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The dynamics of the Parmigiano-Reggiano production system

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The dynamics of the *Parmigiano-Reggiano* production system

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Abstract

This paper contains an analysis of the dynamics of the economic behaviour of the cheese dairies operating within the "Parmigiano-Reggiano" (PR) cheese production system. These firms play a crucial role in the supply chain of this highly artisanal product, which interests over 15% of Italian milk production.

The analysis is focused in particular on the nature of the up and downstream relationships of the cheese dairies. Sub-chains are identified characterised by stable and constant relationships between dairy farmers, cheese dairies and wholesaler-ripeners, which contribute significantly to the reduction of transaction costs.

Cheese dairies have only limited possibilities for product diversification. This strategy is performed essentially by the cheese ripening firms.

Cheese production techniques remain primarily artisanal, where the cheese-maker continues to play a key role in the quality definition of the cheese. However, standardisation practices are introduced to comply with the demand of the large retailers, increasingly asking for cheese lots with constant and limited quality variations.

The profitability of the PR system is highly cyclical and the market transparency is low, but five-year averages show that the remuneration of labour and capital invested on the dairy farms and the cheese dairies is satisfactory.

Keywords : Parmigiano-Reggiano, Parmesan, vertical co-ordination, cheese dairies, profitability, market power

INTRODUCTION

In his theory of the value chain, Porter (1985) stresses the importance of how each firm relates its own value chain with the value chain of up and downstream firms in the product chain. To which extent it is convenient to produce the product within the own firm and under which circumstances it becomes necessary to delegate functions outside the firm? This question of *make or buy* is crucial for the economic efficiency of the firm. Full vertical integration creates the advantage not to depend from the power of delivering firms and to internalise the transaction costs related to the bargaining process with these firms. At the other side vertical integration creates internal bureaucratic costs inherent to the adjustment of different production functions within the firm. Hence, the decision to integrate with up or downstream firms depends upon the balance between transaction costs and the internal organisational costs. Frequently it is more efficient to arrive at certain forms of vertical co-ordination, which, ultimately, depends on the nature of the contractual relationships the firm is able to create with other firms.

Interesting is the application of the three proposed basic firm strategies to the analysis of firm behaviour as proposed by Porter. The option to adopt cost reduction, product differentiation or focalisation as the main driving force of the firm behind the objective to remain competitive on the market has important consequences for how to combine the different cost determinants in a consistent way. Product differentiation definitely incurs costs, which have to be compensated by better valorisation of the products on the market. The strategy of focalisation rises firm costs even more, and puts even higher conditions to the final selling price to be competitive. The concepts developed by Porter can thus be considered as highly valuable in analysing the behaviour of firms inserted in the different product chains.

The question, to which extent the value chains of vertically co-operating firms are integrated or not, makes the boundary of the firm becomes less defined. In neo-institutional theory, the firm as an entity of research is even abandoned. The economic world is composed of organisations and markets. As has been stated above, important to this respect is the question of how to produce: in one single vertically integrated organisation or in a series of vertically co-ordinated organisations. In the first type of organisation, the internal co-ordination generates bureaucratic costs, in

vertically co-ordinated organisation co-ordination is performed by markets, which generate transaction costs. In other words, the interactions of individuals within an organisation are co-ordinated by rules complemented by prices, whilst the interaction on markets between actors are co-ordinated principally by prices and complemented by rules (Favereau, 1989).

In this paper, an analysis is presented of how the cheese dairies, operating in the *Parmigiano-Reggiano* production system, deal with their the upstream and downstream relationships and how the interaction is taking place between first the cheese dairies and the wholesalers-ripeners and second between the cheese-makers and the dairy farmers. One of the questions is posed how these interactions contribute to the quality definition of the cheese and which written and unwritten rules govern the up and downstream relationships.

1. CHEESE DAIRY SURVEY

In the production area of *Parmigiano-Reggiano* cheese in 1998, there were 612 cheese dairies in operation. Out of this number, 491 were co-operatives, 78 privately owned and 43 are run as a farm scale cheese dairy.

The co-operative dairies form the majority of cheese-making dairies to be found in the P-R area. About 85% of the milk used in the production of *Parmigiano-Reggiano* was processed by this type of dairy. The general objectives of the co-operative set up differ significantly from those of the privately owned undertakings. First of all, the members are obliged to supply all the milk they produce to the dairy. Implicitly, the main objective of the co-operative dairy is that of maximising the payment made for the milk supplied to it. At the moment when the annual accounts come to be drawn up, this objective predominates over all others. All other secondary objectives are subsumed into this primary one.

Evidently, within the co-operative, the dairy farmers are fully integrated in the cheese dairies, or in other terms the value chains of both firm types are completely integrated. In the co-operative, the upstream relationships are thus governed primarily by written and unwritten rules, which govern the interaction between the two entities.

The improvement of cheese quality is obviously an aim of all cheese dairies, but the very concept of quality has

widely differing connotations. The final quality of the consignments of cheese from the dairies depends largely on the interaction between the cheese-maker and the supplying members, on the cheese-maker's skills and on the quality characteristics of the milk supplied.

The strategies adopted by the cheese dairies may be very different in relation to size of the dairy and to the degree of integration in the post-production stage : the extent to which the dairy undertakes the ripening of the cheese itself.

A study involving 115 dairies has been conducted in order to identify their strategies and their relations both with their farmer members and with the buyers of their products. The sample was selected as being representative of the prevailing situation applying to co-operative cheese dairies within the P-R area of production. The sample represents 22% of co-operative dairies and 18% of all dairies within the cheese area, producing 18% of the milk processed in the entire P-R production area. The cheese-makers and chairmen of these dairies were interviewed using a structured questionnaire.

Table 1 : The research sample of cheese dairies

	Plain	%	Mountain	%	Total	%
Mantua	9	12.8			9	7.8
Parma	20	28.5	15	31.1	35	30.4
Reggio Emilia	20	28.5	13	28.9	33	28.7
Modena	21	30	17	38.8	38	33
Total	70	100	45	100	115	100

Most cheese dairies sell their consignments of cheese to the wholesaler-ripeners once it has already been ripened for an average of only seven months. The statistics produced by the sample indicate that 77% of the co-operative dairies sell their cheese ripened for this length of time. Only 23% ripen their cheese from 18 to 24 months, at which point the cheese is ready for consumption. The activity of dairies in the final phase (that of the final ripening) is thus not very common. Considering however, the fact that the average size of these cheese-dairies (processing of 3,330 metric tons a

year) is higher than the average, it is worthy of note that they process 29% of the milk in the P-R area.

In the present survey, dairies have been broken down into the following categories : small, medium-sized and large dairies (all acting autonomously) and "integrated" dairies – which are active in the ripening process and produce PR cheese ready for consumption. Table 2 lists the main structural characteristics of the four categories of cheese dairies.

Table 2 : Some structural characteristics of the cheese dairies in the sample

	Number	% Dairies	% milk processed	Milk processed per year (tons)	Average number of members
Small	24	20.9	8,9	1,108	10
Medium	47	40.9	32	2,041	15
Large	18	15.7	30,3	5,047	21
Integrated	26	22.7	29	3,330	17
Total sample	115	100	100	2,608	15

Two actors play key roles within the co-operative cheese dairy structure : the cheese-maker and the chairman of the co-operative. The first is responsible for the quality of the cheese produced, whereas the second, together with the management committee, carries out the commercial functions. The chairman maintains the financial relations with the co-operative members supplying the milk and with the cheese buyers. The questionnaire distributed for this survey included a number of questions to be answered by the cheese-maker with another section containing questions for the chairmen.

For a full understanding of the various different strategies adopted by the co-operative dairies in their attempts to increase the return on the milk from their supplier

members, it is important to emphasise that they have very little room available for product diversification. The majority of cheese dairies only sell *Parmigiano-Reggiano* with an average age of between ten and twelve months - in other words not ready for direct consumption. Hence, the cheese dairies are not in direct contact with the final consumer. Their contacts are with a secondary demand originating from the wholesaler-ripeners. The majority of cheese dairies do not know through which final sales outlets their own produce is sold. Only those dairies undertaking the final ripening process are better informed in relation to the final destination of the cheese they produce, because they contract directly with retailing businesses or sell directly to the final consumer.

Table 3 : Do you know the final sales outlet your cheese is sold through ?
(N = 115)

	Integrated	Small	Medium-sized	Large	Total
Unknown	46.2%	58.3%	63.8%	77.8%	60.9%
Supermarkets	19.2%	20.8%	14.9%	16.7%	17.4%
Small Retailers	34.6%	20.9%	21.3%	5.6%	21.7%

Long and short-term trends in final consumption patterns are registered by the cheese ripening firms. They are not restricted to purchasing cheese from a single cheese dairy and can thus meet changes in final demand by purchasing cheese from a range of different cheese dairies, each being characterised by its own specific quality of unripened cheese. Hence, the strategy involving product diversification is open primarily to the ripening firms and is only an option to a very small extent for the cheese dairies.

Basically, the dairy has three options in pursuing its objective of maximising return on its members' milk :

- Reduction of waste production ;
- Reduction of processing costs ;
- Increase the quality of the unripened cheese in order to achieve a higher price ;
- Increase in business skills and sales strategy of the co-operative chairman.

A strategy based on producing a range of different quality types of unripened cheeses would be too costly for an individual cheese dairy. The additional costs could not be

recouped by charging higher prices. Quality differentiation, if at all, can be seen at a more general level, taking all dairies as a whole, but it is not apparent at the level of the individual cheese dairy.

Obviously, all cheese dairies seek to improve their cheese quality. The end result, in the form of the total cheese production for sale depends to a significant extent on the interaction between the cheese maker and the milk-supplying members, on the cheese-maker's skills and on the quality characteristics of the milk supplied.

Notwithstanding the distinction made here between "integrated" and "non-integrated" dairies, so-called non-integrated dairies do complete the ripening process for a limited quantity of their production. Almost all dairies have a sale outlet based on the premises for the direct sale of fully ripened cheese. The integrated dairies though, ripen their entire cheese production and sell cheese ready for consumption to wholesalers, retailers and large-scale sales distribution networks.

The strategies of the four groups of cheese dairies have been analysed focusing on the following issues :

1. Management of demand and relations with the purchasers ;
2. Management of the production process ;
3. Training of the work-force ;
4. Management of the supply and relations with their farmer members.

1.1. Relations with the purchasers of the cheese

Almost 90% of cheese produced by the non-integrated dairies are purchased by the wholesale cheese ripeners in consignments comprising the full year's production,

ripened on average for seven months. The specialist ripeners will thus be responsible for the completion of the ripening process.

Within the non-integrated group, only the large dairies are in a position to enter contracts with sales distribution networks and retailers. Although they are only able to do so to a very limited extent : about 10% of production. This remains true although they have made the decision not to ripen their entire year's consignment of cheese. This portion of cheese production ripened by the dairies themselves is sold to retailers (3.4%), supermarkets (5.9%) or else directly to the consumer (2.1%).

Table 4 : Sales outlets used (%)
(N = 115)

	Integrated	Small	Medium-sized	Large	Total
Wholesalers-ripeners	73.9	92.6	96.8	88.6	89.7
Retailers	6.0	.0	.0	3.4	1.8
Hypermarkets	1.3	.0	.0	5.9	1.2
Final Consumers	18.8	7.4	3.2	2.1	7.3
Total	100.0	100.0	100.0	100.0	100.0

Those cheese dairies, which have invested in a ripening store house and which see through the entire production process, have a more diversified client group. A large proportion of the production of the cheese dairies which integrate the final production stage is sold directly to the consumer (18.8%). The integration with others in the ripening stage allows these dairies a more frequent contact with the final consumer as compared with those, which have not undertaken such integration. The chairmen of these dairies have a better knowledge of the sales outlets for final consumption (see table 3). They justify the

decision to undertake their own ripening by their conviction that this strategy ensures a greater income for the dairy members (88%).

It is nevertheless surprising that the integrated cheese dairies still sell over 70% of their ripened cheese to wholesalers. This means that also these dairies arrive at the final sales outlet only to a limited extent. Presumably, the quantities sold by these dairies are too small to provoke the interest of the large-scale retail sector.

Table 5 : Does ripening the cheese yourself ensure a greater income for the members ?

	Integrated	Small	Medium-sized	Large	Total
No	12.0%	25.0%	30.4%	50.0%	28.0%
Yes	88.0%	75.0%	69.6%	50.0%	71.9%

The chairmen of the large dairies, not involved in integrated production, are those least convinced of the financial benefits to be derived from investment in the

ripening stage (50%). The majority believe (87%) that dealings with large cheese wholesaler-ripeners are more likely to be good for the dairy's business and it is thus

better to pass on the ripening activity to others (table 6). The choice made by the large dairies to ripen 10% of their production in any case for sale to the distribution network

may be motivated by a limited diversification strategy, not impinging though, on the dominant strategy : that of not undertaking the ripening themselves.

Table 6 : What kind of purchaser do you prefer as being good for your business ?

	Integrated	Small	Medium-sized	Large	Total
Retailer	36.0%	15.0%	21.7%	6.3%	21.5%
Small ripener	24.0%	35.0%	19.6%	6.3%	21.5%
Wholesaler	40.0%	50.0%	58.7%	87.5%	57.0%

It is surprising to note the limited number of wholesalers contacted before signing the supply contract. A large majority (76%) do not contact more than one cheese ripener, and their clientele is also fairly stable over time. Very often (in 77% of cases) the entire year's production is sold to a single cheese ripener. In the case of the small dairies, it is usually one ripener who purchases the entire production. Even the large dairies, though, do not have

very diversified commercial contacts. Almost 60% are sold to a single client and 30% had two clients. Those dairies undertaking the complete ripening of the cheese are clearly closer to the final consumer and their client group is thus more diversified. More than 20% of these dairies sell their production to more than three clients. On the other hand, it is still worthy of note that even out of these dairies, 58% have only had a single client.

Table 7 : Normally, how many firms do you contact before signing the contract ? (N = 112)

	Integrated	Small	Medium-sized	Large	Total
One	54.2%	79.2%	84.8%	76.5%	75.7%
Two	16.7%	12.5%	10.9%	11.8%	12.6%
More than two	29.2%	8.3%	4.3%	11.8%	11.7%

Table 8 : Over the past year, who has bought your cheese ? (N = 112)

	Integrated	Small	Medium-sized	Large	Total
Single client	58.3%	95.8%	83.0%	58.8%	76.8%
2 clients	12.5%	4.2%	12.8%	29.4%	13.4%
3 clients	8.3%		4.3%	5.9%	4.5%
More than 3 clients	21.0%			5.9%	5.4%

Apart from the fact that the dairies sell to only a small number of purchasers, it was also noted that the clientele remained very stable over time. The greater part of the dairies does not change their purchasers frequently. Year

after year, the entire cheese production is sold to the same ripeners or wholesalers. This is an observation which is valid for all dairies, but is particularly true for the large and integrated dairies.

Table 9 : Describe the nature of sales effected over the last five years. (n = 111)

	Integrated	Small	Medium-sized	Large	Total
Stable	87.5%	60.9%	68.1%	76.5%	72.1%
Changed : 2 purchasers	21.7%	17.0%	11.8%	13.5%	
Changed : more than 2 purchasers	12.5%	17.4%	14.9%	11.8%	14.4%

Two observations can be drawn from these data :

- The attempt of cheese dairies to establish long term trust relationships with the purchasers of their cheese ;
- The dairies' low bargaining power.

The dairies have little bargaining power when dealing with the cheese wholesaler-ripeners since they neither seek nor are able to sell to the highest bidder. On the other hand though, the stability of the relationship with few purchasers ensures that they have both a secure and steady outlet for their production. This means that the payments they make for the milk supplied to them are also secure. Sales stability over time to few purchasers guarantees a high level of reliability in the commercial relationship and payment conditions are respected. All this contributes to the reduction of transaction costs.

The ripeners are often in an advantageous position in their dealings with the cheese dairies. Constrained as the latter are, on the one hand, by the demand for liquidity from their member farmers and on the other by the limited space for ripening the cheese themselves, they cannot afford to wait long before selling their unripened cheese production. On the other hand, in order to increase their return on capital operating in two adjacent markets subjected to wide price fluctuations, the ripeners have to :

- Choose the right moment to buy the consignments of cheese ;
- Take great care in choosing the right cheese-dairies to reduce the risk of waste production to a minimum during the long ripening process ;
- Obtain the best buying terms possible from the cheese dairies, delaying the time for the weighing, the collection and the payment for the product.

The wholesaler needs an extensive knowledge of the market to be able to choose the best time and the best conditions for purchasing the cheese. A number of studies carried out on the *Parmigiano-Reggiano* market have all concluded that it is characterised by a kind of oligopsony. This means that the ripeners have greater bargaining power than the cheese dairies (Messori 1984).

In their sales strategy, the cheese dairy has a limited room for manoeuvre, but this does not mean that it does not exist at all. Half the chairmen of the large cheese dairies interviewed believe that the skills of the chairman in obtaining advantageous price terms counts as much as the quality of the cheese produced. The chairmen of the integrated dairies, consistently with the diversification rationale, believe that, with respect to other dairies, their role is of added importance in the pre-contractual bargaining process. These dairies thus have a little bit more room for bargaining.

Table 10 : Are the chairman's commercial bargaining skills at least as important as the quality of the product in obtaining advantageous price terms ? (N = 114)

	Integrated	Small	Medium-sized	Large	Total
No	34.6%	50.0%	46.8%	47.1%	44.7%
Don't know	3.8%	4.2%	4.3%	5.9%	4.4%
Yes	61.5%	45.8%	48.9%	47.1%	50.9%

1.2. Management of the production process

The degree of craftsmanship involved in the cheese-maker's work is very high, as it consists of following all the critical points in the productive process. Furthermore, since each farmer supplies milk with different qualitative characteristics and this quality changes from day to day and from season to season, the work of the cheese-maker does not lend itself easily to automation. The cheese-maker's work requires a high degree of skill because it involves the processing of a raw material which is highly changeable both time and space.

The importance of the cheese-maker's work is thrown into sharper relief when it is considered that almost one half of the chairmen of the large cheese dairies assert that the cheese-maker's skills have the greatest effect on the end quality of the cheese, even coming before the intrinsic quality (in terms of casein or hygiene) of the milk itself. While the chairmen of the small dairies do not under-estimate the cheese-maker's role, they believe that the basis of a good cheese lies primarily in its casein.

Table 11 : Which are the most important factors in making a better cheese quality ?
(N = 115)

	Integrated	Small	Medium-sized	Large	Total
Casein	32.0%	54.2%	32.5%	17.6%	34.9%
Hygiene	36.0%	20.8%	40.0%	35.3%	34.0%
Cheese-maker	32.0%	25.0%	27.5%	47.1%	31.1%

The cheese-maker has to follow a long apprenticeship in order to acquire his technical skills. In general, it is necessary to work many years as an apprentice before becoming a fully-fledged cheese-maker : eight years is the average according to the sample data. The first step after such an apprenticeship is normally that of becoming the cheese-maker for a small dairy on a relatively low wage,

as the small dairies cannot afford high labour costs. It is after this experience that the cheese-maker moves on to the large dairies. A cheese-maker in a large dairy will on average, have worked for 28 years in the business of which 9 will have been as apprentice and 19 as cheese-maker. The average career-length for the small dairy cheese-maker comes out at 19 years.

Table 12 : Data on the cheese-maker's working career
(N = 115)

	Integrated	Small	Medium-sized	Large	Total
Years as cheese-maker	17	12	15	19	16
Years as apprentice	8	7	9	9	8
Cheese-maker's total working life	25	19	24	28	24

It is clear that the milk quality has undergone significant changes over time. The majority of cheese-makers assert that 20 years ago it was easier to make cheese than it is today. This belief is connected to the substantial changes affecting dairy cattle both in terms of genetics and feeding practices. The absence of reward for milk quality, a situation which has persisted for decades, has resulted in

a dramatic decline in the casein content of the milk, but even more important, the replacement of traditional breeds, firstly with the Dutch Friesian and then with the America and Canadian Holsteins has altered the composition of the casein, reducing the frequency of the kBB variants, which have beneficial effects on the speed and consistency of the milk coagulation.

**Table 13 : From a professional point of view, was it easier to make PR twenty years ago than it is now ?
(N = 114)**

	Integrated	Small	Medium-sized	Large	Total
No change	24.0%	33.3%	23.4%	11.1%	23.7%
Now easier	40.0%	12.5%	23.4%	27.8%	25.4%
20 years ago easier	36.0%	54.2%	53.2%	61.1%	50.9%

The milk may be processed in the vats in three different ways :

1. By processing the milk from each farmer in a separate vat ;
2. By putting the milk from the small farmers together and keeping that from the larger farmers separated ;
3. By making a single mix of all milk supplied to the dairy.

The traditional method envisages the separation of milk according to its origin. This is the only way the cheese-maker is able to identify a direct correlation between the different qualities of cheese and the different milk supplies. This is done by marking the cheeses with the code number of the farmer supplying the milk used in the

making of that cheese. If there are anomalies in the cheese quality, the cheese-maker is able to trace it back to a particular milk supplier. This method allows the cheese-maker to carry out quality control checks on the production cycle.

In spite of the undeniable benefits of this system, over the last few years a practice has become increasingly common whereby all the milk supplied is mixed in the vats without regard to its farm origin. It is a technique which results in the standardisation of the final cheese quality and increases the homogeneity of the overall production. This practice has undoubtedly grown up in response to market demand as expressed by the large-scale distribution sector. They ask for a good quality product, but constancy over time is even more important to them.

Table 14 : What is the criterion you use when putting the milk from different farms into the cheese vats ? (N = 114)

	Integrated	Small	Medium-sized	Large	Total
Separate Farms	24.0%	45.8%	38.3%	50.0%	38.6%
Large on their own	60.0%	20.8%	27.7%	5.6%	29.8%
Small together and Large together		8.3%	2.1%	5.6%	3.5%
A single mix	16.0%	25.0%	31.9%	38.9%	28.1%

Although it is still a practice involving only a minority of cheese-dairies, the sample statistics show that primarily the cheese-makers in the large cheese dairies whom recourse to the single mix method when processing the milk. This is because the large dairies sell their production to the large-scale ripeners which in their turn, sell into the large-scale distribution network. The greater part of the cheese-makers in the small cheese dairies still process the milk separately in the different vats and seek to exploit the variety of milk quality coming from the different herds, with the objective of producing the highest possible quality.

This way of working allows the separation into different vats of those kinds of milk which, when combined with others, tend to produce less than perfect cheeses so far as final quality is concerned. The main defect of the method where all the milk supplied is mixed together in a single mix irrespective of its origin, is that it is unlikely to produce the very highest quality cheese. The product may well be of good quality, but the main reason for using this method is rather to keep the variability of the cheese produced to a minimum. This clearly tends to be at the expense of the highest quality production.

A way to increase the standardisation of milk quality is through the use of dry forage crops throughout the year. Traditionally farmers give green summer forage to their herds from spring to autumn, cut and brought to the cowshed on a daily basis. This practice results in reduced loss of dry matter during harvesting, avoiding as it does, the losses inherent to the haymaking process. At the same time, the change from the winter rations (based on hay) to green forage can provoke mastitis in high production cows.

Another effect of feeding with green forage is that the milk, and thus the cheese, becomes more yellow as a

result of the higher concentration of carotene. The cheeses made in the summer are yellow in colour while those in the winter are whiter.

The introduction of the hay-only feeding system and the elimination of green forage thus has the following advantages :

1. Less problems caused by mastitis in the high production herds ;
2. A cheese production which is more homogeneous as far as its colour is concerned, which is increasingly appreciated by the demand of the large retail sector.

**Table 15 :What forage do you advise your farmers to use ?
(N = 114)**

	Integrated	Small	Medium-sized	Large	Total
All dry forage	85.0%	82.6%	79.5%	76.5%	80.8%
Green forage in summer	15.0%	17.4%	20.5%	23.5%	19.2%

In response to the question "what feed do you advise your farmers to use ?" 80% of the cheese-makers answered that they prefer dry forage. The cheese-makers in general would thus prefer the practice of feeding dry forage in summer were to become more wide-spread because it makes the milk processing easier. Cheese-makers from all different types of dairies share this opinion.

If the age of the cheese-maker is taken into account the differences in the replies to the same question are much greater. The older cheese-makers generally advise feeding with green forage in the summer. These cheese-makers have sufficient experience to be able to deal with a milk quality which varies greatly over time. The milk quality changes significantly as soon as the green feed is introduced in spring time. These changes can be dealt with more easily by the older than the younger cheese-makers.

**Table 16 : What feed do you advise your farmers to use ?
(N = 113)**

	Up to 35 years	From 36 to 45 years	From 46 to 55 years	Over 55 Years	Total
All dry forage	88.2%	84.6%	68.0%	57.1%	75.8%
Green in summer	11.8%	15.4%	32.0%	42.9%	24.2%

1.3. Management of relations with the farmers

The co-operative dairies producing *Parmigiano-Reggiano* have an average of 15 farmer members. This number can vary from a minimum of 9 up to about 50 in some large co-

operative dairies. The sample statistics show that the average size of the milk supplying farms is in direct correlation to the size of the dairy. The large dairies receive milk from the large herds and the small dairies from the smaller herds.

**Table 17 : Farm sizes of the supplying members
(N = 115)**

	Integrated	Small	Medium-sized	Large	Total
Number of suppliers	17	10	15	21	15
Average annual supply in litres	219,600	135,100	166,800	273,200	186,400

Within the co-operative cheese dairy the milk and cheese production are fully integrated. The dairy farmers are the owners of the dairy. The chairman is always a farmer and is elected by the general assembly of the members. The cheese-maker is paid by the farmers as their employee.

Unlike this complete integration, the nature of the relationship between the dairy farmers and the cheese-maker has a decisive impact on the quality of the cheese. While on the one hand, the farmers can dismiss the cheese-maker if there is an increase in waste production ; on the other, the cheese-maker keeps a check on the changes in the quality of the milk coming from the members. He warns those producers whose milk falls short of the required standard too often. The relationship between the farmers and the cheese-makers is thus often changeable in nature, depending on changes in milk quality.

The milk quality in turn, not only varies from herd to herd but also over time. This can be seen principally in the seasonal variations in milk quality due to changes in the related feeding regimes. It also occurs as a result of the introduction of new productive practices. The following are of particular importance in this regard :

- Development through genetic selection ;
- Introduction of the uni-feed system³ ;
- Feeding of dry forage in summer.

These changes mean that the cheese-maker must be able to adjust his cheese-making techniques to cope with changes in milk quality - a skill not possessed by all cheese-makers, which may lead to this dismissal. On the

other hand, the cheese-maker may advise the farmer members to change the feed regime or their milk production methods as long as the recommendations fall within the production regulations. The feeding of silage to young heifers is allowed under the PR regulations, but the presence of silage in the cowshed may have indirect and undesirable effects on the milk, with negative repercussions on the quality of the cheese. A second problem is connected to genetic selection. A genetic improvement primarily concerned with the quantity of milk per cow may be at the expense of the casein content in the milk. The reduction of casein leads to a reduction in the "strength" of the milk and hence a lower cheese yield obtained from the same quantity of milk. The milk quality payment system applied by almost all dairies serves to correct too great an emphasis on performance-based criteria in genetic development, but financial incentives may not be enough on their own though. In such circumstances the cheese-maker is able to act against individual farmers to ensure that they concentrate genetic selection more on the quality and less on the quantity of milk produced.

In short, the relationship between the dairy farmers and the cheese-maker is governed on one hand by written rules, like the statute of the co-operative and the milk quality payment schemes ; on the other hand by an interactive negotiable process between dairy farmers and the cheese-makers, which are very important in determining the final cheese quality. The power relationship between cheese-makers and dairy farms changed significantly over time. If in the past, the cheese-maker was commanding the dairy farmers ; nowadays he has become increasingly dependent on the decisions taken by the farmers⁴.

**Table 18 : Is it better to have many or few suppliers for the same amount of milk ?
(N = 114)**

	Integrated	Small	Medium-sized	Large	Total
No difference	8.3%	8.7%	6.7%	11.1%	8.2%
Few	91.7%	87.0%	88.9%	83.3%	88.2%
Many		4.3%	4.4%	5.6%	3.6%

The majority of cheese-makers prefer to deal with only a few farmers. A less changeable milk supply makes the processing of milk into *Parmigiano-Reggiano* easier. It has already been noted that the greater part of the cheese-makers considered it was easier to process the milk twenty years ago than now. Today's milk is more difficult to process because it comes from cows which are no longer

the traditional breeds and with high milk production rates per cow. In such a context, it is understandable that today's cheese-makers prefer fewer suppliers for their milk since this removes one cause of change in milk quality. The opinion of the majority of cheese-makers that a dairy with few suppliers produces higher quality cheese is consistent with such a view.

Table 19 : What quality of cheese is produced by a dairy with few suppliers, all else being equal ? (N = 110)

	Integrated	Small	Medium-sized	Large	Total
Better	60,9%	58,3%	68,9%	55,6%	62,7%
No difference	39,1	41,7%	28,9%	33,3%	34,5%
Worse			2,2%	11,1%	2,7%

2.4. Types of cheese dairies and quality of the cheese

As has been clearly demonstrated, a single cheese dairy is not able to adopt a firm strategy based on diversification. This is because the extra costs incurred by adopting such a course cannot be compensated by the price differential for a variety of different product types. In their search for the maximum return price for the milk, all dairies

concentrate instead on the reduction of the cost of processing the milk into a particular and uniform quality grade of cheese over the entire production. Then the cheese wholesalers/ripeners apply a strategy of diversification by combining the different cheese qualities from the production of the individual dairies. In this way, they can ensure that they have a wide range of *Parmigiano-Reggiano* available for sale. But which are those dairies producing the better quality cheeses ?

Table 20 : What quality of cheese does a mountain cheese dairy produce, all else being equal ? (N = 110)

	Integrated	Small	Medium-sized	Large	Total
Better	47.8%	75.0%	71.1%	55.6%	64.5%
No difference	52.2%	25.0%	22.2%	44.4%	32.7%
Worse			6.7%		2.7%

The majority of cheese makers are convinced that cheese produced by mountain cheese dairies is of a superior quality. Only the responses from integrated and larger dairies betray an element of doubt as to the truth of such an assertion. The mountain dairies seek to recover their

processing costs primarily through the higher quality of their production. Their processing costs are higher on average because of the greater expense involved in collecting the milk.

Table 21 : What quality of cheese does a dairy produce which is supplied by large dairy farms, all else being equal ? (N = 110)

	Integrated	Small	Medium-sized	Large	Total
Better	45.8%	12.5%	40.0%	72.2%	40.5%
No difference	45.8%	50.0%	40.0%	22.2%	40.5%
Worse	8.3%	37.5%	20.0%	5.6%	18.9%

The above table indicates a significant split in opinions on the quality of cheese produced by dairies supplied with milk by large farms. The cheese-makers in the large dairies - the prime recipients of milk from this kind of farm - claim that the resulting cheese quality is better than

average. The small dairies are by no means convinced that this is true, while the replies from the medium-sized and integrated dairies show a position about mid-way between the two.

Table 22 : What kind of cheese quality does a privately run dairy produce, all else being equal ? (N = 110)

	Integrated	Small	Medium-sized	Large	Total
Better	4.5%	12.5%	13.6%	12.5%	11.3%
No difference	50.0%	50.0%	34.1%	50.0%	43.4%
Worse	45.5%	37.5%	52.3%	37.5%	45.3%

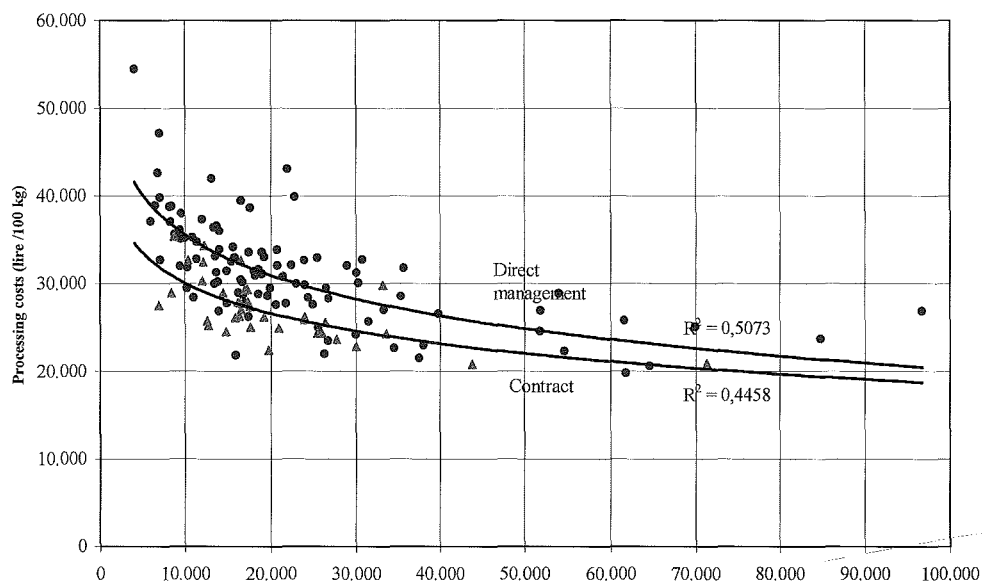
The last question in this series concerned the quality of cheese produced by the privately run dairies. Almost none considered that this kind of dairy is able to produce an above-average quality of cheese. The replies from the cheese-makers are essentially divided between "no difference" and "worse". All types of co-operative dairies are thus in almost complete agreement on the fact that the privately-run cheese dairy produces cheese of lesser quality and certainly not better than that produced by the co-operative dairies themselves.

This survey of different assessments of cheese quality produces a complex pattern of opinions on the subject. There is a general belief that the type of dairy does effect the quality of cheese. As far as mountain cheese dairies are concerned, almost all cheese-makers, from almost all kinds of dairies, agree that they produce better quality cheese. Some characteristics denoting quality may be considered entirely objective. However, the split in opinion both between small and large cheese-dairies and between integrated and non-integrated ones lead to the conclusion that the assessment of quality may also be a very

subjective process. If one takes economic criteria as a yardstick, this may provide an additional indication of those qualities, which are and are not recognised as such by the market. The price difference between mountain and plain dairies proves in fact the higher quality of the former with respect to the latter dairies.

3. ECONOMIC PERFORMANCE OF THE PR PRODUCTION SYSTEM

In previous work, the production costs of milk destined to PR cheese have been exposed, putting into evidence a cost difference of about 15% with respect to the production costs of industrial milk (De Roest, 1997). As the processing costs in cheese dairies are concerned these vary between ITL 32,000 per 100 kg in small dairies down to about ITL 24,000 per 100 kg in the large ones. In particular the economies of scale in the PR cheese dairies are limited, as with the current production techniques no significant cost advantages can be obtained beyond a dairy size of 50,000 quintals of milk processed per year (figure 1).

Figure 1 : Milk processing costs in *Parmigiano-Reggiano* cheese dairies, 1996

Source : Elaborated by CRPA

Table 23 : Economic performance of "Parmigiano-Reggiano" cheese dairies, direct management in plains 1990-1998 in lire per kg milk equivalent

	1991	1992	1993	1994	1995	1996	1997	1998
	L./kg	L./kg	L./kg	L./kg	L./kg	L./kg	L./kg	L./kg
Wholesale price PR	1.028	977	916	1.085	1.421	1.247	1.219	1.092
Butter output	70	71	85	92	112	91	99	90
Whey output	7	7	9	10	12	9	9	9
Processing costs	213	223	232	237	263	283	287	278
Implicit milk price	893	833	778	950	1.281	1.065	1.040	914
Milk production costs	791	806	814	833	911	990	1.009	967
Profit/loss	102	27	-36	116	370	75	31	-53

Source : elaborated by CRPA

From the presented analysis, a highly fluctuating economic performance emerges. During crises, losses are incurred, but during prices rises considerable profits are attained. The balance between losses and profits in

a time period of 1991 - 1998 is on average remunerating the high production and processing costs of milk, enabling the PR system to be competitive. In table 23, the final results of these calculations are presented. The

implicit milk price is the direct result of the cheese receipts and butter receipts after deduction of the processing costs. The high processing costs which may be up to 25,000 lire per 100 kg is three-fold the processing cost of milk in large-scale dairy plants. From the above analysis, it turns out that the high processing and higher milk production costs are on average covered by the cheese price. This shows the economic viability of the PR production system.

CONCLUSION

According to the neo-classical theory, a market is most efficient when goods are neither over- or under-priced, or in other terms, when prices are set on the basis of expected returns. An efficient market is characterised by the greatest possible openness, with instantaneous access to information on prices and stock levels. These data must be provided to all potential participants in the bargaining process. According to the market analyses carried out by Rosa (1985), the *Parmigiano-Reggiano* market is according to neo-classical terms, inefficient. This is due to the difficulties experienced by the small and medium-sized operators in obtaining access to the relevant data. An indication of this low level of efficiency is the fact that the operators rely only on past experience in the process of price setting. At the moment when the purchase takes place they are not fully informed of current, actual demand conditions.

It appears nonetheless, that the large-scale ripeners, with substantial cheese storage facilities, are able to realise additional profits solely as a result of their superior knowledge of market conditions. This has been the stimulus to set up a market observatory of the Consortium, the representative body of the cheese dairies, to increase market transparency.

The PR market is characterised by a high degree of uncertainty and the economic behaviour of the actors in the supply chain is characterised by, as Simon calls, bounded rationality. Margins in cheese production and in cheese ripening are highly variable from year to year. Cheese dairies are facing opportunistic behaviour of cheese ripening firms. Ripening of cheese is carried out only by a minority of cheese dairies, because the financial risks related to this activity are retained to be too high.

The cheese dairy survey provides a view of how dairies deal with the uncertainty on the market and opportunism

in the commercial relationship with the ripening firms. First, the upstream relationships with the farmers are governed by a complete vertical integration by means of a co-operative organisation. The majority of the dairies are co-operatives and therefore the upstream relationships change only to a very limited extent. As the private dairies are concerned, several open interviews give evidence of a stable relation with dairy farms. As private dairies are a minority their room of manoeuvre to change their reservoir of milk delivering dairy farms is limited. Although remaining private, these firms are almost forced to imitate the co-operative organisation.

Essentially most cheese dairies have very stable commercial relations with the firms involved in the ripening of the cheese. It is through these stable relationships that cheese dairies reduce their transaction costs. Selling cheese always to one or two cheese ripeners does at one side not always give the highest remuneration of the employed resources, but reduces the risk to remain with large stocks of unsold cheese or to paid at disadvantageous terms. It is this trust relationship with solves part of the problems related to uncertainties and opportunism which severely characterise the market of PR cheese.

The decision to carry out the ripening of cheese themselves does provide for a limited diversification strategy. The number of clients is enlarged and more knowledge is obtained about the evolution of the characteristics of final demand. Nevertheless, the financial risks related to this activity is explaining the still limited number of cheese dairies involved in cheese ripening. New market uncertainties are added to the already existing ones and milk payments to the dairy farmers are delayed.

Finally, the consequences of changes in demand are transmitted by the wholesaler-ripeners to the cheese dairies. The large retail sector asks for a more standardised product and this puts the actual production techniques under pressure. When more and more cheese is sold through these market channels, changes in milk processing techniques will eliminate the highest cheese qualities on the market. Only those cheese dairies, which are able to sell on small niche markets, selling to speciality shops and by means of direct sales, will maintain the practice of processing the milk of single dairy farms separately.

NOTES

- (1) My acknowledgement goes to Silvio Antonello, with whom I prepared this research, but who unfortunately has not been able anymore to assist at its results.
- (2) This research is part of the EU project "PDO and PGI products : Markets, Supply Chains and Institutions" FAIR 1CT95-306.
- (3) In the unifeed system, roughage and feed concentrates are mixed in mixing trailers. On the PR dairy farms water has to be added in order to obtain a good amalgamation of the feed ingredients. When this mixture is not given immediately to the cows moulds may develop which influence negatively the milk quality.
- (4) A comprehensive analysis of the change of the role of the cheese-maker is found in the anthology of Silvio Antonello (1999).

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