World Applied Sciences Journal 6 (12): 1625-1628, 2009
ISSN 1818-4952
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Cost of Cultivation of Tomato in Kuwait in Uncooled Plastic Tunnel System - A Case Study

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Abstract: Tomato is one of the main vegetable crops in Kuwait with a total greenhouse production of 39,218.3 tonnes and with a value of $ 9.58 million in 2004. Because of the country's harsh climate, scarce water resources and poor-quality land resources, protected agriculture has a significant role in Kuwait's agricultural development. Tomato is grown in 25% of total area under greenhouse crops and it produces 30% of total value of greenhouse crops. Approximately 89% of protected agriculture is carried out in un-cooled and cooled plastic tunnels. Calculation of the production cost of tomato in Kuwait is very important for both the farmers and the government to achieve efficient crop production and to improve resource management within the country. This study is aimed to estimate the cost of production of tomato in Kuwait in uncooled plastic tunnels. Al-Faisalia farm in Al-Wafra was taken for case study. Tomato (super sweet 100) was grown in uncooled plastic tunnel green house (30 x 9 m) and the costs incurred were categorized into initial investment costs, fixed costs and variable costs.The productivity in the case farm was 4.96 kg/m^2.The total cost to produce one kilogram of tomato was estimated to be $ 1.03. The net profit per square meter and net profit per kilogram were $ 1.41 and $ 0.28 respectively. The study shows that tomato production can be profitable in Kuwait if the available resources are managed efficiently with proper marketing.

Key words: Tomato % Greenhouse % Net profit % Investment cost % Productivity.

INTRODUCTION

Tomato is a main crop in Kuwait with a total production of 39,218.3 tonnes and with a value of $ 9.58 million [1]. Kuwait has a desert climate characterized by a long, dry, hot summer (May-August) with temperatures reaching more than 45°C with frequent sandstorms and a cooler winter December-February), with temperatures sometimes even falling below 4°C. The rainy season extends from October to May. The mean annual rainfall is 113mm [2]. Because of the country's harsh climate, scarce water resources and poor-quality land resources, protected agriculture has a significant role in Kuwait's agricultural development. In the 2003-2004 growing season, greenhouse crops accounted for 14% of the total cropped area and produced 40% of the total value of crop production (Table 1).

Tomato is grown in 25% of total area under greenhouse crops and it produces 19% of total value of greenhouse crops (Table 1). This shows the importance of tomato in the green house crops in Kuwait [1].

Approximately 89% of protected agriculture is carried out in un-cooled and cooled plastic tunnels, with the remaining 11% in cooled greenhouses covered with fiberglass, glass or acrylic material. Many evaporative cooling systems are used in Kuwait, but Celdeck and rope 'pads' predominate [3]. Cucumber and tomato are the two main crops grown in protected agriculture accounting for 76% of the total area [4].

Like other countries in the middle-east, an important aspiration of Kuwait is to achieve at least a modest level of self-sufficiency in food production. To fulfill this aspiration, the state of Kuwait has made massive investments during the past 30-40 years to create favorable conditions for crop, poultry and dairy production. Although the contribution of agriculture to the national GDP is still small, the agriculture sector is making considerable inroads in providing fresh food commodities, in fulfilling citizen's aspirations, in developing career opportunities and in diversifying income sources. Literature review showed that economic feasibility studies were done by University of Florida for

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Table 1: Importance of crop production in Kuwait according to occupied area, quantity of production and economic value during the 2003-04 growing season.

Crop	Value of Crop Production (in million $)	Quantity of Crop Production (in Ton)	Crop Area (in hectare)
Tomato	9.58	39218.3	388.3
Greenhouse Crops	49.43	103480.6	1573.7
Total Crops	123.89	611148.1	11334.9

Source: Annual Statistical Abstract, Ministry of Planning, 2006

greenhouse tomato [5], colored pepper [6]. Engindeniz and Tuzel [7] conducted a comparative economic analysis of organic tomato and cucumber in Turkey. Absence of research on this aspect in Kuwait in the recent years signifies the need for more studies in this area. This study tries to work out cost of cultivating tomato in the widely used un-cooled plastic tunnel system taking Al-Faisalia farm as a case study.

MATERIALS AND METHODS

Calculation of the production cost of tomato in Kuwait is very important for both the farmers and the government to achieve efficient crop production and to improve resource management within the country. Wafra was selected because the concentration of green house crop production was the highest there [3]. In Wafra, Al-Faisalia Farm was selected for the case study.

The study was conducted in an uncooled plastic tunnel green house of size 30 x 9 m (270 m^2) which was selected randomly. The height of the greenhouse was 3.5 m. A plastic flap (1.5×1 m) was provided in both ends of the tunnel for ventilation.

Tomato was grown during September 2nd 2006 to February 10, 2007. in the green house. The variety used was Super Sweet 100. Tomato seeds were sown in germination trays on August 1st, 2006 and maintained in the nursery for one month. Tomato seedlings were transplanted in the greenhouse soil on September 2nd, 2006. Planting was done in double rows which were 60 cm apart with a walking space of 1m before repeating two more rows which were also spaced 60 cm apart. Plant density was 0.35 m^2/plant. The greenhouse soil was enriched with Farm Yard Manure before planting (300g/ plant). Two weeks after transplanting, plants were pruned to a single stem. All side shoots or suckers were removed once in two weeks. Plants were supported by plastic twines. One end of the twine was tied loosely to the bottom of the plant with a small nonslip loop and the other end to an over head wire. Growing point was topped during 2nd week of January, 2007. A water pump was used for irrigation. Polyethylene tubes were used for drip irrigation. Ripe fruits were harvested three times a week. Harvest started on November 5th, 2006 and continued till February 10th, 2007.

Yield data and observations were recorded through out the production period and the income and expense data were collected from the farm. The general cost items of green house tomato production were classified as the initial investment cost, variable cost and fixed cost [8].

The variable costs associated with crop production were all inputs that directly relate to the production and covered labour, fertilizer, pesticides, fungicides, farmyard manure, seeds, electricity, transport and packaging.

In this study, fixed costs included interest on total initial investment costs, initial investment costs for that particular season (September- February) and interest on total variable costs. Interest on total initial investment costs and total variable costs were calculated by charging a rate of 3% (annual average nominal interest rate) on the total initial investment costs and the total variable costs. And from that, the interest for the half yearly period (6 months- for that particular season) was derived [7]. As the same greenhouse was used for cultivating another crop in the following season, interest was calculated for six months only. Depreciation was estimated using the straight line method. The initial cost was divided by its useful years to get its annual cost of depreciation. The conversion of the cost incurred in Kuwaiti Dinar to US Dollars was done at the rate of 3.3 in this report.

Fixed costs and the variable costs make the total production costs. The net profit was calculated by subtracting total cost from total gross income.

RESULTS

In this study all the expenses associated with the production of tomato are given in Table 3, 4 and 5.

Table 3 shows the initial investment cost to construct an uncooled plastic tunnel green house. No cooling system was used. This type of green house costs very less when compared with the other types and it is widely used by farmers in Kuwait. Initial cost per m^2 for the construction of the green house was $ 9.57. The initial investment cost for that season was $ 1.37.

Table 4 shows all the variable costs involved in the tomato production and it was found to be $ 3.58. The products were transported to the supermarket owned by the farm. As the farm was far away from the super market, the transport cost accounted for 27.3% of the total variable cost.

Table 2: Distribution of protected agriculture area (ha) in Kuwait according to the type of covering material and crop.

Crop	Plastic Tunnels	Acrylic	Fiberglass	Glass	Total
Tomato	114.0	0.9	9.5	0	124.4
Cucumber	266.1	0	34.6	2.7	303.4
Eggplant	30.5	0.4	1.8	0	32.7
Pepper	23.9	0	1.1	0.5	25.4
Total fruit-vegetables	475.1	2.1	47.5	3.2	527.9
Leafy vegetables	15.1	2.9	1.5	0	19.5
Tuber/root vegetables	8.1	0.5	0.8	0	9.4
Total	501.7	5.7	50.1	3.2	560.7

Source: PAAFR [4]

Table 3: Initial Investment Cost per m^2 for the construction of an uncooled plastic tunnel greenhouse

Item	Initial Cost (US $)	Useful Life (Years)	Annual Cost (US $)	Cost for that season (US $)	% of Cost
Uncooled plastic tunnel construction	7.33	3	2.44	1.22	
	89.30				
Pots (5 cm)	0.18	5	0.04	0.02	1.30
Irrigation tubes	0.22	3	0.07	0.04	2.70
Water pump	1.83	10	0.18	0.09	6.70
Total	9.57		2.74	1.37	100.00

Table 4: Variable Cost per m^2 for Tomato Production in Uncooled Plastic Tunnel Greenhouse

Item	Cost (US $)	% of the Cost
Labour *	1.83	51.24
Farm yard manure	0.12	3.42
Fertilizer	0.05	1.37
Fungicide and Insecticide	0.06	1.73
Seeds	0.29	8.20
Electricity	0.02	0.68
Transport	0.98	27.33
Yellow sticky boards	0.01	0.34
Packaging	0.20	5.70
Total	3.58	100.00

(*) sowing, transplanting, fertigation, fungicide and insecticide application, pruning, training, packaging etc.

Table 5: Total Cost per m^2 for Tomato Production in Un-cooled Plastic Tunnels.

Item	Cost (US $)	% of the Cost
Variable cost (A)	3.58	69.61
Fixed cost (B=1+2+3)	1.57	30.48
1. Interest on total initial investment cost	0.14	2.80
2. Initial investment cost for that season	1.37	26.64
3. Interest on total variable cost	0.05	1.04
Total (A+B)	5.14	100.00

Table 6: Net Profit per m^2 Obtained from Tomato

Item	Total (US $)	Proportion of Income (%)
Total gross income (1)	6.55	100.00
Variable cost	3.58	21.69
Fixed cost	1.57	9.50
Total cost (2)	5.14	31.20
Net profit (1-2)	1.41	68.80
Net profit per kilogram	0.28	

Total cost for the production of tomato in un-cooled green house is $ 5.14 (Table 5). In this study the total cost to produce one kilogram of tomato was calculated to be $ 1.03 ($ 5.1 / 4.96 kg = $ 1.03).

The harvested tomatoes were marketed in their own super markets. The tomatoes were sold at the price of $ 1.32 per kg. A total yield of 4.96 kg/m^2 was obtained. The gross income per m^2 obtained from tomato cultivation was $ 6.55. Therefore the net profit per square meter was calculated as $ 1.41. Net profit per kilogram for was found to be $ 0.28 (Table 6).

CONCLUSION

The present study indicates that tomato production is economical because of the high consumer's demand in Kuwait. Tomato production in un-cooled greenhouse can be accepted as profitable if there is no yield loss and

proper marketing is done. But the results of the study can not be generalized as the conditions and expenses vary with each farm. Although costs and returns estimated are believed to be typical and realistic, individual growers should adjust values to represent their specific situations and circumstances.

The tomato for the Kuwaitis is an essential item of their diets, accounting for 22.9% of their total expenditure on vegetables. In Kuwait, the growers are not wholly dependent on their farms for a living and therefore farming is not been pursued efficiently or with commercial skill. Farming has become more of a hobby than a 'way of life' to many [9]. Unlike the other farms, the farm that was chosen for the case study was managed properly and the products were marketed efficiently through their own super markets. The study has demonstrated that tomato farming in Kuwait can be profitable. More study is required on marketing of tomato in Kuwait. The attitude of the farmers should change and they should aim for self sufficiency in tomato production reducing the dependency on imports. The competition from the imports can be tackled by making changes in tariffs when the local production comes nearer to the demand. The need of the hour is competitive spirit among the farmers to produce and manage the existing resources efficiently to reduce the dependency on the imports and to attain self-sufficiency in food production.

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