry” dates due to their relatively low moisture content which ranges from 10 to 14 percent. “Fresh” dates, namely Deglect Noors and Medjools found in international markets, are classified such due to their high moisture content of 18 to 26 percent.

Market Players for Fresh and Industrial Dates

Iraq is currently capable of producing large quantities of premium “industrial grade” dates, namely Sayer and Zahidi. Iraq’s main competitors in producing “industrial grade” dates are Iran and Pakistan. Iran grows both Sayer and Zahidis, especially Sayers. Pakistan grows the Aseel and BJ, dry varieties that compete with Sayers and Zahidis.

California, Tunisia, Algeria, and Egypt mainly produce varieties suitable for the fresh market. Fresh variety dates are table fruit and packed accordingly for retail sale. They are not adequate or acceptable for use as ingredients or industrial grade dates due to the high moisture content. Even if they were, the price of secondary or cull fruit of fresh variety dates is far in excess of the cost of premium dry-variety dates. As such, it is not economical to replace the market for dry-variety dates with fresh-variety dates for use as ingredients or industrial grade fruit.

Competitiveness of Dry-Date Market Competitors

Iran Iran is the major competitor to Iraqi dry-variety dates. However, Iran’s date export program suffers under the weight of certain financial sanctions and constraints. Many Western companies are hesitant to buy Iranian products due to fear of negative perceptions resulting from country of origin labeling. Changes in Iranian government policies have resulted in the loss of farm subsidies to Iranian date farmers and it is reported that date packers are no longer provided financial incentives such as no interest or very low interest loans. There is also direct and indirect pressure from governments not to do business with Iran and a growing and continuing fear of future and further sanctions being applied against Iran.

Pakistan Recognizing the opportunity presented by the ongoing political and economic problems of both Iran and Iraq, Pakistan began growing industrial grade dates on a commercial basis. The result has been one of mixed success: Pakistan does not have the optimum climate for industrial date production and catches the tail-end of the monsoon season in most years. Dates grow best in areas where temperatures are high, humidity is very low, and sufficient water is available. High humidity and especially rainfall during and/or immediately after harvesting causes a rapid spike in mold and insect infestation and raises the moisture content of the dates to unacceptable levels. High moisture content in dry-variety dates will cause sugaring and even

fermentation. The FDA regulations do not allow the entry of dry-variety dates into the U.S. if moisture content exceeds 16 percent.

Western buyers have turned to Pakistan as a supplier of last resort. Pakistan has recognized the limited success of commercial production of dry-variety dates and has ceased new plantings of date palms. Western buyers are looking for a supplier capable of reliably shipping dry-variety dates of consistent quality. Although Pakistan remains a competitor, they are viewed as unreliable due to seasonal weather conditions.

Market Opportunities for Iraqi Dates

Iraq is now faced with a unique opportunity to reclaim its position as the world’s largest producer and exporter of dry-variety dates. It is reported that Western buyers will even pay somewhat more for quality Iraqi fruit to avoid buying Iranian fruit due to the risk and potentially negative market connotation or buying from such an unreliable supplier as Pakistan. Although faced with many challenges, there are opportunities for Iraqis to produce the following dates and date products in target production regions within Iraq and for different domestic and international markets:

Whole Dates	Date Products	Value-Added Products
Retail packs	Pitted	Date syrup (dibis)
Wholesale packs	Macerated & Pressed	Date vinegar
	Chipped and/or Diced	Date Energy bars
	Paste	Fructose
		Sorbitol and Mannitol*

*High-value, low-calorie, sugar alcohol sweeteners produced from fructose

3.3 Conclusions

The wars, sanctions, and general turmoil within Iraq over the past 25 years has led to the demise of the date industry during a period when other countries, such as Saudi Arabia, UAE and Iran, were investing heavily in both date production and modern processing facilities, often with the assistance of government subsidies. Fortunately many of the Iraqi date gardens remain and can be rehabilitated by a series of interventions that will provide appropriate farming, post-harvest and processing, and marketing technology, facilities, and skills to the industry.

Implementation of a Date Value-Chain Strategy

A domestic market does exist for dates and date products and, as the economy gradually improves, a market can develop for branded, packaged dates and date products. An established export market for date products exists in global markets if the product is processed in modern, sanitary plants. Ingredient buyers of date products in Asia, EU, and USA can be cultivated and a market established. The key to the rehabilitation of a date industry is to focus on producing product for industrial date products. This requires a central processing plant.

The principal elements in a value-chain strategy will include:

- Improved farming practices and higher yields to include a focus on selected varieties
- Initiation of better post-harvest handling procedures
- Processing and Production of Value-added products
- Export premium date products

IV. IRAQI DATE VALUE CHAIN DEVELOPMENT STRATEGY

4.1 Farming Practices

Improved production is an essential part of any successful agribusiness program. A date extension program is needed to provide information, small-scale tools, and assistance to farmers in important tasks such as pollination (i.e. supply and application of male pollen to farmers). The extension program may initially start on a small scale and can be expanded to reach out to selected regions. This program will be discussed in the following section.

It must be remembered that currently Iraqi date farmers have little incentive to care for the date gardens or improve date production because the price received is very low. Since there are no facilities or systems suitable for producing a higher quality date or date product, there is no market except for a low-quality, bulk product. Furthermore, as with many crops, the dates are all harvested over a two month period; this results in a market glut for a two to four months and limited supply of reasonable quality fruit for the remainder of the year.

4.2 Variety Selection

Iraq grows more than 400 varieties of dates. Each variety of date has its own special set of characteristics, such as size, shape, color, and skin texture. This variability creates obstacles in grading and sorting that lead to problems in processing and marketing a uniform product.

Iraqi producers must produce to meet market demand. Western markets demand industrial grade dates. Sayer is at the top of the list, followed by Zahidi. Since Iraq already has abundant production of the Zahidi variety, every effort should be made to propagate the Sayer variety. This type of information needs to be relayed to producers to influence future planting decisions. These varieties can also be utilized to produce products for the local market.

4.3 Post-Harvest Handling Improvements

The date value chain is only as strong as its post-harvest handling capabilities: post-harvest handling of fruit is the crucial link. In Iraq it is undoubtedly the weakest link and the area where greatest loss occurs. Regardless of how good farming and processing facilities become, the Iraqi date industry will not move up the value chain if the fruit is not properly handled from harvest to final processing.

There is little that can be done in terms of processing if fruit arrives at the processing plant infested with insects and full of dirt and sand. Such fruit cannot be processed into a saleable product.

Post-harvest handling of dates currently in Iraq is generally very poor. The majority of date farmers in Iraq are sharecroppers with minimal education who must be taught proper post-harvest techniques from beginning to end.

Farmer education will be a long-term program requiring constant training, oversight, and compliance. Efforts and funding for improving farming methods and equipment and building a processing plant to produce product meeting Western standards will prove a major disappointment if farmer education isn't seriously and continuously addressed.

4.4 Processing and Value-Added Products

Value-added products are without a doubt the future of the date industry in Iraq. Local markets already absorb all of the low-quality dates at a low price.

Value-added products are produced in modern, efficient processing facilities capable of making the wide variety of industrial grade and retail products demanded by the market.

A modern, efficient processing facility will require USD 5 to 6 million of investment. Such a plant must be located where there is an ample and consistent supply of electricity.

4.5 Safety and Security Considerations

Security is a major issue. Workers must be able to come and go without fear of being watched or the requirement of PSD's or security personnel to escort them to and from work.

Secure access to shipping facilities is a must. Containers must be able to ship quickly and safely without fear of being high-jacked or faced with the threat of attack. Containers must be able to ship in a safe and timely manner.

V. PROPOSED WORK PLAN AND INTERVENTIONS

5.1 Overview

The majority of the 150,000 plus persons (not including wives, children, etc.) living and working on date farms are sharecroppers with little education or training on the care and management of date palms. They have gained knowledge through years of experience of working on the land but lack the training to be considered skilled farmers.

These sharecroppers are the poorest of the poor in Iraq. They do not have money or access to credit and must rely on the landowner to provide any farm inputs, the majority of which live either in Baghdad or increasingly outside the country.

Lacking a working knowledge of date farming, tools, and farm inputs, these sharecroppers are unable to realize yields exceeding 10 kg to 15 kg per date palm. By comparison, yields of 50 kg to 75 kg per date palm would be considered mediocre at best while well-kept date palms routinely yield 125 kg to 150 kg per date palm and more.

The skilled date farmers lack capital and access to credit. Unable to buy tools, fertilizer, insecticides, these farmers are unable to achieve high yields. Local or domestic demand for top-quality dates doesn't exist and Iraq lacks the processing facilities needed to produce date products for export to Western markets. As such, skilled farmers have no outlet for or incentive to produce better quality fruit that would otherwise yield a premium price.

Due to cultural reasons and lack of education, outdated growing practices (i.e. intercropping) that are inefficient and prone to insect infestation cannot be expected to be eliminated for years to come. This, coupled with the unfortunate practice of cultivating and growing unmarketable varieties dates, ensures a constant supply of low-quality dates for many years and the need for a program that will add value to low-quality dates via appropriate processing and marketing activities.

The following section is a discussion of date production, post-harvest, processing and marketing issues and proposed interventions.

5.2 Farmer Education and Production

All farmers in Iraq, even those considered skilled, are in dire need of farmer education in all fields of date growing and handling, including irrigation, fertilization, tree and orchard care, pollination, integrated pest management, harvesting, and post-harvest care and storage. Farmer education should include instruction in basic irrigation methods. Iraqi farmers in fact tend to over-water their trees. Presently flood irrigation is the method currently used. In the long-term, drip irrigation should be introduced to conserve water and to prevent salinity build up and soil compaction.

Farmer Selection

A training program and subsequent value chain development activities will be most successful when the farmers who will most benefit from the educational activities are selected. It's

absolutely necessary to support those farmers with the best chance of success. This requires the careful selection of skilled farmers growing in-demand varieties. This will most likely have to be done working with packers, who know the farmers well and are able to assist the project to determining which farmers might receive assistance.

Given the practice of intercropping in date orchards, it is essential to identify potential beneficiary farmers that are truly and exclusively date farmers. The majority of farmers growing and cultivating date palms only are located in the southern governorates of Babylon, Kerbala, Najaf, and especially Basrah. Identifying date farmers that cultivate the in-demand varieties of dates is also essential. Due to limited resources it is unfeasible to support every farmer in the initial stages of the project. Therefore it is essential to select farmers who will most benefit from project activities and be able to disseminate their knowledge and improved practices throughout the industry. More specifically, farmers growing the Sayer variety, which is the optimal variety for processing, should be targeted in order to produce a value-added product as quickly and efficiently as possible.

Farmer Training and Education Program

The Farmer Education Program should consist of the following elements:

Fertilization

A fertilization program should be included in the program for optimum growth and yields. It's impossible to perform soil testing on every orchard. However, date palms have similar fertilizer requirements to other cultivated crops. Nutrient elements necessary for plant growth and production include: boron, calcium, chlorine, cobalt, copper, iron, magnesium, manganese, molybdenum, nitrogen, phosphorus, potassium, sodium, sulfur, and zinc. A good general fertilizer can be developed for industry-wide application.

Palm Tree and Orchard Care

The trunk should be cleaned to remove a natural habitat for insects. Orchards should be weeded to decrease competition for nutrients. Spines should be removed from fronds to enable workers to prune and pollinate flowers safely. The number of fronds should also be reduced to no more than twelve to enable the palm to produce the maximum amount of high-quality fruit.

Furthermore, the practice of intercropping in date palm orchards should be discouraged. Many farms growing date palms often plant row crops such as onions, cucumbers, and tomatoes between rows of palm trees. The mistaken belief being that the wide fronds protect the crops from the hot sun. Inter-planting of this nature was tried in California, found to be ineffective, and abandoned in the 1950s.



Pollination

The Date Palm is dioecious, having separate male and female plants. Dates are naturally wind pollinated but relying on the wind results in a maximum of 10 percent pollination. To ensure maximum yields, female flowers need to be hand and/or mechanically pollinated. Male flowers need to be harvested and pollen mechanically removed from the flowers and properly and adequately stored.

Post-Pollination Care

Excess flowers should be eliminated to afford maximum production from pollinated flowers. Heavy clusters should be tied up to prevent them from snapping off during high winds. Bagging fruit in the khalal stage provides protection against birds, insects, snakes, and rats feeding on the ripening fruit.

Harvesting Techniques

The practice of simply cutting whole clusters and allowing them to drop to the ground must be eliminated. Instead, selective harvesting should occur, working from the outside of the bunch to the interior. This must be complemented by proper handling of harvested fruit and protection of fruit against infestation. Finally, ripe fruit should be placed in standard-sized plastic totes for movement to the processing facilities.

Integrated Pest Management (IPM)

Iraq suffers from a leaf-hopping insect known in Iraq as the Dubas bug (*Ommatissus lybicus*). Dubas has plagued the country for years. The insect burrows inside fruit, turning the fruit into dripping syrup. The syrup falls on the row crops and citrus planted below the date palms, destroying these crops as well.

There is considerable controversy over what causes Dubas infestations. Many experts believe that attacks are the result of inter-planting row crops in date orchards. It is believed that intercropping raises humidity in the fields and creates an artificial atmosphere for Dubas to thrive in.

During the 1990s, aerial spraying to prevent Dubas was undertaken every year and paid for by the government. Spraying for Dubas helped farmers inter-planting row crops with date palms and kept the mosquito population under control. For many years, Dubas did not appear in the southern governorates and aerial spraying for Dubas in and around Basrah was unnecessary. Dubas spread slowly into the southern areas. Even when the U.S. Army undertook aerial spraying in 2006, no spraying took place in Basrah governorate.

Instead of aerial spraying, there is a very effective and cheap method for controlling Dubas. When injected into the trunk of the tree, phosphine travels up the tree and effectively kills Dubas and prevents larvae from hatching. This can be accomplished by drilling a hole of approximately 1.5 in diameter and installing a plastic sleeve with a plastic cap for future phosphine applications. Drilling of the holes can take place year round. Farmers need only pour a prepared amount of

phosphine into the sleeve in April, the beginning of the Dubas season. The result is a cost-effective method to control the potentially serious damage caused by Dubas attacks.

Field Handling

Selective harvesting and picking fruit from the outside in must be encouraged. Cutting clusters of dates and dropping them to the ground must be prevented in any stage of curing. Farmers storing harvested fruit either in the open or under tarps must be prevented.

Implementation of Agriculture Training and Farming Interventions

The selection and training of farmers may best be organized through packers/collection centers, who already know who the best farmers are and have a vested interest in improving their yields. This should be investigated further as the farmer training program is designed and implemented.

Training can be accomplished working with dates experts and trainers (either from Iraq or other date producing countries) would work with packers and selected farmers to training. in all aspects of tree care; on a job by job, or step by step basis. Perhaps 5 to no more than 10 people should be trained in a group at one time. Each one of these trainers in turn trains a larger group of farmers. Training would be best performed according to the season. For example in February workers clean the tree trunk and go up the tree to prune the spines. March/April is the best time to train workers in pruning fronds and flowers, etc.

One method of providing these services is to form a company to provide "orchard services." or to attach these services to the date collection centers...The agricultural services teams would be trained and supported with consultants. The agricultural services teams need a modest amount of equipment to include, field generators, drills, bits, plastics sleeves, caps--for drilling the holes in trees for IPM, machetes, boots, gloves, eye protection gear, and ladders.

For the longer-term, forklifts or "cherry-pickers" are also a consideration for purchase for pollination and fruit harvesting. Harvesting mechanically is 50 percent more efficient than "hand" harvesting, or climbing up the tree. Trucks or vans to get the workers to and from distance orchards would also have to be purchased.

To develop this program in terms of structure and training programs it is suggested that a good contact is the Iraqi Center for Studies & Investment Information, executive director Dr. Jawad K. Lafta, web: www.icsii.org, email: jawadlafta@yahoo.com. The University may also have individuals that can assist in developing this program.

5.3 Post-Harvest Handling

Logistics Coordination

Every effort should be made to schedule picking and harvesting in a coordinated manner to avoid excess fruit on the market and to prevent bottlenecks in the system. This requires careful scheduling of harvesting and delivery with selected farmers. There must be ample plastic totes and truck capacity available at the time of the harvest.

Rural Date Collection Centers

Weigh stations or collection sheds are needed on a regional basis. Preliminary grading and sorting of fruit should occur at the regional collection points. Simple hot-houses made of plastic and wood erected to cure unripe fruit are necessary, as are adequate and clean storage facilities to hold fruit until it can be transported to a processing plant.

The lowest grade of fruit should be shipped to the processing plant separate from fruit graded for further processing. In either case every effort should be made to prevent infestation. This can be accomplished by building enclosed facilities and using Fostoxin as a fumigant.

Provided that the packing sheds are owned and/or operated by the date packers, fruit not suitable for further processing can be returned to the producer or sold in the local market. In this way the highest grade fruit can be processed to its highest value and local producers can service the domestic market.

Implementation of Date Collection Centers

The specifications for a Date Collection Center need to be defined with assistance from Iraqi date industry managers. With such a plan it is possible to go out for bids to implement the Centers. Important equipment in a date collection center includes:

Generator	Shallow plastic field bins
Grading tables	Secure storage area/ripening facilities
Transportation vehicle(s)	Basic processing

The description of the Collection Center should indicate how it feeds into a central processing center. This will be of particular interest to the potential developer of a collection center, as he needs a way to market high quality fruit at an attractive price. There may also be an opportunity to provide equipment to produce dibis at a collection center in order to serve a regional market. It is important to determine during the planning process if an attractive market exists for dibis.

Date packers themselves would be the logical first choice to operate collection centers. Most date packers have long-standing ties to farmers in the areas where their packing sheds are located. Any and all date packers should be given this opportunity, not just the 9 packers in the loosely supported government group. But it can't be expected they will all be interested as many are very independent and unwilling to give up their authority.

Collection centers could be owned by anyone, not just date packers, and should be open to persons who are qualified and willing to invest or provide land and buildings. The owner/operator should have a vested interest.

Collection center managers who do the job properly should be rewarded accordingly. More grants for equipment, low-interest loans, loans forgiven if certain criteria are met over a specific period of time. Another major incentive for the collection center is the ability to sell to the central processing center.

5.4 Processing Value-Added Date Products

This section discusses a variety of date products that can be processed within a date processing plant and marketed domestically and exported. The processing facility envisaged is similar to facilities found in key date producing countries such as the UAE, Iran and Saudi Arabia.

Date Processing Facilities

A preliminary evaluation of raw material and markets indicates that a 25,000 ton processing facility will be scaled to produce:

- 65 pitted dates
- 20% chopped and diced dates
- 15% paste, dibis, liquid sugar

The plant must be designed to meet market needs and demand.

A modern, efficient central date processing plant capable of producing the appropriate line of industrial-grade date products will cost USD 5 to 6 million in addition to the costs of land, construction, and cold storage. Since there is no public cold storage in Iraq it must assumed the cost of cold storage would have to be added to the project. The primary equipment in the building are grading and processing lines for fresh dates, including a line for semi-mechanical pitting. Other equipment includes a line for macerating dates (removes pits) and pressing into blocks.

Turning low-quality dates into syrup and producing high-quality value added products from the concentrate will most likely cost an additional USD 5 million or more. However, additional research is needed and would be carried out in the second phase of the project.

Such a plant must be located where there is an ample and consistent supply of electricity. At present the only area in Iraq capable of meeting these requirements is Basra, specifically the Zubair Free Trade Zone. Electricity has been available on a 24/7 basis since November. The area is secure and free from insurgent attacks.

It is recommended that the first date processing plant be located at the port of Qum Qasar in the new industrial park. It is secure and close to the port. A date processing facility is most often divided into two buildings. One building/unit is used to receive the raw dates, provide initial

cleaning and grading. This is followed by fumigation and storage (preferably cold storage). In this way dirt, insects, etc. remain outside the second building/unit which is a screened and a hygienic building containing the processing equipment. In this way the fruit remains clean and free of insects.

Processing Opportunities for Industrial Grade Fruit

Dates are a unique baking ingredient. Dates can replace sugar and fat and can also be used as a bulking agent, preservative, and emulsifier. Companies are increasingly refusing to buy hand-pitted fruit for health and sanitary reason. Pitting Sayers and Zahidis mechanically would open the large markets of North America and Europe.

Chopped and Diced Dates

Chopped/diced dates coated in dextrose or oats is a growing market. Trail mix, retail packs, and cereal manufacturers are all major users. Presently Iran is the only country producing a chopped/diced product, which is currently done by hand using long knives or machetes. Most Western companies demand a uniform size cube or dice which requires production by dicing machines.

Date Paste

Date paste, when produced from the right varieties in the correct manner, offers a unique market opportunity. Cookies, cakes, and many sauces use date paste. Western companies would prefer to purchase paste rather than make it due to higher labor costs in Western countries. Iran produces paste by very simple methods that are unsanitary and produce an unsatisfactory product.

Date Energy Bars

It is reported that a California company is producing date based Energy Bars for the U.S. Army. Dates are a very good ingredient base for energy bars.

Date Sugar

Date sugar, a byproduct of a complete processing plant, competes effectively with sucrose where demand for dry sugar is required.

Fresh Date Processing

Iraq grows some varieties of dates qualifying as table fruit. Halawi, Barhee, Khadrawi and Khestawi are varieties consumed in North Africa, Middle East and Asia as whole fruit. To access this market, it is necessary to produce and export fruit to the higher food standards now being implemented everywhere in the world. This requires a modern and efficient date processing plant.

Preparation of retail packages of dates requires limited equipment and utilizes considerable hand labor in the grading and packing of fruit. A key requirement is a clean and hygienic facility in

order to avoid infestation of the fruit. While the new processing facility may include a small line for fresh market dates, the emphasis of the plant will be on industrial grade dates.

Processing Opportunities for Low-Quality Dates

First and foremost among the problems faced by the Iraqi Date industry is the predominance of low-quality dates. Low-quality dates are used as animal feed and processed into low-quality dibis (date syrup). Local demand can only absorb a small percentage of this production.

The main component of all date cultivars is the sugar. Invert sugar (an equal mixture of glucose and fructose) is the dominant saccharide type in Iraqi date cultivars, while sucrose is the major sugar found in North African dates and sugar processed from corn.

Date Syrup (Dibis)

The first step in date syrup extraction is producing dibis. Dibis is widely used in North Africa, Middle East, and the sub-continent as sugar. The better filtered brands replace honey.

Dibis can be produced in the “home” by allowing the dates to gradually liquefy. Due to the rather primitive methods of producing dibis, color, brix, fragrance, and taste all vary from one batch to the next as does quality and keeping quality. Producing dibis of consistent quality represents a unique opportunity to “brand” a retail product.

Commercial dibis is reported to be produced by placing date pulp with water in ratios of 1:3 and 1:2, heating the product and then adding an enzyme to assist to breaking down the pulp. Research in Egypt indicated that the break-down can be accomplished in tanks in 90 to 120 minutes. The product can then be concentrated to the desired viscosity and color under vacuum.

The product can then be filtered and packaged. Dibis is a good source of calories and certain minerals such as K, Na, Ca, Mg, Fe, and Zn. Dibis is also reported to be rich in amino acids.

Value-Added Products from Dibis

At a later stage in the development of a processing facility, dibis can be converted to other higher value products. Examples are listed below:

- **Liquid Sugars**

Through sophisticated ultrafiltration (UF) date syrup or dibis can be decolorized and demineralized to produce liquid sugar. Available commercially only in liquid form, invert sugar is sweeter than granulated sugar. One form of liquid inverted sugar was specially developed for the carbonated beverage industry. This form of liquid sugar has many advantages: it dissolves instantly, hot or cold, and sweetens uniformly so that the last sip is as sweet as the first. It contains 25 percent fewer calories per teaspoon than sucrose. Liquid sugar is much easier to mix with beverages and ensures a more stable product that naturally resists re-crystallization.

Utilizing date syrup as feedstock for the production of high-fructose syrup (HFS) and even pure fructose needs evaluation. Producing HFS and fructose is promising when compared to

processing starch as the high concentration of sugar in dates should compete against HFS and fructose produced from starch. The exact equipment requirements and economics needs further study.

- Sweeteners

Polyols (sorbitol and mannitol) production should also be considered. Polyols are sugar alcohols that are not listed as sugars but as a separate group of nutritive sweeteners on ingredient labels. They exhibit reduced caloric values compared to the value of other sugars, which make them applicable as sweeteners in “light” foods. Sugar alcohols are metabolized independently of insulin and are thus used in diabetic food products.

Polyols can be derived through the hydrogenation of purified date syrup that contains glucose and fructose exclusively in approximately equal amounts. The hydrogenation will produce sorbitol and mannitol. Besides applications in the food industry as low-calorie sweeteners, mannitol is also used in the pharmaceutical industry.

- Fermentation of Date Syrup (Dibis)

Citric acid is another possible by-product of date syrup fermentation. Although date syrup has been investigated in Iraq as a source to produce citric acid, the results of these studies have not been disseminated. Citric acid is the most important organic acid produced in tonnage by fermentation. Date syrup can be fermented. Surface fermentation is used in industries of small to medium scale to produce citric acid because it requires less effort in operation and energy cost.

Date syrup can also be fermented into ethanol for medical usage or used as a fuel. Date syrup needs the least amount of pretreatment and gives higher yields compared with other available sugar sources such as molasses and liquefied and saccharified starch.

Iraq has long produced date vinegar from low-quality dates. However, the vinegar has been produced without benefit of yeast or enzymes, resulting in a low-quality and very inconsistent product. A consistently high-quality product can be produced for retail consumption using modern techniques. Vinegar consumption is growing world-wide at a rate in excess of 7 percent. In North Africa, Middle East, and the sub-continent, date vinegar is the top-selling variety.

- Other Applications

The global market for baker’s yeast is expanding at 4 percent plus per annum. The conventional feedstock for baker’s yeast has always been molasses. Due to improvements in beet and cane sugar refining and the quality of molasses, this feedstock is declining. Filtered date extract is an ideal feedstock substitute.

Implementation of the Date Processing Center

A pre-feasibility study will be prepared for the processing center based on the results of the field work in Dubai and Italy and assistance from the most important date equipment supplier in the USA (Elliott Manufacturing, Fresno, CA). In general the equipment from Italy and Dubai was considered equal in cost or even more expensive than equipment from a firm such as Elliott. This is in part due to the weak dollar.

With approval of the pre-feasibility study and processing center, the general specifications can be prepared and submitted for bids. Date processing is a very specialized business and Elliott has dominated the industry for a number of years. It is likely that some of the equipment, such as a line for dibis production could be provided by other firms.

The primary question is whether the plant equipment is purchased on a sole source basis or it requires a bidding process. In the case of a sole source contract the engineering can be provided by the equipment company. If a bidding process is utilized an engineer will be required. Unfortunately there are very few food plant engineers familiar with date processing. Similarly the buildings need to be designed an engineered to meet international food preparation specifications. It is assumed that appropriate engineers can be found in the Gulf Region to prepare specifications for the building.

Processing-Phase II

If additional, high value products are added to the processing plant, further research is required in terms of cost and return, and equipment requirements. An analysis of equipment and transformation costs versus the value added to convert dibis to liquid sugar, from liquid sugar to fructose, from fructose to mannitol and sorbitol must be made and this requires addition research on the optimum technology, economics and markets.

5.5 Markets and Marketing

In order to re-enter world markets, Iraq must produce in-demand products at competitive prices. Without a processing plant, it's simply not possible to produce those in-demand products. Without processing low-quality dates into derived value-added products Iraq will not be able to export enough dates to keep farmers in business.

Consistency of supply is a major hurdle for Iraq to overcome and will take several seasons to do so. Major consumers of processed dates left the market in droves by the 1990s due to supply and quality problems, not because of price. Prices for Iraqi dates were higher in the 1980s than they are today without taking into account inflation.

Note that a strong market for liquid sugar exists in the Gulf region among the many beverage plants. This opportunity needs further investigation.

Dates were once a major ingredient in the baking industry. Baking giants Nabisco, Burton's, and Bordo all closed down their date processing facilities due to lack of adequate and consistent

supply. Major food service providers Kraft, Del Monte, and Calavo also closed down operations because of supply problems.

Iraq will not quickly nor easily regain their position as the world's top date exporter but the opportunity does exist.

VI. PHASED DATE VALUE CHAIN DEVELOPMENT PROGRAM

A date industry improvement program needs to be implemented in phases, as do the processing facilities. The following is a sample work program of project activities and objectives:

2008

- Prepare pre-feasibility analysis for the establishment of a model date processing plant to be located near Basrah utilizing information from:
 - Research conducted in Iraq from October to December 2007
 - Information in the Date Sector Report
 - Processing equipment research and date industry seminar conducted in UAE and Italy in December 2007
 - Discussions with experienced, California-based date processing equipment companies
- Prepare a Work Order for a multi-year Date Industry Rehabilitation Plan
- Prepare equipment and building specifications for the date processing center and seek bids
- Contract for date processing equipment and building, including cold storage
- Form Iraqi company with appropriate investors to own and operate the date processing center
- Initiate one or two model rural date collection centers supported by date Farm Services Teams

2009

- Initiate four to six additional date collection centers supported by date Farm Services Teams
- Identify and hire key management staff for date processing center
- Complete date processing center and commission
- Develop date procurement program for the date processing center
- Operate date processing center for 2009 harvest
- Evaluate other value-added processed date products to be added to the processing center
- Prepare Work Program for 2010 and 2011

VI. ANNEXES

- Annex A Trip Report on UAE and Italy, December 4 to 17, 2007, Prepared by Rocky Walsborn
- Annex B Brochures from Date Equipment Companies in UAE, Italy, and USA
- Annex C ICARDA Workshop Agenda on “Date Postharvest Handling and Processing,” December 9 to 11, 2007, Dubai, UAE