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# The influence of technological changes on the industrial tomato sector

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**Résumé.** *L'influence de l'innovation technologique dans le secteur de la tomate pour l'industrie. Les changements techniques intervenus dans l'industrie de la tomate en Italie ont permis le développement des surfaces cultivées, un élargissement de la gamme des produits et une augmentation de la consommation par tête. Cette communication examine les différentes innovations techniques mises en oeuvre dans la production et dans la transformation.*

**Abstract.** Technological changes in the Italian industrial tomato sector have enabled an expansion of the cropped area, an extension of the product range, and subsequent increase in per capita consumption. This paper examines various innovative techniques for crop production and processing, and their implications.

**Key words.** Tomato – Industry – Innovation – Consumption – Italy.

## Introduction

The aim of this report is to show how technological changes in the industrial tomato sector have influenced its development in Italy.

The use of modern crop production techniques has expanded the tomato cropped area, and new processing systems have widened the range of industrially processed tomato products and by-products.

Technological changes have influenced both supply and demand. In general, per capita consumption of tomato products has risen. Decrease in the demand for tomato by-products, which have entered the maturity or decline phase of their life cycle, has been checked in some cases.

A brief description of the Italian tomato processing industry is presented to show its development status and typical structural problems.

## I. – The Italian tomato processing industry

Italy is the second largest producer of industrial and processed tomato after the United States.

In 1989, total processed tomato production in Italy increased by 23.9% compared with 1988. Similar increases were also recorded in other European countries such as Greece.

The tomato processing sector is highly fragmented in Italy; 356 enterprises were in operation during the 1989 processing year. For tomato puree production, 83% of the enterprises belong to the class of industries that process less than 10 000 t of fresh produce and account for 33% of the national output. Fragmentation is higher for peeled tomato production; 90% of the enterprises account for only 65% of the national output (Tondini, 1990). Low quality puree is obtained as a by-product.

Tomato processing enterprises are not always located in the tomato-growing regions. Puglia and Basilicata account for 30.6% of the national industrial tomato crop, but they process (mainly peeled tomato) only 6.6% of the national total; the remainder is processed by 250 enterprises in the Salerno and Napoli provinces.

The processing plants are mainly concentrated in two areas. The first one (7% of the enterprises) in Emilia-Romagna (mainly Parma and Piacenza) has largely invested in high technology for its operations. The second area (70% of the enterprises) in the province of Napoli is characterized by a more fragmented production structure with a high labor force content. Surplus production in this area is linked to a decreasing demand, particularly for peeled tomato. Stiff competition for market share therefore necessitates high investments in marketing operations.

Most southern enterprises (more than 54%) supply generic products that are sold to wholesalers. Twenty-five percent of the turnover is generated from exports compared with a national average of 30%.

In 1988–1989, Italy was the main exporter of peeled tomato (380 390 t) and tomato by-products (juice and pulp, 46 068 t) in the world; it was second, after Greece, for tomato puree exports.

In an effort to stop surplus production, the European Economic Community (EEC) introduced a regulation<sup>1</sup> in 1982 to control tomato puree and peeled tomato production as well as that of other fruit and vegetables, which were supported by price integration. The regulation imposed a penalty of Community aids on those countries of the European Community (EC) that, according to the final data for the year, had exceeded the maximum authorized production levels ("security thresholds").

Aid reduction was applied to the year after overproduction and it affected all producers alike, regardless of their share in exceeding the threshold. But the security threshold did not prevent surplus formation, which was supported by sufficiently profitable prices in certain years. Starting from the 1985 harvest, the threshold system was replaced by the "production shares" system which was extended until 1991.<sup>2</sup>

The new system has succeeded in keeping Italian production of tomato by-products below the maximum ceiling during the past processing years. But it did not incite any restructuring of the working units, which are still too many. The highly fragmented production structure remains a constraint to greater efficiency (*Table 1*).

This is the main reason why these legislative measures for balancing demand and supply have no durable effect. Supply will thus be affected when EEC prices will not be safeguarded by the production share system.

Tomato quotas for the different processing industries are based on levels for 1982, when 3 million t of tomato were processed. The 1982 data are still valid because the competition level and operating capacity of the enterprises are relatively unchanged. The production shares fixed by the Commission of the European Communities for each member country in 1990 are the same as those in 1989 for Italy, France, and Greece. Export quotas for Spain and Portugal will be increased by 200 050 t and 500 000 t, respectively. The Commission aims to introduce a "security threshold" of EEC quotas to create a stabilization system similar to those for wheat, soybean, sugar, and other commodities. It will be thus possible to select the working units and favor the most efficient ones.

The production share system ensures a fixed profit for small and old enterprises but it hinders more dynamic ones from fully exploiting their processing capacities.

## II. – Changes in the industrial tomato sector

Over the past 10 years, the tomato sauce sector, more than any other segment of the vegetable processing industry, has gained from technological developments which have modernized the entire chain from production to distribution.

### 1. Changes at crop production stage

The main innovation was the introduction of mechanized harvesting, which until the mid-1980s was considered unsuitable for the tomato-growing areas in Italy (Emilia-Romagna and Campania). The last



harvest (1990), at least in northern Italy, has proven this belief wrong: in fact, 80% of tomatoes entering the processing units in Emilia-Romagna are mechanically harvested (Leoni, 1990).

However, the effects of mechanization vary and are not always positive.

Failure of the Californian cultivars in Mediterranean conditions indicates the need for varieties with high ripening concentration, and resistance of peels to breaking and of pulps to bruising. But although the new varieties showed good productivity and resistance, they had poor quality and organoleptic features. As competitiveness will be mainly based on quality, investments should focus on plant breeding and promotion of quality, using the price differentials which were introduced but only existed on a local scale until now.

The use of varieties suited to mechanical harvesting as well as local soil and climatic conditions have shortened the harvesting period (mid-August to early September), mainly in northern Italy. Delivery of fresh produce to processing units is concentrated within a short period (25–30 working days), which has affected the operating efficiency of the units. High-capacity units already faced the problem of inadequate use of their capacity due to the limited harvest period. Cooperatives have partially overcome this problem through unconventional methods (transplantation instead of sowing, use of chemicals to accelerate ripening). Private enterprises prefer to entrust management of crop production to the relevant associations, with variable degree of success.

Micro-irrigation has allowed the development of tomato crops in areas with insufficient water and increased per hectare yields and profits. Puglia, for example, used to be a secondary producer in relation to Campania; it is now the major producer not only for southern Italy, but also for the entire country.

With the shift in production areas and concentration of processing facilities in Campania and Emilia-Romagna, the average distance between harvesting and processing points often exceeds 500 km (*Table 2*). This situation has become worse because of attempts to reduce transport costs. Heavier loads can compress the produce and lengthen loading and unloading times. This affects the quality of the raw material delivered to the processing plants.

## 2. Changes at industrial stage

Higher yields concentrated over shorter periods raise serious problems. Collecting troughs increase the collecting capacity of the processing plants by reducing the time spent in moving boxes and/or washing produce, even if there are more losses. They facilitate sorting as only whole berries are allowed to enter the processing system. For processing purposes, the capacity of the plants needs to be reviewed. Their size has increased but their total number has decreased (*Figure 1*); while this may enable economies of scale, amortization of the rise in fixed costs may be difficult because of higher capacity and shorter operating periods.

Changes in tomato by-products and techniques for producing them are brought about by those in food habits. In a typical postindustrial society consumers spend less time eating, and prefer ready-to-eat or ready-to-cook foods. They are also more quality- and health-conscious.

New or improved techniques are used for traditional products to minimize preparation time and enhance the quality and nutritive value of the end product. Processes such as cold-break, high re-circulation systems, and concentration by inverse osmosis are used to reduce thermal treatments.

A major innovation is the use of aseptic packing. Plastic-lined cardboard packs, which have been used in the dairy industry over the past 20 years, were introduced in the 1980s to pack tomato puree. They are widely used for 200-kilogram recipients in spite of the small quantities produced by most enterprises in Italy. Recently, aseptic packing has been introduced for pulp and new by-products such as *cubettati* (cubes), *pezzettoni* (pieces), and *fettine* (slices) derived from soft grinding of peeled tomatoes. At

present, processors are looking for technology applications for more sophisticated products (e.g., tomato seasoning, concentrates, pizza sauces) that are packed in jars or cans and intended for direct consumption.

Aseptic packing offers the following advantages:

- possibility of using sterilization techniques (HTST or UHT), which retain the taste qualities and nutritive value of the products;
- savings on packing and transport, through the use of large flexible recipients;
- easier utilization of finished and semi-finished foods (Leoni, 1989a).

However, certain constraints still need to be overcome for more extensive use: difficulties in control of automated processes, nonavailability of subsidiary equipment, and choice of packing materials.

### 3. Effects of agricultural and technological changes on food consumption

Changes in consumption patterns have led to the creation of new easy-to-use products. Consumer preference for the new products (*Figures 2-5*) and producers' response prove the success of these products. The dispersal of production sites within the EC countries is a limiting factor for the European processing industry, except for frozen and nonfrozen peeled tomato. These new products have been successful despite the lack of EC subsidies because they can be sold regardless of price (Leoni, 1989b).

Market surveys are needed to monitor and anticipate rapid changes in consumer requirements for product innovation. In addition, efficient industrial concentration policies and adequate marketing and sales operations should be implemented to gain new market shares.

Distribution of food products in the 1990s will be dominated by large groups, which are increasing their market share at the expense of traditional retailers. The food processing industry also needs to concentrate its activities to keep pace with current trends in distribution. At present tomato products are sold under distributors' brands ("private labels") as there is no well-known brand for tomato by-products in Europe, similar to Del Monte for canned fruit in the United States.

The innovation and modernization efforts should also be extended upstream to crop production (suitable varieties, better crop management, higher yields) to satisfy the new needs of the processing industry.

#### Notes

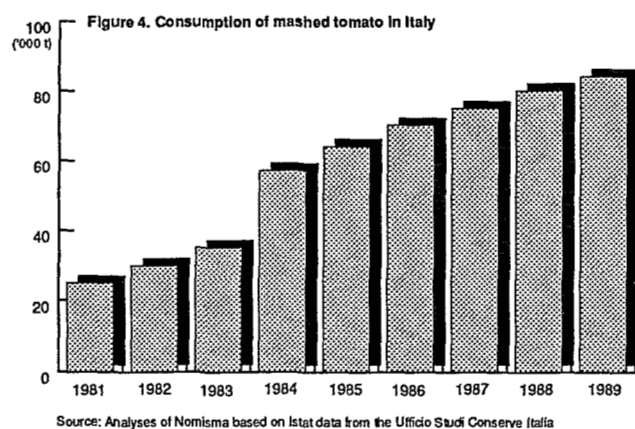
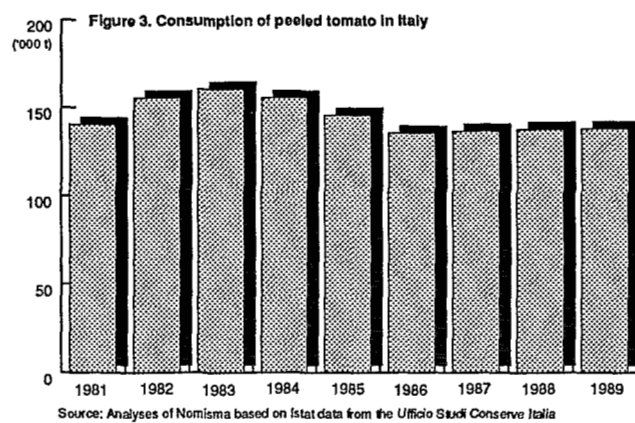
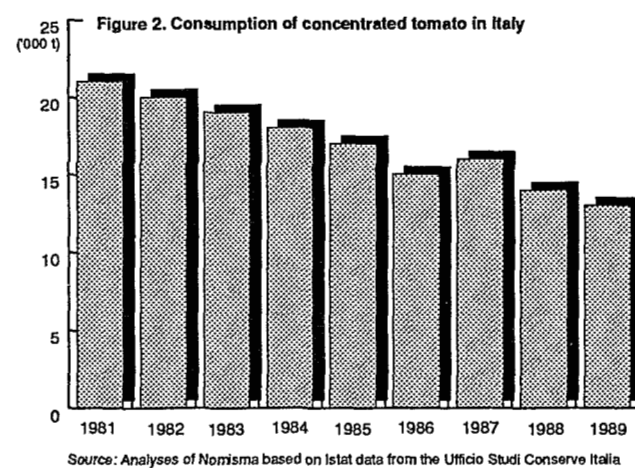
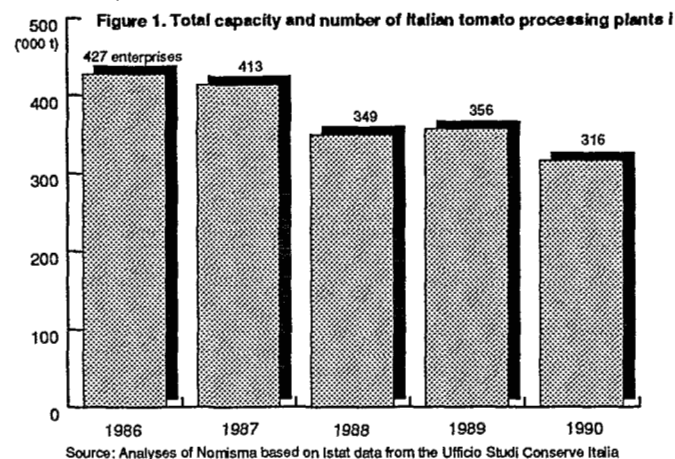
1. EEC Regulation No. 1206/82 of 18 May 1982.
2. EEC Regulation No. 1320/85 of 25 March 1985 which was in force until 1988: it was renewed for the 1989 harvest. In April 1990, it was extended to include the 1991 harvest.

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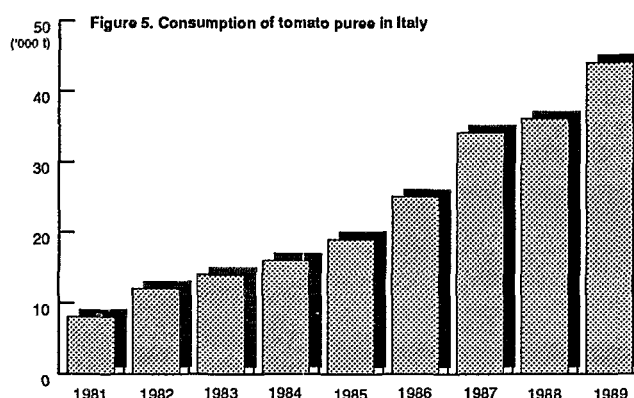
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Source: Analyses of Nomisma based on Istat data from the Ufficio Studi Conserve Italia

**Table 1. Comparison of production shares fixed by the EEC and actual production (in '000 t) in Italy, 1988**

	EEC-fixed shares <sup>a</sup>		Quantity in excess of EEC share		Total processed
Concentrated tomato	1 503	(95.9)	64	(4.1)	1 567
Peeled tomato (Roma)	823	(93.8)	54	(6.2)	877
Peeled tomato (S. Marzano)	203	(98.1)	4	(1.9)	207
Sliced peeled tomato	142	(75.9)	45	(24.1)	187
Frozen sliced peeled tomato	13	(76.5)	4	(23.5)	17
Frozen peeled tomato	11	(84.6)	2	(15.4)	13
Tomato juice (4-7% r.s.)	39	(95.1)	2	(4.9)	41
Mashed tomato (7-12% r.s.)	238	(96.0)	10	(4.0)	248
Tomato flakes	8	(96.6)	1	(3.4)	9
<b>Total</b>	<b>2 981</b>	<b>(94.1)</b>	<b>186</b>	<b>(5.9)</b>	<b>3 167</b>

a. Numbers in parentheses indicate percentage of total production

Source: MAF

**Table 2. Movement of tomato between provinces in Italy, 1987**

Starting point	Load (t)	Destination
Puglia	800 000	Campania
Basilicata	150 000	Campania
Calabria	100 000	Campania
Lazio (Viterbo)	45 000	Campania
Lazio (Viterbo)	30 000	Emilia-Romagna
Lazio (Viterbo)	9 000	Toscana
Toscana	23 000	Campania-Emilia
<b>Total</b>	<b>1 157 000</b>	

Source: Analyses of Nomisma based on data from the Ufficio Studi Conserve Italia

