Socio-economic effects of quality system implementation in typical productions: the case of Parmigiano agroindustrial system (PAIS)

F. Rosa [1], C. Mancini [2]

[1] Franco Rosa is Associated Professor at the Department of Agroindustrial Economics, University of Udine. Ph: xx.432.558.314; e-mail: franco.rosa@dbea.uniud.it

[2] Cecilia Mancini is Phd student at the Department of Agricultural Economics and Forestry, University of Parma. Ph xx.521.902.414; e-mail: agraria@ipruniv.cce.unipr.it

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Typical and traditional productions:
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F. ROSA [*], *C. MANCINI* [**]

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SUMMARY[1]

The aim of the authors is to describe the economic consequences of structural and organizational changes of PAIS (Parmigiano agroindustrial system) to afford the total quality management in accordance with the requirements of the quality standards imposed by UNI-EN ISO 9002 norms. The first part is dedicated to the structural changes in farm organization required by PAIS. The topic is framed as follows: 1) technological adjustments to produce quality; 2) farm adaptation to PAIS; 3) modeling an integrated farm-cooperative organization for managing the total quality system.
The second part is a case study about the certification according to ISO 9002 introduced by the Consorzio Parmigiano Reggiano. The questionnaire distributed to a number of farms involved into the project shows the consequences (costs and benefits) following the implementation and the certification of quality systems.

[*] Franco Rosa is Associated Professor at the Department of Agroindustrial Economics, University of Udine. Ph: xx.432.558.314; E-mail: Franco.Rosa@ DBEA.UNIUD.IT; File pare971.doc
[**] Cecilia Mancini is Phd student at the Department of Agricultural Economics and Forestry, University of Parma. Ph xx.521.902.414; Email Agraria@ipruniv.cce.unipr.it
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1 - THE PAIS: STRUCTURAL AND ORGANIZATIONAL CHANGES TO COPE WITH THE TOTAL QUALITY MANAGEMENT SYSTEM ORGANIZATION

1.1 The Parmigiano Agroindustrial system: PAIS

The Parmigiano Agroindustrial System (PAIS) is the chain organisation of the agricultural and processing Parmigiano cheese stages designed to maintain the present niche market in Italy, increase the commercial value of the production, improve the competitiveness and penetration in foreign markets. Technological innovation in production and processing and the growing importance of distribution have determined the strengthening of the agro-industrial chain and the tightening of the vertical coordination toward the best overall performance obtained with the total quality management system organization. (TQM).
In table 1.1 is reported the stylized version of PAIS.
The functional approach of PAIS is defined the coordination/integration of physical, exchange and facilitating functions performed by units operating at production, processing and commercial stages to achieve business objectives within the total quality management project.[2] The expected consequences of this approach are: i) reduction in costs caused by organizational slacks, ii) the improvement of Parmigiano quality and image, iii) the increasing effectiveness of marketing strategies, iv) higher profits and distribution among the participants in function of their effective contribution to the system performance and risk bearing.
In table 1.2 are described the functions performed by PAIS at production and processing stages.
The functional approach has an empirical justification in the development of vertical relations that improved the interorganizational activities with several forms of coordination strategies: alliances, joint ventures, buyer-seller relationships, subcontracting resulting in various forms of vertical cooperation and partnerships. The analytical background is offered by the traditional neoclassical framework that contributes to explain the competitive advantages obtained with scale and scope economies, processing and product innovation, marketing segmentation and other structural changes that contribute to the system performance. However, the managerial and institutional economics have given more insight to explain the influence of the decisional center defined an abstract unit governing the system. (Venturini, 1997). In the neoclassic theory this was governed by the entrepreneur; but this figure doesn't explain the complexity of decision making in the present decisional contest. The managerial theory, with the separation between property and control, offers a more background to explain the changes in decision making. The enterprise intended as a "nexus of contracts" attributes the control of the government functions to who manages the

[2] Kohl and Uhl have given the definition of these three functions. The physical functions change the nature of the product from imput to final product; main physical functions of PAS are: feeding cattle, milk milk production, refrigeration , processing, storage, transport and delivery. The exchange functions allow to transfer the legal title of the good; buying (assmbling) selling and pricing methods are the main functions of this group. The facilitating functions improve the performance of the physical-exchange functions; grading, standardization, financing, risk bearing, market intelligence are the main functions.
The business objectives are the maximisation of sales under some constrains represented by the minimum of profit , risk limit, growth rate etc.

"strategic contracts". If these contracts were integrated into a specific organization, they will originate different forms of internal organization but the strategic control will be maintained inside the organization. If they are signed with some external agents the control of the organization will depend on the agent capacity to influence the economic results of the organization with strategic contracts, consequences in terms of transaction costs and relevant informations available to the contractors.
To properly afford the topic of the system organization for TQM, it is appropriate to split the effects of function coordination for their effects respectively: technology and commercial.
The technological effects are more relevant at intermediate stages where the product is defined with appropriate physical attributes which costs can be reduced by definition and coordinations of the functions that improve the intrinsic quality (a concept that will be explained in more detail later). The commercial effects are due to the facilitating and service functions that increase the product fitness for the consumer needs, while the marketing strategies are dedicated to improve the marketing performance.

1.2 Technology of milk production

The integration of the farm with dairy plant is of fundamental importance to produce a quality cheese appropriate to managerial objective. The milk quality produced at farm level must possess quality attributes and adaptability to dairy processing.[3] The milk, for possessing good quality attributes, requires the four functions: feeding, milking, conservation and transport to dairy plant executed with traditional methods described in the "Disciplinari di produzione".
A very important distinctive feature of Parmigiano technology is the separation at farm level of the two milk productions obtained with: the evening and morning milkings that are delivered separately to the dairy plant in the shortest time to avoid the contamination or alteration of the original milk quality. This imposes the boundaries to the maximum distance between farm and dairy plant and an efficient organization to coordinate the production-processing functions avoiding organizational slakes that will cause a decay in the original quality.
The evening milk production is delivered to dairy plant and stored in flat containers in thin layers to facilitate the spontaneous cream remounting. The following morning, the creamy milk is removed from the naturally skimmed milk, that will be mixed with the morning milk production. Shortly after the fermentation process will starts.
At this level transaction costs can be originated by the following conditions:
1) the milk quality is not fulfilling the attribute specifications of the dairy plant;
2) there are time-lags in delivery causing quality problems;
3) the contractual specifications for the hygienic control of animals and machinery used are not observed.

[3] The quality of the milk obtained at farm is responsible of the final product quality because obtained with artisan method that cannot be repeated in industrial processes without loosing some of the properties of the original product. (Arfini, p. 26)

4) the asset specificity of the production system do not allow to use them for other productions;
5) the labour skills are not appropriate to the production specificity;
6) feeding quality is not satisfactory.
In table 1.3 is indicated the model of the Parmigiano technology.

The Quality chain controls: HACCP and ISO 9000 norms

Of different methods of quality controls introduced in the agroindustrial chains the most experienced and diffused are the following three: i) the hazard analytical critical control point (HACCP); ii) the certification procedures (UNI-EN-ISO 9000); iii) the good manufacturing practices. The first two methods will be discussed as they are relevant for the PAIS.
The HACCP is introduced at farm level with the purpose to control the performance of physical functions determining the milk quality, by checking the critical production steps.
The Codex Alimentarius (USA, 1993) has indicated the guidelines for the application of HACCP in the next points:
1) Description of the processing technology with a flow chart diagram;
2) Description of the potential risks at farm level;
3) Identification of the critical points and setting the tolerance limits to minimize the risk for milk quality and possible danger for customers (the dairy plant and consumers);
4) Description of the monitoring and control procedures for the critical control points (CCP);
5) Printing a manual of procedures and monitoring for the responsible of the quality control. [4]
Noordhuizen and Welpelo (1977), have affirmed that HACCP offers the best opportunities for the quality improvement and can be perfectly integrated with procedures of integrated Food Chain Quality Assurance, because the HACCP can motivate the farmer's participation in the integrated production-processing chain. The HACCP is specifically framed for farmers because based on prevention, it doesn't require a great amount of control data or higher technical notions, it designs routine controls that are not expensively activated.
In table 1.4 are described the HACCP and CCP scheme.
The second method about quality control will be extensively discussed in the second part of this paper with reference to PAIS. It is the institutional definition of the voluntary quality assurance programs which target is to make public the commercial quality.
The growing marketing competition and the need of demand stabilization especially in the domestic markets, have caused a growing concern for the quality but a little compensation for the quality related costs, determining the urgence to introduce the total quality management (TQM) and the quality assurance to make the product more competitive for quality and costs and improving the product visibility in the selected market channels. The

[4] An important distinction is made between CCP-1 the operations that can be totally controlled: usually all phisical operation like the cleaning water temperature, and CCP-2 that can be partially controlled; for these are fixed limits of tolerance like the bacteria contamination.

underlined concept of quality is the growing awareness of the customers for food legislation and suppliers quality assurance to increase the market transparency for product traceability. Voluntary quality assurance with ISO 9000 (ISO 9001, 9002, 9003) status [5] is a set of international standards officially recognized for the product quality to meet the standard specifications. The initial purpose of the standard was to develop internationally-recognized quality schemes to facilitate the communication of quality standards having a quasi legal status because used as a reference in product liability cases (Zaibet, 1995).

1.3 - Technical and commercial quality of Parmigiano.

The Parmigiano quality is for all customers (traders, wholesale agents, distributors, final consumer) a synonym of "typicality", a synergetic combination of technology, tradition, geographic and hystorical factors. However, to understand the implications of this definition for price determination two types of quality are suggested: intrinsic and extrinsic quality.

The intrinsic quality is elaborated at primary and processing stages with a coordination of physical functions targetted to obtain given quality attributes measured with standards.

The market value for this quality has been commercially evaluated with the estimation of the relations between price and selected attributes defined the standardized measures of the quality accepted by marketing agents or/and defined at institutional level. (Rosa, 1997; Arfini, 1996). The estimation has given the evidence of the statistical correlation between quality attributes and prices in a traditional Lancaster approach suggesting an objective appreciation of the intrinsic quality by the customers operating at production-processing stages.

The extrinsic quality is intended the quality perception, influenced by external factors: tradition, history, culture area of production , brand and label, communication, prices or personal experiences and personal customer reactions to quality solicitations.

The marketing strategies can seriously affect the consumer's perceptions, inducing them to pay higher than market prices for a given product. Statistical results are in this case more undefined because emotional cues can influence the customer's decisions inducing them to pay prices with mark-up for the quality. These considerations justify the protection of quality for typical productions by the UE legislation from illegal imitations and frauds. [6]

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[5] For the meaning of the ISO see Bredahi pag. 60

[6] The legal action pursued by Consorzio Parmigiano reggiano at the European Court to protect the geographic origin of the italian cheese was successfull. The Court invalidated the decision of september 11, 1996 which assigned some denominations of italian cheeses to Denmark , Germany were illegal.
The effects were extended to all Italian Consortia with DOP products. This demonstrate that when Institutions (in the specific case four italian Ministeries) are not able to undertake the required actions to impose the property right of DOP products
cases of unfair competition are possible. In the following table we report the illegal denominations.
Product denomination excluded from dir 92/46 and abolished after decision of April 25, 1997

Country	Product
Denmark	Dansk fontal
	Dansk Fontina

1.4 - Farm production cost

. The costs are the dual representation of the production function; they will measure the economic performance of the dairy enterprise in producing quality milk. In this part the production costs are commented to demonstrate that the results are influenced by environmental condition and quite independent from the managerial efficiency.

In table 1.6 the production costs of milk fueling Parmigiano and Padano this last an effective competitor of Parmigiano are compared (data are referred to 1994).

Appreciable quality differences are the result of the altimetric area, then the mountain and plane area costs are compared. The cost for the two altimetric areas were:

i) for Parmigiano, respectively 848 and 677 lire/liter a difference of 25%;

ii) for Padano respectively 873 and 535 lire/liter a difference of 63%.

It is clear that the Padano has a competitive advantage versus the Parmigiano when produced in plane. This will be more evident using the cross cost differences

The cross-cost differences for the two products were:

iii) in mount area the Parmigiano cost was 3% less than Padano;

iv) in plane area the cost of Parmigiano was 27% higher than Padano.

These results suggests that the scale economies are not exploitable in mountain for the following main reasons: land surface, limited operative capacity of machinery, labour supply, productivity and/or costs.. The quality must compensate the production cost difference; this is the only economic justification to maintain the milk production in mountain.

At the opposite, scale economies are possible in plane where larger farms producing Padano with no serious land machinery or labor constraints can produce milk at inferior costs.

Looking at the prices paid for the two products, the results indicate that the mountain production of Padano is not economically convenient while in plane area the production costs of Padano are estimated to be less than 17% when compared with the Parmigiano after the corrections for scale economies are made. In ordinary market conditions, final price margins are superior to production cost differences suggesting that intrinsic and extrinsic quality are considered in price determination.

The most expensive input costs are for feedstuff and labor, significantly affected by farm dimension and organization. The evidence is given by comparing the costs of Parmigiano and Padano in mountain and plane situations. In all the four cases considered they

	Dansk Grana
Germany	Romonte Typ Grana
	Dansk Fontina
	Romonte Typ Grana
	Asiago nanch italienisher Art
	Montasio
	Kase from Typ Parmesan
	Parmesan
	Duramont Typ Parmesan
Sveden	Pizzaost

represented more than 55% of the total net costs: feeding costs were 15% for Parmigiano and 23% for Padano both produced in mountain; in plane they represented approximately the 28% in both situations. The costs are significantly higher for Parmigiano compared to Padano, for the different conversion feed/milk ratio more favorable to Padano milk production for the use of silo-mais not allowed in Parmigiano production.
The incidences of the labor cost respect the total cost was:
in mountain respectively: 35% for Parmigiano and 44% for Padano production;
in plane reduced respectively to 27 and 24%.
The variable over the fixed cost is a structural indicator suggesting the dependency of the farm from the market in purchasing the production inputs, compared with the investment in fixed assets. The index value varies quite widely: the higher incidence of variable costs in mountain are explained with the transportation costs that affected the feedstuff cost. Another important consideration emerged when comparing the differences between the index values in mount and plane: this was 24% for Parmigiano and 60% for Padano; in the last case the fixed cost remained almost unchanged but the variable costs greatly decreased from mount to plane.
The mount production is more expensive and not convenient for Padano which target is the commercial quality obtained at lower costs possible by exploitation of the scale economies in larger farms and dairy plants located in the plane areas of the Northern Italy.

1.5 - Changes in the organization of PAIS: the farm situation

The growing structure of PAIS induced changes in the farm organization not exhaustively explained by the standard microeconomic approach because:
i) all factors are considered equivalent in terms of productivity;
ii) perfect knowledge and perfect competition are often too abstract assumptions;
iii) the entrepreneur and the profit are assumed to be respectively the unique decision maker in the enterprise and the unique objective to be pursued. This is a stylized vision of a static decisional contest.
The development of microeconomic theory offers now a more exhaustive theoretical background to interpret the influence of external environment and the internal organization for farm decision making. This approach bypasses the question of the abstract or concrete entrepreneur that has intrigued the speculations of Italian Agricultural Economists, and directly focuses on the economic results of the organization.
Coase said that the enterprise conveniently replaces the market transactions when the internal costs of the enterprise are lower than transaction costs of the market. The evidence of the period 60 to 80ties is a favorable environment to the internal growth of the farm producing milk for dairy plants for two reasons: the absence of production quotas with the support price policy to integrate the farm prices and the protection versus the more convenient market transactions being possible outside the UE. Under the new headings of the UE agricultural policy, the protection is gradually vanishing and the farms are required to increase their internal efficiency to survive. The question is: "Will the artisan production be able to cope with the transformations of the competitive agroindustrial environment?
The Parmigiano organization is typically a family farm with few hierarchical levels and direct informal relations between the authority represented by the farmer and the

executors, mostly represented by the family members (usually one or two sons, often part-time employees in the farm). The separation between ownership and control is normally an irrelevant question given that the roles are not well structured inside the organization: infact the same subject can be the owner of assets, director, manual worker and others.
The exchange functions are made with a growing number of different subjects:
i) the input suppliers represented by private companies or multifunctional cooperatives;
ii) the milk delivery, often to dairy cooperatives, in few cases to private dairy industries;
iii) the final product sold by cooperatives through different market channels to private agents (first purchaser) or chain distributors. These relations can be regulated with delivery contracts.[7]
iv) the service suppliers: technical, commercial, fiscal, financial, legal and others.
For the technological and commercial complexity of the final product, most of the facilitating functions are not directly performed by farmers but by agencies and institutions that assist farmers in their daily routine operations: data collection and processing, market intelligence, search for partners, contract bargaining, financial, fiscal and legal assistance, technical advisory, marketing communication, product promotion, risk sharing, internal accumulation, investment and long term debt policy.
The UE agricultural policy didn't cause a dramatic impact on PAIS because the "artisan production" still plays a key role in the production of higher milk quality and this model is based on the conservation of a traditional rural asset for which the milk production slightly changed after the quotas. Here are reported some considerations supporting this type of organization:
i) the geographic area of milk production for Parmigiano is limited to five provinces in Emilia Romagna: Parma, Reggio Emilia, Modena and Bologna (for the area left the Reno river) and Mantua in Lombardia (area right Po river). In this contest the application of milk quota didn't cause relevant structural changes to farm production because the farm unit's objective is the Parmigiano production; consequently the agricultural policy didn't cause a great impact on farming structure. The most important changes were caused by labor costs, the chain organization, the distribution.
ii) the producer name guarantee for the specific combination of farm resources, traditional technology, labor skills, that create niche markets;
iii) the milk collection two times a day requires more labor and transport costs;
iii) the typical Parmigiano requires investments in specific assets, this dimension of transaction costs, is justified only when the quality is recognized by consumers with price margins that compensate the organizational efforts, costs and risks;
iv) a representative superior organization: the Consorzio Parmigiano coordinate the marketing strategies, to protect the image of the product, to control the quality by certifying the procedures at production and processing levels.
v) milk quotas and marketing quota imposed limits to the farm size and caused higher production costs but contributed to increase the quality value.

[7] This contract allows to define the price-quality relations of cheese because with the selling price are specified other contractual conditions concerning the delivery date and product payment that are the costs of dairy plant. The cheese price excluding the commercialization costs is the real price obtained by the producers. This price signal appears at wholesale market, and is appropriate indicator of the cheese quality in the hypothesis the wholesale-ripener will pay the quality in function of the expected price the final consumer will pay.

vi) Parmigiano is offered in a bundle of many national and international substitutable dairy products; its typicality must be protected from imitation and unfair trade practices that disrupt the market competition.
The above considerations suggest the following considerations about the farm organization:

1) Which functions performed by PAIS can be transferred into the integrated organization farm and dairy plants at different and which functions can be more efficiently performed by the market?.
2) which of the following listed below, is the best suitable organization to maintain a decisional autonomy of farmers and to perform optimal business strategies: farm integrated with a dairy processing cooperative, farm integrated in multipurpose cooperative, farm integrated in dairy industry with contractual relations, farm delivering the cheese to bargaining cooperative?
3) what form of internal-external contracts will motivate the organizations to work toward a common strategic objective. These objections will be shortly discussed in next part.

1.6 - The farm-cooperative organization and performance of TQM

The experience of PAIS suggests the farm-cooperative integration being able to improve the performance of at least the following reasons:
i) an increased efficiency of the exchange relations between the farm and business cooperative with reciprocal benefits in terms of profit distribution and risk sharing;
ii) distribution to farmers of the residual profits realized in the integrated system;
iii) reduction in organizational slack due to better coordination of the functions performed at the two stages.
iv) reduction in procurement costs for fixed and operative assets due to scale economies.
v) facilitate the market intelligence and performance by developing the market strategies, with channel diversification, data collection, brand and label development, and lobbying;
vi) introduction of quality control using traditional and innovative instruments;
vii) assisting farmers in affording technical, economic, legal and fiscal problems.
The total quality management project determined the farm-cooperative exchange relations to become so tied up that it is often almost impossible to distinguish the original two organizations. The "joint profit maximization" in a region of great cooperative traditions, bypasses the question of who controls the organization. Nevertheless this problem cannot be ignored: farmers affording the farm management behave like individual decision makers, pursuing the objective of profit maximization; they assume the farm being dominant versus the cooperative organization. This principle is in discussion for the different professional skills imposed by PAIS. Traditionally the farmers are dedicated to solve technical problems concerning the production, while less attention they dedicate to marketing and financial strategies. However, production technologies are quite mature and boundaries are imposed with production and marketing quotas, this makes the innovation in production less relevant, compared with the marketing and financial functions. When farmers afford these problems they must be aware of the risks of losses incurring when these functions are not professionally performed. Unfortunately in most cases farmers

dedicate their professional skills to technical routine functions and are reluctant to get into business operation.

Producer commitments versus cooperative influence the overall performance of the organization. When farmers are elected in the cooperative board they usually pursue more general interests of the integrated organization and subordinate the farm's to the cooperative decisions. This has the direct consequence that the ethical and mutualistic principles are now routinely built into commercial management to provide better and more economic services to members and better marketing performance.

Any performance measure requires: i) a parameter to measure; ii) a yardstick by which to measure. The main dairy cooperative objective (parameter) with respect to its members is to maximize the transformation value of milk in cheese; this requires a technical structure and managerial autonomy to decide the amount of investments in capital assets for the industrial process, setting up a viable marketing strategies with the Consortium Parmigiano that is an higher level Cooperative and deciding the internal accumulation for the development of industrial and commercial activities. Farmers accept to subordinate to cooperative decisions by signing contracts to deliver the entire milk production, accepting the quantity and quality control, the price paid, and long term investment policy. These contractual relations actually determine the separation between the property of the farmers assets from their control that is shifted to the cooperative. The overall business objective for cooperative and benefits for farmers are represented by the following two equations:

1) Cooperative economic objective: Maximize Tansformation value: $TV = Pe - Tcc$
2) Farm economic objective : Maximize Profit $Pr = Pl - Tfc$

Legend:
TV = Transformation value of the milk in Parmigiano cheese;
Pe = Gross value of the Parmigiano including changes in stock;
Tcc = Total transformation cooperative costs: fixed and variables costs;
Pr = Farm profit;
Pl = Gross product sold at market price less transport and selling costs;
Tfc = Total farm costs: fixed and variables costs.

In the integrated organization, the economic result of the cooperative is transferred to the farm by assuming that the profit will be the transformation value less the farm costs. This is represented in equation 3:

3) $Pr = TV - Tfc = (Pe - Tcc) - Tfc$

It may be stressed that these equations indicate the respective organization objectives in the short period and for cooperatives observing the mutuality principles with total distribution of "residual" to members after the cooperative costs have been fulfilled. In the dairy processing cooperative, a long term policy of investment to implement the technical efficiency of the plant must be considered; this will arise the necessity to destinate a quota of profits for financing the investments. Further, the cooperative performance can in principle be limited by the quantity of product supplied by members being inferior to the optimal processing size. In this case some cooperatives purchase additional milk from non

members to improve the technical efficiency. The commercial performance is achieved with production-processing and marketing coordination that usually makes possible to receive better than market prices. Then potential economic advantages for farmers are obtained with the increased value of the final product adding processing and commercial functions to raw product. The cooperatives are requested to improve the efficiency of processing and marketing functions to increase the overall performance. The following considerations suggest the potentials and limits of cooperative organization:
1) reduction of industrial costs with scale economies seems not achievable due to the quite stable milk supply and quota. A consistent number of dairy plants closed during the past three years but the ones still working did not improve consistently their economic results.
2) transaction cost for specific assets are quite important: some of the costs determined by the investment in milk production and control and dairy processing are not recyclable in alternative productions.
3) more investments are required: i) in biotechnologies to improve the milk functionality for processing and marketing strategies; ii) in extensive introduction of HACCP at farm level;
4) the introduction of certification procedures at dairy plant. The certification of the quality management system started in 1992 introduced by the Consorzio Parmigiano Reggiano to give an official award of quality by introduction of the norms UNI EN ISO 9002.

The performance control of the chain: benchmarking

When farm-cooperative start to change into a business organisation, the objectives to be pursued are to to improve the internal efficiency and strengthen the market position by extending the overall control of the integrated organisation to all production-processing units responsible of cheese quality and market prices. The overall efficiency of the organisation can be evaluated by introducing the benchmarking a managerial technique which claims to deliver a competitive edge with the improvement of quality management and business performance at both farm and processing levels. In our case the method should be implemented toward the main objective to satisfy the customers meanwhile the distribution and the final consumer. We describe here four types of benchmarking:
1) internal benchmarking: the purpose is to implement the internal communication into the organization to clear the shared objectives and functional responsibilities within the organisation.
2) Industry or competitive benchmarking is a cross comparison among the managerial performance of competitors with different products in the same industry. This will give the chance to collect informations not disclosed to the all competitors about organization performance.
3) Functional or non competitive benchmarking compares related functions in different businesses which need not to be in the same industry or an unrelated function in different industry.
4) Generic or best practice world class benchmarking, considers the best practice of the world class organisations
To be applied to co-operative organisation some suggestions are needed:
i) a culture of business that must be accepted by both partners: farmers and cooperatives;

ii) a culture of competition: all member of the organisation must be aware of the market opportunities to be exploited by concentrating resources and skills for competitive products;
iii) an open minded attitude that make the organisation open and accessible to any form of innovation: technical, economic and organisational generated in the same or in other industrial contests.
The fourth it must be organised, planned and managed and monitored .
The benchmarking is the appropriate to measure the total quality management performance using the direct method to infer into the internal organisation performance and outside by considering imitable organisations even if not producing the same products.

2 - THE QUALITY ASSURANCE: A CASE DESCRIPTION

2.1 The ISO certification for typical product

In 1993 the Parmigiano Reggiano Consortium started the "Progetto Qualità Export" (Export Quality Project) aimed at introducing and certifying Quality Assurance Systems in cheese factories according to the UNI EN ISO 9002 standard.
The characterising feature of this initiative lies in the fact that it is aimed at a protected denomination of origin (DOP) product. Parmigiano Reggiano is processed according to production guidelines whose respect is guaranteed by the brand engraved at the end of the curing period.
In a system where quality is ensured by a product brand, we need to clearly define the role that the certification process must play in order to avoid confusing the consumer and weakening the meaning of the denomination of origin.
We believe this concept has to be stressed because, since certification started to become popular in Italy, we have seen instances in which certain companies started exploiting this certification making it appear to the final consumer as evidence of the excellent quality of the product, rather than a guarantee of consistency.
Besides creating confusion and suspicion on the part of the consumer faced with the proliferation of brand about which he knows very little, this abuse made people in the industry loose sight of the original meaning of the certification process. Although it was born as a "technical" instrument for those working in along the processing and distribution line, certification has often become an unjustified reason to increase the price paid by the final consumer.
In the case of a DOP product, the need to clearly distinguish the role of process certification from the role of the brand has become especially important. While such a brand ensures that the product has the characteristics specified in the production guidelines, Quality Assurance Systems represent a winning strategy when their role is played inside the processing and distribution chain. This way, we think, certification according to ISO 9002 can strongly contribute in a better performance of the PARIS.

The case of Parmigiano Reggiano is exemplary. The data supplied by the Consortium show that, on average, 12% of the production of Parmigiano Reggiano factories (with maximum values ranging from 30% to 40% and minimum values ranging from 2% to 3%) does not pass the final inspection and is sold below price. It's obvious that there must be a reason or a series of reasons why certain factories have such a high percentage of rejects as compared to others that have significantly lower percentages.
The identification of non conformities, the prevention and definitive solution of problems represents the scope of Quality Assurance Systems. In our specific case, these systems minimise rejects, thus reducing the risks for people in the curing sector.
Quality Assurance Systems so defined do not justify a price increase for the final customer, since the consumer has a right to the guarantee of the quality of the product certified by the Consortium brand. There is, however, the possibility of a price increase of the fresh product to the curing factory, that would be counterbalanced by a lower percentage of second-choice products at the end of the curing period.

2.2 - "The Quality Export Project"

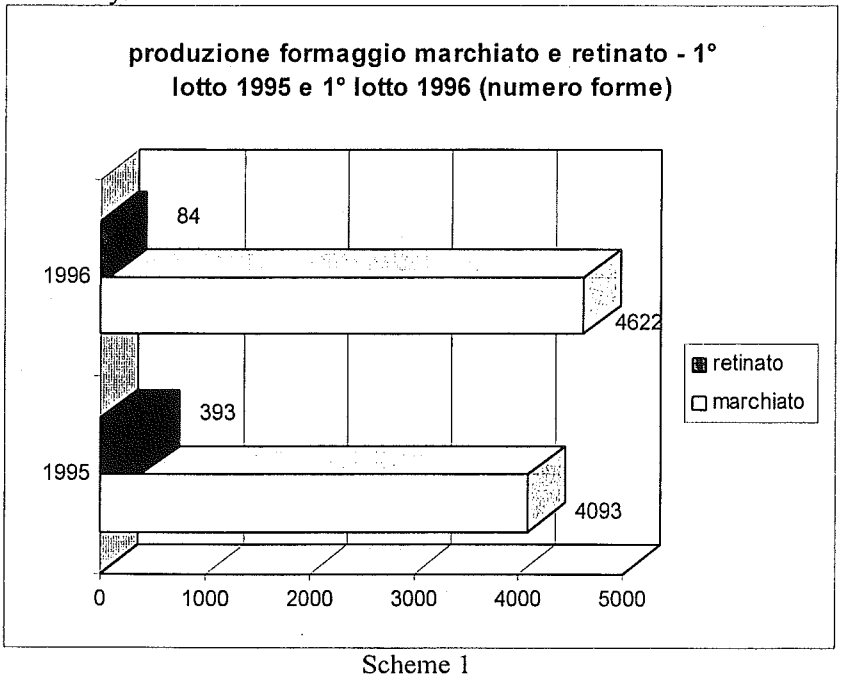
Because of the voluntary nature of the project, during the initial stage the Consortium identified a group of dairies willing to take part in the project and allowed experts to use its structures. Subsequently, the Consortium studied and created a Quality Assurance System model capable of integrating the UNI EN ISO 9002 standard and the traditional and "artisan" reality of Parmigiano Reggiano production. The survey researched in detail each stage of the production process, from the reception of raw materials to the delivery of finished product to the market, trying to identify risks and potential problems. At the end of the survey a Manual was created. This manual represents a reference model for dairies taking part in the project, since it contains the concepts the Consortium deems fundamental for the implementation of a Quality Assurance System. Among them, special importance was given to:
- the adoption of a production line approach (making the farms that supply milk take part in the Quality System);
- a prevention approach (with the use of HACCP method);
- the communication among system operators, creating a standing group inside the dairy, the "inter-functional production line group", made up of the President of the cheese factory, the technologist, a nutritionist and of the master dairyman. This group has the task of steering the quality system, defining production choices relating to fodder, forage, milk and cheese and setting implementation times and modes of Quality Assurance Systems.
In 1996 the first six dairies of the area received the certification of their Quality Assurance System while eight others were certified during the first months of 1997, bringing the total to 14 certified dairies. They will be followed by the remaining 56 dairies taking part in the project before extending the "Progetto Qualità Export", now renamed "Progetto Qualità Export Extra", to all the cheese factories of the area.

2.3 Empirical analysis of certified dairies

The survey of the 14 certified was carried out by sending them a questionnaire pertaining cost, benefits and the main problems met during the adoption and certification of the Quality System.
The results obtained were then processed by subdividing dairies into the production-size classes:
- class A: small dairies capable of processing 3,000 tons of milk or less (4 dairies in our sample);
- class B: medium-sized dairies capable of processing between 3,000 and 6,000 tons of milk (four dairies);
- class C: large dairies capable of processing more than 6,000 tons of milk (six dairies).

Costs were subdivided into structural costs, costs for the implementation of the Quality Assurance System and costs for maintaining certification standards.
The first class of costs (structural costs) was included in the questionnaire since the adjustment to EC directive 92/46 was considered to be a prerequisite for the implementation and certification of Quality Assurance Systems.
Answers vary widely according to the size of the dairy (see table 9). While small and large dairies had to meet the expenses of a large-scale restructuring in the same year or in the year after the issuing of the directive, medium-sized dairies (whose structures already complied with the law) had to adjust some of their structures in 1996.
In 1992, the year in which most small and large dairies adjusted their structures to the directive, the most common expenses were met for the reception room (100% small dairies and 83% large dairies), for the cream separation room (100% small dairies and 83% large dairies) and for the milk processing room (100% small and large dairies), for personnel rest-rooms (100% small and large dairies) and for the adjustment to the electrical plant (75% small dairies and 100% large dairies).
For medium-sized cheese factories, restructuring mainly entailed changes to milk processing rooms (100%), brine rooms (75%), steam boiler room (75%) and the adjustments of the curing storehouse (75%) and of the electric plant (75%).
The second category related to the costs that diaries incurred in order to comply with the UNI EN ISO 9002 standard (see Table 10).
The second cost item is "test and chemical analysis" due to the introduction of test on raw materials coming from the farm (analysis of hay and fodder, aflatoxins test on hay and fodder, water analysis), the cheese factory (analysis of rennet, soda and water) and test on the sanitary conditions both of the farm and of the dairy. The third cost item is represented by expenses met to update equipment and guarantee the accuracy of measuring instruments and the repeatability of measurements. As for structural costs, the highest were incurred by medium-sized dairies. Since they had not made any adjustments at the beginning of the 1990s, they had to update their structures during the implementation of the Quality Assurance System.
On the other hand, no dairy had to face the costs for external consultants and for the certification body, since these were incurred by the Consortium that, in turn, benefited from funds from AIMA and from the Emilia-Romagna region.

The costs for maintaining the certification standards are clearly linked to the type of production of the cheese factories and are represented by the costs of GIF members, the costs for tests and for checking equipment calibration.
As far as benefits are concerned, the answers seem to be more homogeneous. 100% of dairies stated that the adoption of a Quality System brought about an improvement in company organisation both as far as documentation of the process and communications among the various operators are concerned.
The introduction of a policy of registration of all activities ensures the traceability of the product up to the raw materials used. This, in turn, makes it possible to identify and evaluate the causes of potential or actual non conformities.
The best communication was introduced with the creation of the above-mentioned GIF groups. Since they bring together different areas of knowledge and technical expertise, they create a direct line among operators and workers involved in different stages of the production process, from the farm, to the dairy, to the curing storehouse.
Among the most popular benefits were: better opportunities in the marketing of cheese (72%), improved opportunities on foreign markets (64%) and a higher selling price (22%).
As far as problems are concerned, all dairies agree that the main obstacle is raised by workers who, being used to deeply rooted traditions, have proved reluctant to change their day-to-day routines (i.e. the filling in of company documents) and, in general, to modify their approach in order to organise a traditional production process inside the framework of the UNI EN ISO 9002 standard (Table 11).
The increase in the production of first-choice cheese (+7,02%) is extremely interesting as we can see by comparing the first batch of 1995 and the first batch of 1996 in a medium-sized certified dairy.



Scheme 1

2.4 Some considerations on the results of the survey

If we look at the results we see that the adoption of Quality Assurance Systems involved huge expenses due to the structural adjustments required by the Directive in force. On the other hand, other cost classes were rather limited, thanks especially to the financial support of the Consortium. In a second survey on the certification of Quality Assurance Systems in Parmigiano Reggiano factories we saw that for a medium-sized dairy (with an annual production ranging from 3,000 to 6.000 tons) structural costs (as stated above) + the costs due to the implementation of a quality system are about 7% of the annual dairy running costs, while the costs for maintaining the certification standards range between 1 and 1.5%. The financial burdens are obviously higher for small dairies (annual production up to 2.000 tons): about 28% for structural costs + implementation costs and about 6% for maintaining the certification standards.

The adjustment process to the ISO 9002 standard along the production chain showed the problem of structural inadequacy of a large number of farms supplying milk to Parmigiano Reggiano factories.

At present, the Quality Assurance System sees the involvement of a pilot farm that was chosen both for its ability to supply large quantities of milk and for its structural efficiency. The farm uses an internal system of registration cards that allow the documentation of the activities. This, in turn, proves useful when the need arises for adjustments of any kind. Gradually, all farms supplying milk to the dairy will have to be involved in the Quality System of the cheese factory to cover 100% of the milk supplied.

A survey carried out in 1995/96 on the structure of farms in the province of Parma showed that 58% of farms have between 1 and 19 heads. This class is characterised by high average costs, limited financial resources and a difficult generational turnover and is below the efficiency threshold. These farms also have to face the problem of adjusting to the 92/46 Directive. This adjustment will entail an average expense of 200 million lire for a farm with 40-60 heads and a good building structure. In view of the fact that most of these costs are fixed, to all intents and purposes, they are especially hard for farms with 1-19 heads that are already weak for their small size. The question is how will the Consortium and farms be able to comply with the requisites of the law; non-compliance with these terms will entail the closing down of a large number of farms and a drastic reduction in milk supply.

As far as benefits are concerned, we must state beforehand that the recent introduction of Quality Assurance Systems does not give us a large enough database, although we can still comment on some of the results.

First, the reduction of second choice product seems to confirm the efficiency of ISO standards as a means for managing business process. For this reason we must insist on the need to train operators and workers to prevent problems and to look for the causes of errors.

The second observation is that, up until now, the Progetto Qualità Export seems to be aimed mainly at satisfying the requirement of a certification document by foreign organised distribution. However, if the only aim of certification is its use as a competition instrument on foreign markets, the expenditure of energy and resources to obtain it is probably not counterbalanced by results.

If we analyse the answers to the questionnaire, there seems to be a lack of information about the benefits the curing industry can draw from the reduction of non conformities. Proof of this is the fact that the curing industry is not ready to pay a higher price for cheese coming from certified dairies.
In our opinion, the use of certification to increase the contractual power with foreign organised distribution and to improve the image of the product in the eyes of the final consumer falls short of taking advantage of all the potentialities of Quality Assurance Systems. In the case of a DOP product, this approach is both reductive and risky because it weakens the meaning of the protected denomination of origin. For this reason, we believe that the proposal to put the caption "Extra" on Parmigiano Reggiano produced by certified dairies is both unjustified and dangerous since it would bring into question the credibility of the DOP brand for which the consumer has already accepted a higher price, at least up until today.
We believe that Quality Assurance Systems should have a role along the production and distribution chain, but also that the protected denomination of origin should guide the consumer in his or her choice. This would prevent the possible confusion from damaging the operators involved in the production of Parmigiano Reggiano.

Table 1.1 Scheme of PAIS

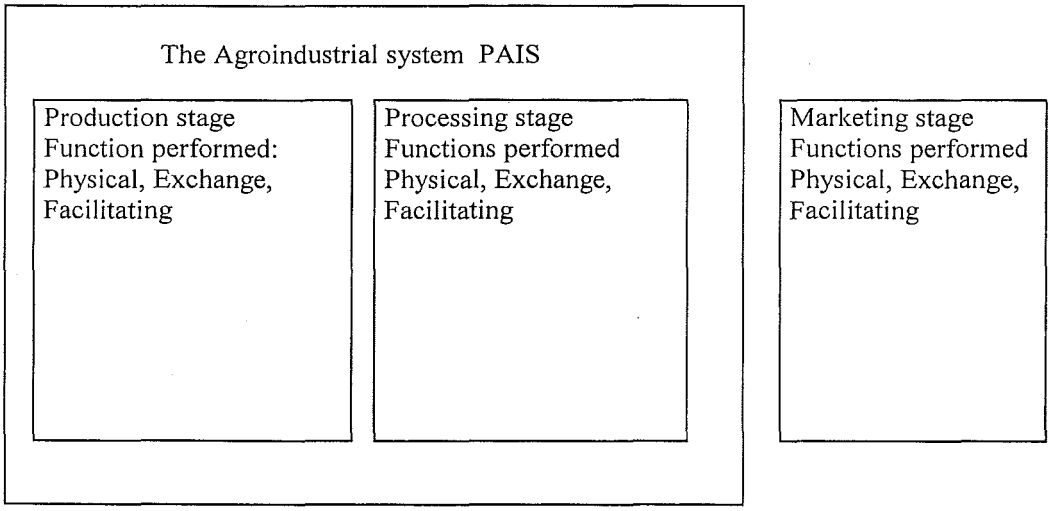
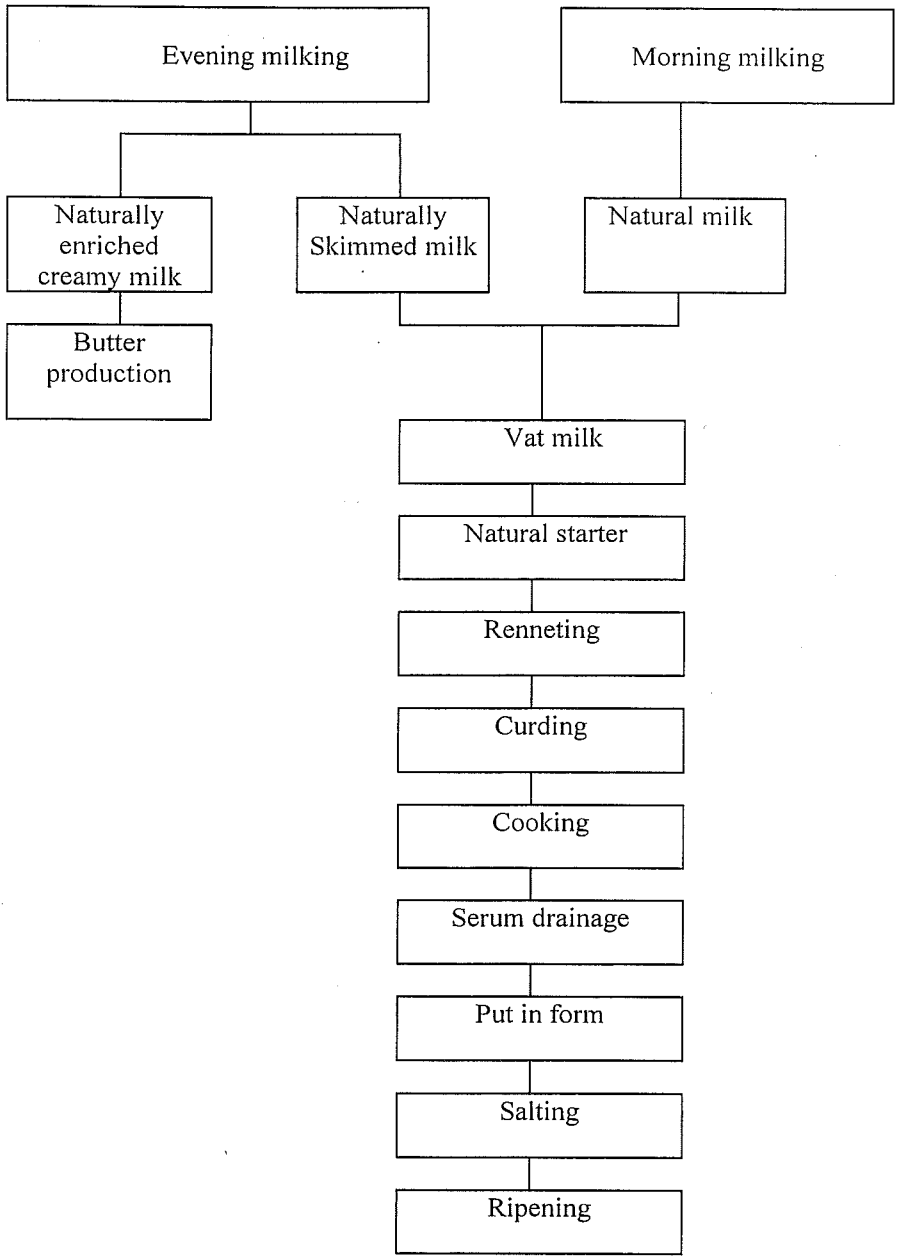


Table 1.2 The functions performed by PAIS at production and processing stages

Stage of production	Physical function	Exchange function	Facilitating function
Production	Input storage Cattle selection (Reggiana, Frison) Artificial insemination Feeding (nutrition and physiology) Veterinary control (pathology) Milking: HACCP and CCP Milk refrigeration/conservation Milk delivery to dairy plant	Fixed assets acquisition Operative assets acquisition Asset maintenance Mortgage, General costs Milk sold to dairy plant Milk sold to other agents Veal, cattle selling Service acquisition Intermediation Bargaining	Quality standards: igienic, nutritional, technological Financing: short long debt Insurance Consultant, Assistance Market intelligence Search for partners Quality insurance (UNI-EN-ISO-9002)
Processing	Milk storage Milk processing Cheese storage and seasoning Quality assurance Engineering control Technical assistance to farmer Transport Biotech. development R&D	Milk buying from suppliers Operative assets acquisition Fixed assets acquisition Asset maintenance Mortgage General costs Transport cost Price-profits paid to suppliers Price received from market	Accounting control Financial control Balance Certification Marketing strategies Market intelligence Forecasting Search for partners Consulting Quality insurance (UNI-EN-ISO-9002

Table 1.3 Technology assessment of Parmigiano production



TQM of PAIS: the objectives of certification procedures

Beginning with 1993: 14 Dairy plants have experimented the TQM

The TQM program intends to improve the quality by controlling the all steps of the production cycle and to communicate a better commercial image of the product.

The program is based on the following steps:

1) The application of the directive 93/43/CEE concerning the quality definition;
2) The introduction of certified quality and quality assurance systems;
3) The protection of the typical productions (DOP) characterized by:
   technology, tradition, history, geography artisan methods of production,
4) The definition of the Chain (Filière) with the following integrated units:
   Farm-Dairy plant-Ripening plant
5) The definition of the HACCP and CCP method for the respect of procedures
   to obtain a good quality milk at farm level;
6) The definition and adoption of quality system based on the ISO-9000 norms
   at dairy plant to obtain the chhese satisfying the DOP standards:
   6.1) the dairy plant is the focus of the quality system.
   6.2) the activation of quality circle in dairy plant.
7) The application of new UE norms for DOP products including Parmigiano:
   hygienic, safety and product security;
8) The adoption of a manual of dairy quality describing:
   7.1) the physical functions at production,processing stages,
   7.2) the control procedures and control instruments,

The UNI-EN-ISO norms for a good Parmigiano fabbrication:

UNI-EN-29000 (ISO 9000) Norms for the management of quality and quality insurance;
UNI-EN-29001 (ISO 9001) Quality systems: criteria for the quality insurance in project, development , processing, plant installation and assistance;
UNI-EN-29002 (ISO 9002) Quality systems: criteria for the quality insurance in processing and plant installation;
UNI-EN-29003 (ISO 9003) Quality system: criteria for quality insurance in final control
UNI-EN-29004 (ISO 9004) Criteria for the management of quality and quality insurance;

Table 1.4 HACCP: The critical steps of farm operations for a good milk quality *

Critical Points	Operation	Risk	Control
1	Work dressing	contamination	Dressing
2	Personal hygiene	contamination	Use of the appropriate detergent
3	Arm-hand cleaning	contamination	Superficial tampoon
4	Vacuometer	Anomalous functioning	Check pressure
5	Udder control	Milk contami nation and cattle health	Chech sheath
6	milking plant	contamination	check detergent
8	hoof cleaning	lower concentration of active principle	check the concentration
9	final milk temperature	contamination	check temperature
10	milk deposit	contamination	check tampoon at the exit valve
11	vacuum machine control	contamination	cleaning
13	water alcalinity	coating	control
14	alcaline washing	decreased efficacy	check temperature and time
15	acid washing	decreased efficacy	check temperature and time
16	pipe, connections washing	posssible contamination	chech procedures

* Other three elements of the CCP regard: 1) the operators charged to execute the operation;
2) the prescription limits indicated by the legislation or by experience; 3) the correction procedures

Table 1.5 The Dairy structure and the Parmigiano production in the last two years

Provinces	Dairy plant number			Production (ton)		
	95	96	% change	95	96	% change
Parma	231	229	-.86	34712	37213	7.20
Reggio E.	199	199	--	30903	32870	6.36
Modena	154	153	.- .65	19291	20344	5.46
Bologna	16	16	--	2051	2228	8.63
Mantova	52	52	--	11565	12241	5.84

Table 1.6 Production cost for liter of milk in Emilia Romagna in 1994

	Milk for Parmigiano production				Milk for Grana Padano			
	Mountain		Plane		Mountain		Plane	
Cost	Abs value	% (GC)	Abs value	% (GC)	Abs value	% (GC)	Abs value	% (GC)
Feedstuff	229.5	23.3	220.0	27.6	165.7	14.9	190.0	28.9
Miscellanea	75.1	7.6	71.2	8.9	59.2	5.3	56.6	8.6
Forage production	61.7	6.3	54.6	6.8	77.2	6.9	70.2	10.7
General costs	33.3	3.4	39.6	5.0	32.8	2.9	30.0	4.6
Mortgage	129.2	13.1	81.3	10.2	156.0	14.0	60.7	9.2
Labor	344.1	34.9	213.8	26.8	484.7	43.5	159.0	24.2
Interests (neg)	113.4	11.5	116.4	14.6	137.7	12.3	91.1	13.9
Total cost	986.2	100.0	796.9	100.0	1113.4	100	657.7	100.0
Fixed Cost	366.2	37.1	345.7	43.4	302.2	27.1	316.8	48.2
Variable cost	620.0	62.9	451.2	56.6	811.2	72.9	340.9	51.8
Var/Fixed		1.70		1.30		2.70		1.08
Value of the meat	137.9	14.0	119.7	15.0	240.7	21.6	122.5	18.6
Net cost	848.3	86.0	672.2	85.0	872.7	78.4	535.1	81.4
Number of farms	113		67		24		10	
Cows per farm	29		42		26		69	

Source: elaboration from CRPA data. reported in Annuario del latte, 1995

Table 2.1 STRUCTURAL CHANGES CARRIED OUT BY DAIRIES (%) ACCORDING TO PRODUCTION CLASS (tons/year)

	A < 3,000	B 3,000-6,000	C >6,000
milk reception room	100%	25%	83%
cream separation room	100%	25%	83%
milk processing room	100%	100%	100%
cheese rest room	75%	67%	67%
salting room	67%	75%	83%
steam boiler room	75%	75%	50%
weigh-house	67%	33%	60%
dressing room	100%	50%	100%
curing storehouse	33%	75%	67%
electric plant	75%	75%	100%

Table 2.2 CHANGES AND COST FOR THE IMPLEMENTATION OF THE QUALITY SYSTEMS CARRIED OUT BY DAIRIES (%) ACCORDING TO PRODUCTION CLASS (tons/year)

		A < 3,000		B 3,000-6,000		C >6,000	
GIF		100%		100%		100%	
	million lira per year	before certif.	after certif.	before certif.	after certif.	before certif.	after certif.
chemical analysis	up to 5			25%			
	5-10	100%	25%				
	10-15			25%	25%	17%	
	15-20		75%		25%	17%	
	more than 20			50%	50%	66%	100%
equipment	stainless steel tanks for cream separation	25%		50%		0%	
	aspirators	25%		50%		0%	
	instruments for milk analysis	50%		100%		17%	
	measuring instruments	0%		50%		34%	
	air conditioning for the curing room	0%		100%		0%	

Table 2.3 BENEFITS AND PROBLEMS FOR DAIRIES (%) DURING THE ADOPTION AND THE CERTIFICATION OF A QUALITY ASSURANCE SYSTEM

benefits		problems	
better business organisation	100%	overcoming personnel reluctance and habits	100%
better communication	100%	filling in and updating documents	100%
improved ability to market cheese	72%		
more opportunities on foreign markets	64%		
higher selling price	22%		

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