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Strawberry Profitability Study

Inma
AGRIBUSINESS PROGRAM

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Executive Summary

Strawberry production in Iraq is a medium risk business characterized by a relatively high investment (on average $10,000/donum) and by high price volatility. The current cost of production ($2.61/kg) [1] is considerably higher than in neighboring countries mainly due to the fact yields in Iraq are poor (on average 10 – to 15MT/ha) for lack of appropriate IPM (Integrated Pest Management), poor fertilization and fertigation, insufficient crop management and possibly salinity of the soil and water.

Under current circumstances (crop management practices) strawberry production in Iraq is recommended for the highly profitable markets of Karbala (from August to April) and Najaf (from October to February). In all the other areas (Baghdad and remaining governorates) estimated cost of product sold (at around $2.61/kg) is higher than market prices at farm gates year round.

The introduction of a new crop management and technology supported by *Inma* based on proper IPM (Integrated Pest Management), proper use of drip irrigation and fertigation is expected to raise yields from current 10MT/ha to a minimum of 40MT/ha reducing cost of product sold from a current $2.61/kg to $1.75/kg. [2]

This leap in productivity, coupled with correct post-harvesting practices, will allow Iraqi farmers to be highly profitable in Karbala and Najaf all around the year and to achieve a significant profitability (on average $4,500/donum) in Baghdad and all the remaining governorates in the months October to April.

[1] Cost of product sold, discounting losses in harvest and post-harvest estimated at 20%.
[2] This study should be regarded as a guide, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. The practices described are based on production procedures considered typical of the crop in Iraq or recommended based on best practices principles. Nevertheless the numbers provided in this study may not apply to every situation.

Strawberry Market Overview

Consumption of strawberries in Iraq is relatively low, standing at an average of 80g per capita/year[3], meaning a market of approximately 2,200MT/year. Most of the strawberries consumed in Iraq are imported from Syria, Iran and Turkey while domestic production is concentrated in the Karbala region. Most of the governorates in Iraq show a price trend for strawberry in line with the Baghdad market, while Karbala and Najaf (to a lesser extent) regularly command prices two to three times higher all year round.[4]

Table 1: Strawberry Wholesale Prices January – June, 2009 in Iraqi Dinars

Month	Baghdad	Erbil	Karbala	Najaf
Jan 2009	3,852	3,545	na	6,000
Feb	2,512	2,873	na	4,969
March	1,998	2,754	3,715	3,825
April	1,758	2,520	5,126	3,341
May	1,710	1,764	7,242	3,388
June	1,900	1,673	7,200	3,500

Source: Anka Wholesale Prices 2009

Typically [5] prices of strawberries reach their lowest point during the months of May, June and July when most of the production from the Middle East countries, including Iraq, comes into the market. The price for strawberries is highly seasonal and volatile. An analysis based on the series of prices over the last five years (2005-2009) [6] shows there are basically two patterns of seasonality in Iraq: the regional level, applicable to Karbala and Najaf; and Baghdad and all the remaining governorates. [7]

Table 2: Strawberry Price Seasonality in Baghdad and Karbala and Najaf

Price Seasonality Index-May to July =100	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baghdad and "Remaining" Governorates	220	220	175	165	100	100	100	110	120	155	220	220
Karbala and Najaf	150	150	125	112	100	100	100	100	120	135	150	150

Source: Anka Wholesale Prices 2009, Inma Seasonality Study for Horticultural Produces, Miraq (UAE)

Historically prices for strawberry in Baghdad and "remaining governorates" (excluding Karbala and Najaf) more than doubled in winter time (November to February) with respect to

[3] Iraq Households Socio Economic Survey IHSES, COMIT and The World Bank, 2008.
[4] The supposed reason for higher prices in Karbala and Najaf is the strong demand from the religious tourism, although limited competition (strict control by locals providers of the catering the religious tourism channel) may also play an important role.
[5] Based on *Inma* seasonality model developed over series of four years (2006 – 2009).
[6] Based on data provided by Anka and Miraq (MAIN strawberry producer and traders in UAE).
[7] To simplify hereafter in the study "Baghdad" will be used as abbreviation of "All the governorates but Karbala and Najaf".

those of peak harvesting time (May to July). Karbala and Najaf shows less accentuated "normal" [8] curves (flatter curves) with winter prices (November to February) only 50% higher than in peak harvesting season. The analysis of strawberry profitability is conducted using a model built on 2009 prices and, subsequently adjusted for seasonality using historical series on a wider span of time (2005 – 2009). *(Reference Attachment 1)*

The chosen starting point of the model is the 2009 peak harvesting price (May to July) in Baghdad (a factual data) that is considered as a reference and benchmark (ID 1,800/kg - $1.5/kg) being consistently in line with the international price trend for strawberry. [9]

The second step of the model is to determine the reference price (May to July) for the market of Karbala and Najaf. The reference price for Karbala and Najaf is expressed as a ratio of the price in Baghdad based on historical series for the same period. Based on historical series, the ratio adopted for Karbala and Najaf are respectively 2.5 (ID 4,500) and 2.0 (ID 3,600).

The final step of the model is the recalculation of the monthly prices using the historical series for seasonality. The table below should be regarded as a probability function of the most likely prices to occur in the market, based on historical series, and updated with the latest available data trend (2009):

Table 3: Strawberry Price Probability Function (Expected Price for a Long Term Sustainability Analysis)

Expected Price	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baghdad ID/kg	3,960	3,960	3,150	2,970	1,800	1,800	1,800	1,980	2,160	3,150	3,960	3,960
Baghdad $/kg	3.30	3.30	2.62	2.47	1.50	1.50	1.50	1.65	1.80	2.62	3.30	3.30
Karbala ID/kg	6,750	6,750	5,625	5,040	4,500	4,500	4,500	4,950	5,400	6,075	6,750	6,750
Karbala $/kg	5.63	5.63	4.69	4.20	3.75	3.75	3.75	4.13	4.50	5.06	5.63	5.63
Najaf ID/kg	5,400	5,400	4,500	4,032	3,600	3,600	3,600	3,960	4,320	4,860	5,400	5,400
Najaf $/kg	4.50	4.50	3.75	3.36	3.00	3.00	3.00	3.30	3.60	4.05	4.50	4.50

Source: Anka Wholesale Prices 2009, Inma Seasonality Study for Horticultural Produces

[8] The normal distribution curve or Gaussian is a continuous probability distribution that describes values around a mean or average. The graph of the associated probability function is bell shaped.
[9] Dubai market used as a main benchmark along with price of Strawberry in EU27 for the season 2009

Current Scenario: Supply Side - Production Costs and Profitability

Production Costs

The estimated cost of producing 1kg of strawberries in Iraq [10] is relatively high if compared to other strawberry producing countries. Current cost of product sold [11] has been estimated at around $2.61/kg as compared to $1.32 in Egypt and in the range of $1.14 and $1.28/kg respectively in Iran and Syria.[12] *(Attachment 2)*

High production cost in Iraq is due to the following factors:

- Extremely low yields, in a range of 12 to 15MT/ha (mode 3.6MT/donum);
- High costs of the plants since they are mostly imported ($0.20/unit);and
- Relatively high cost for the plastic (for mulch and tunnels) and irrigation system.

In a benchmark analysis, [13] low yields (10 to 12MT/ha) looks undoubtedly to be the major drawback in Iraq taking into account that yields as high as 50-60MT/ha are considered standard in the industry (California has on average 67MT/ha, Egypt 62MT/ha, Poland 55MT/ha).

Current low yields in Iraq (on average 0.3kg/plant) may be attributable to the lack of proper IPM [14] (Integrated Pest Management), poor fertilization and fertigation [15] and above all to salinity. [16] Soil salinity (and possibly water salinity) is indeed a key issue in strawberry production: The strawberry is in fact one of the most salt sensitive crops produced in Iraq. Salt accumulation at the soil surface inhibits root development from the crown, decreases root development, water uptake, growth rate, and fruit yield. Soil salinity is measured by electrical conductivity (EC_e) an indicator that estimates the amount of total dissolved salts (TDS), or the total amount of dissolved ions in the water.

Typically strawberries yields are significantly affected by salinity levels:

Table 4: Strawberry Yield Potential with Increasing Salinity

100% Yield	90% Yield	75% Yield	60% Yield
EC_e < 1.5	EC_e = 1.5-2.5	EC_e = 2.5-3.5	EC_e = 3.5-5.0
ppm 1,000	ppm 1,500	ppm 2,100	ppm 3,000

Source: California Strawberries Advisory Board

[10] Best estimated cost based on information collected with farmers in Karbala.
[11] Based on data provided by farmers in the Karbala region, currently the most important production clusters in the country. Taking into account farmers utilize plastic mulch and low tunnels all around the year and drip irrigation. Cost of product sold discounts harvest and post-harvest losses estimated at a 20%.
[12] Euromonitoring Strawberry Market Analysis, 2009.
[13] An analysis comparing any single factor of costs among several countries to identify strengths and weaknesses.
[14] Strawberry is a crop highly prone to diseases.
[15] Fertigation is the process of fertilizing through irrigation via soluble fertilizers.
[16] Soil and water salinity, reminding water salinity is rarely tested in Iraq.

In general, strawberry production is not recommended with a level of salinity >4 EC_e, (2,500 ppm) while levels around 2.5 (1,500 ppm) usually reduce yields by 25%, and level around 4.0 (3,000 ppm) by 40%. Yields for strawberry in Iraq may also be negatively affected by poor IPM (Integrated pest Management) taking into account crop susceptibility to molds, insect attacks, diseases and fungi. In particular field visits taken place in Karbala region have highlighted lack of pre-plant fumigation and insufficient usage of defensives.

Currently, with a cost of product sold at around $2.61/kg, strawberry farmers in Iraq can make a profit (green area in Table 5) in the extended out-of-season in Karbala (August to April) and in winter time in Najaf (October to February). Production costs would exceed market price all year round in Baghdad [17] and April to August in Najaf (pink area in Table 5). A virtual break-even (white area in Table 5) would occur in the months May to June in Karbala and March, and September in Najaf.

Table 5: Strawberry Margin Map in Iraq

Farm Gate Price*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baghdad $/kg	2.31	2.31	1.84	1.73	1.05	1.05	1.05	1.16	1.26	1.84	2.31	2.31
Karbala $/kg	3.94	3.94	3.28	2.94	2.63	2.63	2.63	2.89	3.15	3.54	3.94	3.94
Najaf $/kg	3.15	3.15	2.63	2.35	2.10	2.10	2.10	2.31	2.52	2.84	3.15	3.15

Source: Anka Wholesale Prices 2009, Inma Seasonality Study for Horticultural Produces
**Strawberries: Farm Gate Price/kg Based on Wholesale Anka Price -30%.*

Profitability

Growing strawberry requires a total estimated investment of almost $10,000 per donum. Working capital is around $5,200/donum, while fixed investment is in the range of $4,800/donum ($3,800/donum for plastic tunnels and an additional $1,000/donum if drip irrigation is added). Positive returns start to be achieved only with prices above $2.90, a level currently only achieved in Karbala from October to March and Najaf in November to February.

[17] In the table Baghdad should be read as Baghdad plus all the other governorates but Karbala and Najaf.

Table 6: Strawberry Production in Iraq – Sensitivity Analysis

Scenarios Yields 3.6MT/Donum – Prices from $2.0 to $3.80/kg							
Price at Farm Gates $/kg	**2.0**	**2.30**	**2.60**	**2.90**	**3.20**	**3.50**	**3.80**
Net Sales $/Donum	5,760	6,624	7,488	8,352	9,216	10,080	10,944
Net margin $/Donum	(-1,755)	(-891)	(-27)	837	1,068	2,565	3,429
Cost of Product Sold $/kg	2.61	2.61	2.61	2.61	2.61	2.61	2.61
Net Margin $ per kg	(-0.49)	(-0.25)	(-0.01)	0.23	0.47	0.71	0.71
Net margin/ Net Sales %	-30%	-13%	0%	10%	18%	25%	31%

In comparison, wheat farmers in Iraq make on average a margin of $700/donum (in the absence of subsidies) and up to $1,200to $1,600 (with subsidies) with an investment as low as $400 per donum.

A New Pattern of production for Strawberry in Iraq

The USAID *Inma* program is planning a total of 9 donums of strawberries demonstration sites to demonstrate the advantage of modern/alternative technology in strawberry production leading to higher yields, lower production cost and better profitability for farmers.

The expectation of higher yields relies on the following assumptions:

- The import from USA or Turkey of disease-free strawberry plants of the varieties *Ruby Gem, Sweet Charlie* and *Florida*;
- More advanced soil management with soil test to avoid high level of salinity;
- The adoption of more advanced IPM (Integrated Pest Management) including soil pre-plant fumigation; and
- The introduction, or improved use, of modern drip irrigation and fertigation technology.

Inma considers there is a realistic opportunity to increase strawberry yields from the current 10 to 12MT/ha to a minimum of 40MT/ha.

Table 7: Strawberry Estimated Profitability with the Adoption of New Technology Yields 40MT/ha

Scenarios Yields 10MT/Donum – Prices from $2.0 to $3.80/kg							
Price at Farm Gates $/kg	**2.0**	**2.30**	**2.60**	**2.90**	**3.20**	**3.50**	**3.80**
Net Sales $/Donum	16,000	18,400	20,800	23,200	25,600	28,000	30,400
Net margin $/Donum	1,988	4,388	6,788	9,188	11,588	13,988	16,388
Cost of Product Sold $/kg	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Net Margin $ per kg	0.20	0.44	0.68	0.92	1.16	1.40	1.64
Net margin/ Net Sales %	12%	24%	33%	40%	45%	50%	54%

The introduction of new crop technology and management should lead to a drastic reduction in cost of the product sold from current $2.61/kg to $1.75/kg. This will lead to an interesting profitability ($1,988/donum) [18] even with prices at farm gates at $2.0/kg. Profitability per donum would reach $4,500 with prices at around $2.30/kg and $10,000/donum with a price of $2.90/kg. *(Attachment 3)*

More importantly, with cost of product sold at $1.75/kg, strawberry business is viable and profitable in Najaf and Karbala all year round and becomes viable and profitable in the months of October to April in Baghdad and all the remaining governorates.

Table 8: New Strawberry Margin Map

Farm Gate Price*	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Baghdad $/kg	2.31	2.31	1.84	1.73	1.05	1.05	1.05	1.16	1.26	1.84	2.31	2.31
Karbala $/kg	3.94	3.94	3.28	2.94	2.63	2.63	2.63	2.89	3.15	3.54	3.94	3.94
Najaf $/kg	3.15	3.15	2.63	2.35	2.10	2.10	2.10	2.31	2.52	2.84	3.15	3.15

Source: Anka Wholesale Prices 2009, Inma Seasonality Study for Horticultural Produces
*Strawberries: Farm Gate Price/kg Based on Wholesale -30%.

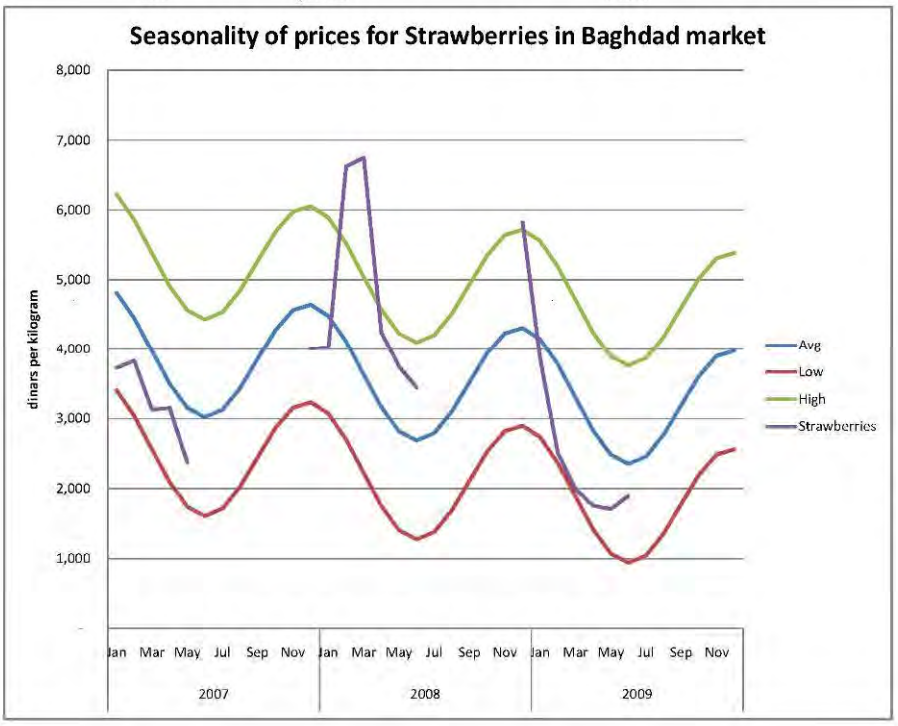
With yields at 30MT/ha the break-even point would occur at a price of approximately $2.10/kg meaning Baghdad market would only be profitable in winter time (November to February) and Najaf market at break-even in the peak of the harvesting season (May to July). With yields in the range of 60MT/ha break-even point would drop to $1.40/kg, a level still not viable in order to enter profitably the Baghdad market and other governorates in the months from May to September.

[18] On average doubled than wheat profitability, although with a much higher investment.

Attachment 1

Seasonality Pattern of Strawberry in Iraq – an Example

R Square	Standard error	Coefficient of Variation
26%	1,411.20	34.6%



Year	Month	Avg	Low	High	Strawberrie
2007	Jan	4,815	3,404	6,227	3,729
	Feb	4,449	3,038	5,860	3,832
	Mar	3,970	2,558	5,381	3,131
	Apr	3,498	2,087	4,909	3,153
	May	3,153	1,742	4,565	2,371
	Jun	3,020	1,609	4,432	
	Jul	3,127	1,716	4,539	
	Aug	3,438	2,027	4,849	
	Sep	3,862	2,451	5,273	
	Oct	4,278	2,866	5,689	
	Nov	4,566	3,155	5,978	
	Dec	4,644	3,232	6,055	4,010
2008	Jan	4,481	3,070	5,892	4,027
	Feb	4,114	2,703	5,526	6,625
	Mar	3,635	2,224	5,046	6,750
	Apr	3,163	1,752	4,575	4,250
	May	2,819	1,408	4,230	3,750
	Jun	2,686	1,275	4,097	3,447
	Jul	2,793	1,382	4,204	
	Aug	3,104	1,692	4,515	
	Sep	3,527	2,116	4,938	
	Oct	3,943	2,532	5,354	
	Nov	4,232	2,821	5,643	
	Dec	4,309	2,898	5,720	5,824
2009	Jan	4,146	2,735	5,558	3,852
	Feb	3,780	2,369	5,191	2,512
	Mar	3,300	1,889	4,712	1,998
	Apr	2,829	1,418	4,240	1,758
	May	2,484	1,073	3,895	1,710
	Jun	2,351	940	3,763	1,900
	Jul	2,458	1,047	3,869	
	Aug	2,769	1,358	4,180	
	Sep	3,193	1,782	4,604	
	Oct	3,608	2,197	5,020	
	Nov	3,897	2,486	5,309	
	Dec	3,975	2,563	5,386	

Attachment 2

Strawberry Production in Iraq: Current Estimated Costs and Profitability			
Strawberries	Donum	*Labor(h)*	
Plants	12,000		Farmgate
Yields kg	3,600	0.30 kg per plant	$/kg
Total Revenue	**$5,760**		$2.00
Total Labor costs	**$170**	*85*	*Other*
Field Preparation	$105		105
Mulch	$250		250
Plants @$0.20/unit	$2,400		
Plant Transplants	$50		
Fertilizers	$68		68
Fumigation	$0		0
Pesticides	$350		350
Insecticides	$0		0
Fungicide	$0		0
Irrigation (drip)	$30		30
Harvest (@25kg/h)	$288		
Post-Harvest Cooling @$0.125/kg	$450		450
Packaging (Clamshell)@$0.10/400gr	$972		900
Transport	$108		
Total Operational Cost	**$5,241**		
Operational Net Margin	**$519**		
FIXED COSTS - DEPRECIATED			
Drip Irrigation	**$330**		
Metal Frame	**$169**		
Plastic	**$706**		
Coolers	**$0**		
Financial Expenses (interest rate 15%/year)	$1,068		
Total costs	$7,515		
Net Margin	-$1,755		

Net margin $ Donum	-1,755		$2.00
Cost of Product Sold $/kg	2.61		
Net Margin $ per kg	-0.49		
Net margin/ Net Sales %	-30%		

Profit & Loss Assumptions
Selling Price at Farm Gates = $2.0/kg
Plants 12,500 per donum
Yields = 0.30kg/plant, 3,600kg/donum
Plants Cost: @$0.20/unit
Post harvest losses: 20%
Packaging Cost: @0.10/400gr
Post Harvest Cooling: @$0.125/kg
Labor: 85h/donum excluding harvest and packaging
Harvest Labor: 25kg/h - $2/h
Packaging Labor: 100kg/h - $2/h

Capital Investment

Tunnel Plastic = $2,119 donum, amortization 3 years
Tunnel Frame = $1,695 donum, amortization 10 years
Drip Irrigation System = $4,000/ha amortization 3 years

Interest Rate = 15% year

Attachment 3

Strawberry Production in Iraq: Estimated Costs and Profitability with the Introduction of New Technology			
Strawberries Karbala	Donum		
Plants	12,500		Farmgate
Yields kg (0.8 kg per plant)	10,000	0.80 kg per plant	$/kg
Total Revenue	**$16,000**	*Labor(h)*	$2.00
Total Labor costs	**$170**	*85*	*Other*
Land Preparation	$126		105
Mulch	$250		250
Plants @$0.20/unit	$2,500		
Plant Transplants	$60		
Fertilizers	$810		806
Fumigation	$0	0	0
Pesticides	$990		990
Insecticides	$510		510
Fungicide	$380		380
Irrigation (drip)	$50		500
Harvest (@25kg/h)	$800	400	
Post-Harvest Cooling @$0.125/kg	$1,250		1,250
Packaging (Clamshell)@$0.10/400gr	$3,200		3,000
Transport	$300		
Total Operational Cost	**$11,396**		
Operational Net Margin	**$4,604**		
FIXED COSTS - DEPRECIATED			
Drip Irrigation	**$330**		
Metal Frame	**$169**		
Plastic	**$706**		
Coolers	**$136**		
Financial Expenses (interest rate 15%/year)	$1,605		
Total costs	$14,012		
Net Margin	$1,988		

Net margin $ Donum	1,988	$2.00
Cost of Product Sold $/kg	1.75	
Net Margin $ per kg	0.20	
Net margin/ Net Sales %	12%	