

# ECONOMIC RESULTS OF THE GREEK TOMATO PROCESSING INDUSTRIES, CLASSIFIED ACCORDING TO THEIR SIZE

NIKI LAIOPOULOU (\*)

The sector of industrial tomato processing in Greece, contributes in a very dynamic way to the economy of the country, representing in addition, a very important source of foreign currency with exports reaching around 80-100 billion drachmas<sup>(1)</sup> per year (IOBE, 1981; Matalas, 1985).

Out of the sixty seven industrial units existing, around fifty of them operate on a regular basis. In most of them, other vegetables and fruits, are also being processed (SEKOBÉ, 1985). Around 50% of these operate on a co-operative basis. Most of the facilities were constructed during the 1970s. Their processing capacity ranges from 300 to 2,250 tonnes per 24 hours while their productive operation period usually ranges from 50 to 55 full 24-hour periods per year (Laiopoulou, 1992; Oustabasidis, 1990).

During the 1970 processors took advantage of a favorable financial climate and borrowed heavily to modernize their facilities and to update their processing equipment utilized.

The advantageous situation that they were then occupying in the market during 1970-80 was not followed though, by the necessary actions that would allow them to protect themselves against the incoming competition, after 1980 mostly external, as well as the effects that the Gatt agreements had on the way agricultural trade has been conducted (Kamenidis & Priporas, 1995; Papageorgiou & Koliris, 1995).

This resulted in the whole sector is becoming, heavily indebted with no foreseeable solution to the problem (Delivani-Negreponi, 1983).

## ABSTRACT

Industrial tomato processing holds a central and important position, from an economic point of view, in the Greek economy as a whole. Despite its great potential though, the industry is plagued by chronic, apparently insurmountable, financial problems. In an effort to view closely the sector and to establish the facts before any corrective action is taken, this paper examines the economic results of the relevant industrial units classified into three groups (Large, Medium, Small). The classification was based on the capacity of the processing equipment used, the only accurate index of size at our disposal.

## RÉSUMÉ

*L'industrie de transformation de la tomate joue un rôle économique central et important dans l'économie grecque dans son ensemble. Malgré ses grandes potentialités, l'industrie est tourmentée par des problèmes chroniques et financiers apparemment insurmontables. Afin d'examiner de près le secteur et pour établir les faits avant de prendre toute action corrective, cet article examine les résultats des unités industrielles marquant les calssifiées en trois groupes (Grandes, Moyennes, Petites). La classification a été basée sur la capacité du système de transformation utilisé qui est le seul indice précis de la taille à notre disposition.*

In addition, the sector is continually asking for assistance and subsidies without being in a position to get out of the perpetual circle of loan-taking. As a result, some of the smaller units have gone bankrupt and closed operation.

The problem is a complex one and all different aspects have to be examined closely to establish accurately the relevant facts before any corrective action can be taken (Koutsos et al, 1996).

This paper examines the economic situation of this sector, from the prospective of the size of the company, to determine if this

has any influence on its profitability. The economic results examined include production cost, gross income, labour cost, fixed cost, variable cost and the utilisation rate of the equipment used (Wen & Richart, 1977; Kamenidis & Zioganas, 1987).

A fact towards which special attention must be paid is that exports account for a large part of the sector's income (Appendix 1 shows the evolution of the production as well as of the tomato-paste exports). Regardless of whether productivity causes exports or exports cause productivity (Arnade et al., 1995), the reorganisation of the factories aimed at an increase of the productivity is something that will bring about only benefits to the sector.

## METHODOLOGY

The industrial units were classified into three groups, using the following processing:

- Small (—999 tonnes/24 hours)
- Medium (1,000-1,499 tonnes/24 hours)
- Large (1,500 -/24 hours)

The processing was chosen because it was the only accurate index of size at our disposal.

The data, upon which the research was based, were gathered by questionnaires during the June 1985 - July 1986 period and represent a random sample of twenty

(\*) Nagreef, Agricultural Research Centre of Macedonia and Thrace-Department of Biometry - 57001 Thermi, Thessaloniki, Greece.

(1) 1 ECU = 280 Drachmas (1986).

five factories.

Given the fact that some process other products as well, in an effort was made to choose as representative tomato processing units as possible to minimise any sizeable adverse effect on the economic results.

Data collection was burdened with many difficulties: including reluctance, if not outright unwillingness, on the part of the companies to share data and unavailability of the relevant data (in many cases the available company records spanned only a one year period).

The data received from the companies, through questionnaires, were supplemented by, and collated with, the records kept in the Ministry of Agriculture and the Agricultural Bank.

Other sources include the cultivation agreements between the co-operative organizations and the producers, the quality control certificates for exports, as well as the application subsidies submitted by both the producers and the industries concerned.

Though ten years have elapsed since the time the survey was conducted, the situation has not changed in any discernible way (during the 1986-1990 period only two new small enterprises started operating and no one after 1991-96) ensures the validity of the results and conclusions to be drawn. It must also be stressed that this was the first time that a similar survey was undertaken at such a scale.

The product mix of the sample factories, referring to the finished tomato products, can be seen in **table 1**. To facilitate the statistical analysis the cost figures were converted to tomato-paste equivalent, given the fact that the contribution of the other products was relatively low (8% canned tomatoes, 3% tomato juice).

The operation capacity during the study period was 85-90%.

The composition of the twenty five factories, according to their size, was: 11 Small/6 Medium/8 Large.

While performing the data analyses for the different economic results, the average value, corresponding to the "average" factory, was calculated and is also presented for comparison reasons.

Because the available data did not span a sufficiently long period, it was not possible to conduct a time series analysis, covering the production procedures of the twenty five units.

Therefore a cross section analysis was performed covering the production procedures of the twenty five units (Kitsopanides, 1974; Katochianou, 1978). Finally, a break-

even analysis was used to determine the optimum size of the processing units (Laiopoulou, 1994; Ikonomopoulou, 1984).

#### RESULTS OF THE STATISTICAL ANALYSES AND DISCUSSION

**Table 2** lists comparative data for the three categories of the processing factories, with respect to the finished products produced (tomato-paste, canned tomatoes and tomato-juice), the gross income generated and the corresponding production costs.

##### i) Production, gross income

The raw material (industrial tomatoes) used in the production are presented in **table 1**. **Table 3** lists the average quantity processed in the respective factories, the correspond quantity of finished products produced and the gross income generated:

The relation between the industrial tomatoes used and the finished product is given in **table 4**, while the indices referring to the utilization rate of the processing equipment [defined as: Utilization rate = (Observed real production/Theoretically possible production) \* 100], together with the corresponding rates for the immediately preceding period 1983-1986 appear in **table 5**.

— The equipment utilization rate is very low for all three categories. Performing an analysis of variance (Anova) on these data it was found that the size of the enterprise is independent of the utilization rate (the observed significance level  $p = 0.585$  is not statistically significant) (Manos, 1985) the same for the form (co-operative-private factories).

**Table 1** *Product mix of the 25 processing factories for the June 1985-July 1986 period (figures in tonnes).*

| Factory Number | Industrial Tomatoes | Tomato-paste | Industrial Tomatoes | Canned Tomatoes | Industrial Tomatoew | Tomato Juice |
|----------------|---------------------|--------------|---------------------|-----------------|---------------------|--------------|
|                | (raw material)      |              | (raw material)      |                 | (raw material)      |              |
| 1              | 68,733              | 14,207       | 1,170               | 811             | -                   | -            |
| 2              | 74,827              | 12,785       | 3,304               | 2,450           | -                   | -            |
| 3              | 39,074              | 7,059        | -                   | -               | -                   | -            |
| 4              | 62,547              | 11,608       | 2,055               | 1,476           | 3,780               | 2,788        |
| 5              | 24,359              | 4,009        | 316                 | 199             | 226                 | 166          |
| 6              | 51,686              | 8,970        | 173                 | 87              | -                   | -            |
| 7              | 75,855              | 12,963       | -                   | -               | -                   | -            |
| 8              | 42,540              | 7,580        | -                   | -               | -                   | -            |
| 9              | 26,427              | 4,682        | -                   | -               | -                   | -            |
| 10             | 21,219              | 3,675        | -                   | -               | -                   | -            |
| 11             | 45,646              | 7,911        | 208                 | 147             | 110                 | 82           |
| 12             | 36,850              | 6,566        | -                   | -               | -                   | -            |
| 13             | 34,056              | 6,007        | 1,284               | 1,194           | 584                 | 417          |
| 14             | 25,000              | 3,660        | -                   | -               | -                   | -            |
| 15             | 88,540              | 17,594       | 1,353               | 1,168           | 564                 | 463          |
| 16             | 51,053              | 9,818        | -                   | -               | -                   | -            |
| 17             | 29,388              | 5,545        | -                   | -               | -                   | -            |
| 18             | 33,554              | 5,933        | -                   | -               | -                   | -            |
| 19             | 36,353              | 6,667        | -                   | -               | -                   | -            |
| 20             | 64,198              | 11,638       | -                   | -               | -                   | -            |
| 21             | 23,623              | 4,172        | -                   | -               | -                   | -            |
| 22             | 31,450              | 5,435        | -                   | -               | -                   | -            |
| 23             | 50,265              | 7,812        | 492                 | 366             | 100                 | 60           |
| 24             | 61,858              | 8,967        | 3,605               | 2,996           | 1,730               | 1,612        |
| 25             | 7,130               | 1,278        | -                   | -               | -                   | -            |

**Table 2 Economic data.**

| Size   | Production (%) |                 |              | Gross Income (%) |          | Production Costs (%) |                          |
|--------|----------------|-----------------|--------------|------------------|----------|----------------------|--------------------------|
|        | Tomato-paste   | Canned tomatoes | Tomato juice | Tomato-paste     | Rest (*) | Labour               | Capital fixed + Variable |
| Small  | 96.0           | 3.8             | 1.2          | 97.2             | 2.8      | 9.4                  | 90.6                     |
| Medium | 88.8           | 6.5             | 4.7          | 69.4             | 9.4      | 16.4                 | 83.6                     |
| Large  | 89.5           | 7.9             | 2.6          | 92.6             | 9.1      | 9.5                  | 90.5                     |

**Table 3 Economic data (quality, gross income).**

| Size & Number of Enterprises | Average quantity processed | Finished product income      | Average gross         |
|------------------------------|----------------------------|------------------------------|-----------------------|
|                              | (tonnes/24 hours)          | (equivalent to tomato-paste) | (in million drachmas) |
| Small enterprises [11]:      | 668                        | 4,800 tonnes                 | 484.4                 |
| Medium enterprises [8]:      | 1,183                      | 8,806 tonnes                 | 966.9                 |
| Large enterprises [6]:       | 1,916                      | 11,916 tonnes                | 1,283.0               |
| Average enterprise:          | 1,132                      | 8,039 tonnes                 | 830.5                 |

**Table 4 Relationship between raw material and finished product (in equivalent to tomato-paste (\*)).**

|                    | Industrial tomatoes (tonnes) | Finished product (tonnes) |
|--------------------|------------------------------|---------------------------|
| Small enterprises  | 27,275                       | 4,800                     |
| Medium enterprises | 47,232                       | 8,806                     |
| Large enterprises  | 65,352                       | 11,916                    |

(\*) According to data made available by the Ministry of Agriculture, Department of Agricultural Products Processing.

**Table 5 Equipment utilization rate.**

|                    | 1986 (%) | 1983-1986 Average (%) |
|--------------------|----------|-----------------------|
| Small enterprises  | 14.37    | 15.49                 |
| Medium enterprises | 14.88    | 14.84                 |
| Large enterprises  | 12.44    | 12.60                 |
| Average enterprise | 13.58    | 14.41                 |

## ii) PRODUCTION COSTS

Production Factors: Capital, Labour and Other expenses

[The rest of the expenses (e.g. rents) are negligible]

**Table 6** lists the economic data referring to the production factors.

In particular, with respect to the labour costs see **table 7**, while with respect to the number of the personnel employed, see **table 8**.

The labour employed in the medium category is greater because the automatic processing equipment is missing.

## iii) Production cost

Fixed, Variable Costs

**Table 9** presents the economic results referring to the fixed, variable and total production cost. In continuation, **table 10** presents the corresponding figures expressed per kilogram of finished product.

— Applying the analysis of variance (Anova) technique we see that

the relation of production costs to the size of factories is not statistically significant ( $p = 0.983$ ).

## iv) Profit

— Applying the analysis of variance technique on the data, the relation of profit/loss to the size of factories is not statistically significant ( $p = 0.620$ ).

Through the use of a break-even analysis the optimum factory size was determined. It was found that the factories with a processing capacity of around 900 tonnes/24 hours show the best economic results. Of the 11 factories that were classified in the small category only two have a processing capacity between 900 to 950 tonnes/24 hours. Taking into consideration the fact that the productive operation time in a year, for this sector, is 50-55 24-hours periods, the total processing capacity would be around 49,500 tonnes per year. This

**Table 6 Production factors.**

| Size                | Capital & other costs (in million drachmas) | Labour cost (in million drachmas) |
|---------------------|---|-----------------------------------|
| Small enterprises:  | 528.8 (92.0%)                               | 46.2 (8.0%)                       |
| Medium enterprises: | 956.0 (85.3%)                               | 165.2 (14.7%)                     |
| Large enterprises:  | 1,312.9 (90.7%)                             | 136.2 (9.3%)                      |
| Average enterprise: | 882.2 (89.5%)                               | 103.6 (10.5%)                     |

**Table 7 Labour cost.**

| Size                | Labour cost (fixed cost) (in million drachmas) | Labour cost (variable cost) (in million drachmas) |
|---------------------|--|---|
| Small enterprises:  | 20.7   | 25.5  |
| Medium enterprises: | 86.2   | 79.0  |
| Large enterprises:  | 52.7   | 83.5  |
| Average enterprise: | 46.7   | 56.9  |

**Table 8 Number of employed personnel.**

| Size                | Permanent | Seasonal |
|---------------------|-----------|----------|
| Small enterprises:  | 27        | 165      |
| Medium enterprises: | 131       | 516      |
| Large enterprises:  | 138       | 429      |
| Average enterprise: | 87        | 333      |

**Table 9 Production costs.**

| Size &                     | Total cost<br>(in million<br>drachmas) | Fixed cost<br>(in million<br>drachmas) | Variable cost<br>(in million<br>drachmas) |
|----------------------------|--|--|---|
| Small enterprises:         | 575.0                                  | 70.8 (12.2%)                           | 504.2 (87.8%)                             |
| Medium enterprises:        | 1,121.2                                | 175.7 (15.6%)                          | 945.5 (84.4%)                             |
| Large enterprises:         | 1,449.1                                | 172.5 (11.8%)                          | 1,276.6 (88.2%)                           |
| <b>Average enterprise:</b> | <b>986.2</b>                           | <b>128.5 (12.9%)</b>                   | <b>857.3 (87.1%)</b>                      |

**Table 10 Costs results.**

| Size &                     | Total cost/kg<br>(in million<br>drachmas) | Fixed cost /kg<br>(in million<br>drachmas) | Variable cost/kg<br>(in million<br>drachmas) |
|----------------------------|---|--|--|
| Small enterprises:         | 123.0                                     | 17.9                                       | 105.1  |
| Medium enterprises:        | 125.0                                     | 17.6                                       | 107.4  |
| Large enterprises:         | 124.2                                     | 17.0                                       | 107.2  |
| <b>Average enterprise:</b> | <b>123.9</b>                              | <b>17.6</b>                                | <b>106.3</b>                                 |

**Table 11 Economical Results.**

| Size &                     | Total profit<br>(in million<br>drachmas) | Selling price /kg<br>(in million<br>drachmas) | Profit/kg<br>(in million<br>drachmas) |
|----------------------------|--|---|---------------------------------------|
| Small enterprises:         | -90.6*                                   | 102.1   | -23.2                                 |
| Medium enterprises:        | -154.3                                   | 96.36   | -15.4                                 |
| Large enterprises:         | -166.1                                   | 100.13  | -15.1                                 |
| <b>Average enterprise:</b> | <b>-130.5</b>                            | <b>99.6</b>                                   | <b>-18.7</b>                          |

\* Without subsidies

figure, is very close to the one proposed by the Ministry of Agriculture in 1986, arrived at after a relevant investigation of the sector conducted in collaboration with the Agricultural Bank. In particular, the proposal suggested that the processing capacity of the enterprises should be equal to 40,000 tonnes/year (30 tonnes/hour) for tomato-paste, and 7,920 tonnes/year (6 tonnes/hour) for canned tomatoes and tomato juice.

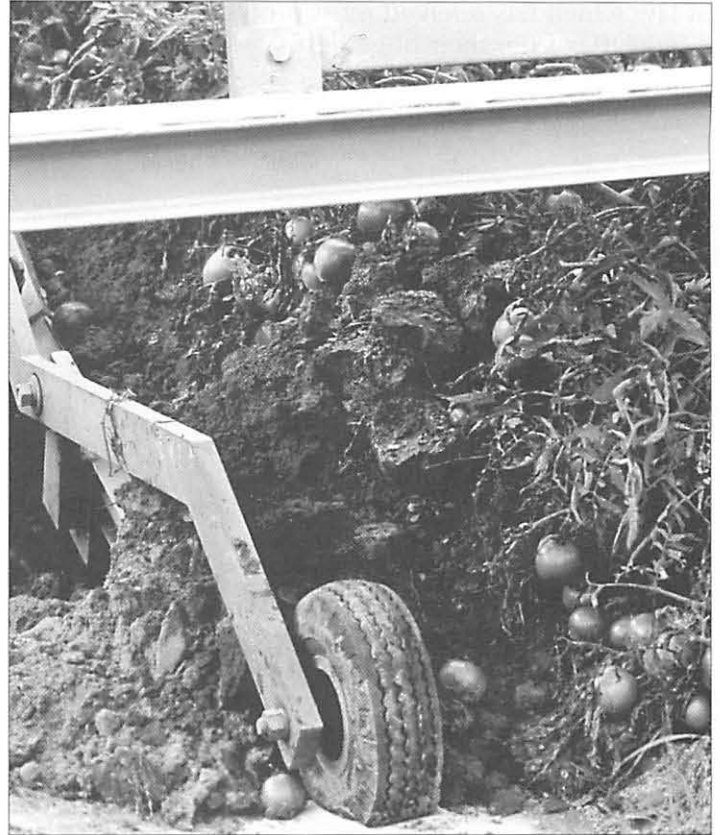
The return of capital or return on investment figures for the three categories are:

Small: -1.3% Medium: 2.7% Large: 3.6% Average: 1.2%.

This fact, in conjunction with the optimum factory size of 900 tonnes/24 hours, means that though the economic results favour the Small factories, but with an attention to automatization of mechanical equipment, the investments carried out till now were aimed towards the Medium and Large factories. Something that should be reconsidered and amended.

## CONCLUSIONS

Though the importance of the sector of tomato processing in Greece is not disputed by anyone, the chronic problems faced by practically all concerned factories has not met, the appropriate attention they deserve. The competition the sector is currently facing, and will



face in the years to come, will, if anything, intensify. This paper showed that though the economic results of all tomato processing enterprises were negative and independent of size, the Small factories have higher fixed and variable costs than the rest. The Medium factories employ more labour than the rest. At the same time the Total Cost/Kgr is higher for the Medium companies, while their Selling Price/Kgr is lower.

The equipment utilisation rate is especially low for all the factories, ranging from 12.44% for the Large factories to 14.37% for the Small factories.

This study verified in an unequivocal way the optimum factory size proposed, though never implemented, by the Ministry of Agriculture. The size of the enterprise yielding optimum economic results is equal to around 900 tonnes/24 hours. It was proved that the subsequent, and still now prevalent, policy of support aimed towards the Medium and Large factories should be abandoned.

In addition, this paper has shown that apart from a series of decisions that have to be taken with respect to the huge debts accumulated over the years by the sector, attention, accompanying with immediate action, should be paid to the production reorganization of the factories, alongside a better utilization of the processing equipment used and a better thought out pricing policy. In this respect, one should take into account the beneficial impact of a recent (No. 2538/1.12.97) government-

tal law which has relieved most problematic agricultural industries from their huge debts. ●

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