

ECONOMICS OF PISTACHIO INDUSTRY IN IRAN TROPICS

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Abstract

Pistachio is the most important agricultural crop cultivated extensively in Iran's tropics. The country earns sizable income from Pistachio export. To be globally competitive, the production and processing of Pistachio should be economically viable especially in the long run.

This paper aims to analyze the economic viability of production and processing of Pistachio in Iran both in short run and long run. Necessary data were collected through personal interview of randomly selected 100 sample farmers and 10 sample exporters/processors in Kerman province in the crop year 2003-04.

Net returns over variable costs, Net returns over total costs, Returns per Rial of variable costs, Returns per Rial of total costs were calculated and also the Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR) and Break-even techniques were employed in this study.

The results show that production of three major varieties of pistachio was not economically viable in longrun but viable in short run. However, the servicing and export terminals are economically viable both in short run and long run.

Key words: *economic viability; productivity; break-even; long run; short run; variable costs; fixed costs ;cash flow.*

INTRODUCTION

Iran is the world's largest producer and exporter in pistachio industry accounted for 52.89, 58.00, 64.79, and 65.84 percent of world production, cultivation area, export and export value, respectively (FAO, 2003). Currently Pistachio export earnings stand next to petroleum. Around 10 percent of non-petroleum export value is realized from pistachio.

Pistachio is cultivated in Iranian dry regions with low rainfall of nearly 100 mm /year with also extreme geographical climate and temperatures. High salinity level of agricultural water and inadequate irrigation are the main restrictions that farmers are facing (Sedaghat, 2006). Recently the productivity of Pistachio orchards has declined and also the share of Iran in Global Market has decreased significantly due to the above mentioned restrictions (Sedaghat, 2006). As such areas are not suitable to produce other crops economically; hence Pistachio plantation remains the only opportunity of farmers. Moreover Pistachio is one of the major exported produce of the country, so the viability of production and processing should be attained specially in long run to be globally competitive.

There are few studies which attempted to study the economic viability of the crop in the past. Sedaghat (1997) studied the economics of Pistachio plantation and its effect on farmer's income and cropping pattern. He reported that Pistachio plantation was an economically accepted substitution for some other crops in the tropics of Iran. Sedaghat (2002) confirmed the economic theory in poverty and under development in tropical areas of Iran. In this

background, an attempt is made in this paper to analyze the economic viability of the production and processing of major varieties of Pistachio in Iran both in Short run and Long run.

MATERIAL AND METHODS

Data sources and sampling design

Rafsanjan city accounts for 39.42, 43.35, and 49.14 percent of total area planted, bearing gardens and production of Kerman province was purposively selected for this study. For the selection of sample for the study, a two stage cluster random sampling technique was adopted. In the first stage 40 villages and in the second stage 100 sample farmers were selected randomly based on the population of each village. In addition to the sample farmers, 10 processors – cum- exporters were randomly selected for detailed study in the crop year 2003-2004.

Analytical tools

To define the short run viability of the projects, the Net returns over variable costs and Returns per Rial of variable costs was calculated. Here there was no attempt for including the fixed costs which are mainly the initial investment made at the time of project establishment. While, in defining the long run viability it was also an attempt to include the fixed costs of the projects. It is economically more realistic to go to long run viability than short run viability, but defining the short run viability also is important as it shows the ability of the projects to recover at least the variable costs. Especially when the investor's alternatives in hand are few, may be attaining the

short run viability is acceptable but not satisfactory (Kallsen *et al.* 2000, Singh and Singh 2001, Joshi *et al.* 1999 and Chand *et al.* 2002).As Pistachio is the only crop producing by the farmers in the study area and there is no other crop can be economically substituted, hence the short run viability of the projects also seems realistic to be calculated and compared with the long run one.

To assess the economic viability of production and processing of Pistachio in Long run the three main discounted cash flow methods were employed. They are: Net Present Value (NPV), Benefit- Cost Ratio (BCR) and Internal Rate of Return (IRR) .The related formula for these methods are as follows:

$$NPV = \left[\sum_{t=1}^n (R_t - C_t) / (1+d)^t \right] - I \dots\dots\dots(1)$$

$$B-C \text{ Ratio} = \left[\sum_{t=1}^n (R_t - C_t) / (1+d)^t \right] / I \dots\dots\dots(2)$$

$$IRR = \sum_{t=1}^n [(R_t - C_t) / (1+\gamma)^t] - I = 0 \dots\dots\dots(3)$$

where,

- R_t = Cash inflows in period t
- C_t = Cash outflows in period t
- n = Economic life in years
- d = Discount rate
- I = Initial investment
- γ = Internal rate of return

Break-even analysis

The break-even analysis was attempted to ascertain the minimum revenue and minimum output at the current output price that is needed to cover at least the cost of production. Similarly, break-even price was also

assessed. The break-even analysis will also facilitate the sensitivity of the projects as well.

The break-even revenue (variety -wise) was calculated using the following formula (Vohra, 2001):

$$BER = F / (1 - VC/S) \dots\dots\dots(4)$$

The break-even output determined using the equation (Johl and Kapur, 2001)

$$BEO = FC / (S-VC) \dots\dots\dots(5)$$

The break-even price was determined as

$$BEP = BER / Y \dots\dots\dots(6)$$

where,

- BER = Break even gross revenue /Ha.
- BEO= Break-even output /Ha.
- BEP = Break-even price / Kg.
- F = Annualized fixed cost
- V = Variable cost per Kg. of output
- S = Selling price per Kg.of output
- Y = Yield in Kg/ Ha

The annualized fixed cost was obtained as follows

$$F = P / [1 - (1+d)^{-n} / d] \dots\dots\dots(7)$$

Where,

P is the present value of total fixed cost,

F is Annualized fixed cost,

d is discount rate, and

n is economic life of project.

RESULTS AND DISCUSSION

Returns from major varieties of Pistachio

The returns of major varieties of Pistachio are shown in Table 1. The net returns over variable costs were positive against the negative net returns over total costs for all the varieties of Pistachio. The positive net returns over variable costs show that the major varieties were economically viable in the short run. As the net returns over total costs were negative, none of the major varieties are said to be economically viable in the long run. Returns per Rial of variable costs were greater than unity but Returns per Rial of total costs were less than unity for the major varieties of Pistachio.

Returns from major processing terminals

The returns of major processing terminals of Pistachio are shown in Table 2. The net returns over variable costs and total costs were positive for both servicing and exporting terminals indicating that they are viable both in the short run and in the long run. Moreover, Returns per Rial of variable costs and total costs were greater than unity. Looking at the results, it can be comprehended that in the short run the servicing terminals are more economically viable as is clear from the higher value of returns over variable costs. Conversely, in the long run the exporting terminals were found to be more economically viable as highlighted by the respective values.

Investment analysis

As indicated in the methodology, the economic viability of the three varieties of pistachio gardens, variety-wise, was assessed using the discounted cash flow measures. The net present value of the three varieties was negative indicating that pistachio production is not viable (Table 3). This is corroborated by the IRR values of less than the required rate of 18 per cent and the B-C ratio of less than unity. The major reasons for the non-viability of pistachio gardens in Iran are low yields, high cost of production and low prices of the output. The economic viability analysis of the processing terminals is presented in Table 4. The results show that both the servicing and export terminals are economically viable as indicated by high positive values of NPV, more than unity of B-C ratio and high IRR.

Break-even analysis

The break-even analysis was attempted to work out the break-even revenue, break-even output and break-even

price of different varieties and the results are presented in Table 5. It can be seen from the table that the actual yield, price and revenue are lower than the break-even yield, break-even price and the break-even revenue for the three major varieties of Pistachio produced in Iran. This clearly shows that pistachio production is not economically viable. This calls for efforts at improving yields and realistic pricing of the produce to make the pistachio farmers to continue in production. This is all the more essential as there is no substitute for this crop in major pistachio producing province of Kerman. Similarly, the break-even analysis was attempted both for the servicing and export terminals. The results of the analysis presented in Table 6. clearly show that the actual output handled, service charge/price realized and the revenue are higher than the respective break-even figures. This is a very clear indication that the servicing and export terminals are viable propositions. This is a clear indication that these two type of terminals, that are also the traders/wholesalers, are making huge profits (specially exporting terminals) at the cost of the pistachio producers making them unviable.

ACKNOWLEDGEMENTS

It is an opportunity to express my sincere thanks to Agricultural Research and Education Organization, Government of the Islamic Republic of Iran and Iranian Pistachio Research Institute for all supports which granted in rendering the current study.

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Received for publication on March 8, 2006
Accepted for publication on September 20, 2006

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Tab. 1.: Returns from major varieties of Pistachio in the study area

10 Rials/farm)

Varieties Particulars	Fendoghi (4.56 Ha)	Kaleghoochi (5.30 Ha)	Akbari (4.21 Ha)
A. Yield (Kg/farm)	3119	3805	2960
B. Gross returns	7,239,292	9,380,311	7,547,056
C. Net returns	—	—	—
i) over variable costs	3,039,730	3,857,180	3,358,087
ii) over total costs	-849,982	-764,839	-312,040
D. Returns per Rial of variable cost	1.72	1.70	1.80
E. Returns per Rial of total cost	0.89	0.92	0.96

Tab. 2. : Returns of different Pistachio processing plants

(10 Rials/year)

Particulars	Servicing terminals	Exporting terminals
A. Revenue from processing		
working days in year	50	60
working hours per day	8	16
Quantity processed per hour (kg)	2,500	7,500
value charged per Kg (10 Rials)	50	35
Total revenue from processing (10 Rials)	50,000,000	252,000,000
B. Revenue from export	—	
Quantity exported (tones/year)	—	3000
Revenue from each tone exported (10 Rials)	—	250,000
Total revenue from export (10 Rials)	—	750,000,000
C. Total Gross revenue (10 Rials)	50,000,000	1,002,000,000
D. Net Returns		
Returns over variable costs	37,118,800	598,600,000
Returns over total costs	6,959,922	272,314,954
Returns per Rial of variable costs	3.88	2.48
Returns per Rial of total costs	1.16	1.37

Tab. 3. : Economic viability of pistachio farms in Kerman Province, Iran

Variety	Initial investment (10 Rials)	NPV(10 Rials) @18%	IRR (%)	B-C ratio @18%
Fendoghi	16,631,613	-8,402,774	12.46	0.49
Kaleghoochi	19,498,247	-8,991,670	13.05	0.54
Akbari	15,450,000	-6,671,439	13.45	0.57

Tab. 4. : Economic viability of processing terminals in Kerman Province, Iran

Processing mode	Initial investment (10 Rials)	NPV(10 Rials) @18%	IRR (%)	B-C ratio @18%
Servicing Terminals	156,000,000	26,488,010	21.32	1.17
Export Terminals	838,800,000	1,502,636,493	52.20	2.79

Tab. 5. : Break-even analysis of major varieties of pistachio in Kerman Province, Iran

Varieties	Fendoghi	Kaleghoochi	Akbari
Particulars			
Annualized fixed cost (10 Rials/Ha.)	853,007	872,079	871,764
Total variable cost (10 Rials/Ha.)	920,956	1,042,100	995,004
Variable cost (10 Rials/Kg)	1,346	1,451	1,415
Gross revenue (10 Rials/Ha.)	1,587,564	1,769,870	1,792,650
Selling price (10 Rials/Kg)	2321	2465	2550
Output (Kg./Ha)	684	718	703
Break-even revenue (10 Rials/Ha.)	2,030,969	2,127,022	1,959,020
Break-even yield (Kg./Ha.)	875	860	768
Break-even price (10 Rials/Kg.)	2,969	2,962	2,786
Break-even Index	1.28	1.20	1.09

Tab. 6. : Break- even analysis of processing terminals in Kerman Province, Iran.

Terminals	Servicing terminal	Servicing-cum- exporting terminal
Particulars		
Annualized fixed cost(10 Rials / terminal)	30,158,878	326,285,046
Total variable cost(10 Rials / terminal)	12,881,200	403,400,000
Variable cost/Kg handled (10Rials/Kg)	12.88	56.03
Service charge / revenue realized (10 Rials /Kg handled)	50	285
Break-even service charge/revenue (10 Rials /Kg handled)	40.75	56.65
Quantity handled (Tons/terminal/year)	1000	7200
Break even quantity (tons/Terminal/year)	812	1425
Revenue realized (10 Rials /year/terminal)	50,000,000	1,002,000,000
Break-even revenue (10 Rials /year/terminal)	40,755,240	407,856,307
Break-even Index	0.81	0.20