Traceability and safety of rough rice

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Abstract
This paper describes a project that is in the process of being carried out, relative to the implementation of a voluntary system of traceability and safety of rough rice.
The project is actually an offshoot of a larger project of self-control pursued by the rice-growers, that has led to quality control of rice since 1999.
The project was developed by the Consorzio Vendita Risone Scarl of Vercelli in collaboration with the Centro Assistenza e Consulenza S.r.l. of Ravenna.
As of 2001 rough rice will be sold on the market and a passport of origin will be made available for it. The system of traceability makes it possible, starting from the seeding operations, to identify the product during its storage in the collection silos until it is shipped to the different processing centres. The H.A.C.C.P is also designed to guarantee the quality of the raw product by controlling moisture, residual impurities and contamination of the product.

Keywords: Food safety, Consumer, Rice

1 The market of rough rice

1.1. The international market

With a production of 570 million tons of rough rice, 30 million of which for the international market, it can be said that rice is one of the main commodities at the world level (table 1).

Analyzing the worldwide production picture, a positive trend can be seen, with an increase of 60% in the last 20 years and a production of 198.5 million tons of rough rice (+54% in the twenty year period examined) China confirms its position as the leading producer. Considering the production of all the countries of south-east Asia, it is clear that 85% of the world's production comes from the Far East with an increase of about 70% as compared to the production of the season 75/76.

Other important producing countries are, in order, Japan, where production went down, however, by 27% in the twenty year period examined, with a production equal to 2% of the total, the United States (1.4%) and the South American countries (3%). Unlike the U.S. that, with a consumption of 19.1 kg of rough rice per capita, are net exporters, both Japan (97.9 kg per capita) and the South American countries (52.5 kg per capita) can be considered as areas of consumption and not as exporters.

The European Union has also experienced a significant development of its production with an increase of 72% in the twenty year period examined, but with total volumes of only relative significance on the world scene (the Community production in the global context amounts to only about 0.5%) (table 1).

Table 1: European Union production (rough rice in ,000 tons)

Country	1999-00	2000-01	Var.%
Italy	1,427.1	1,229.8	-13.8%
France	103.0	112.7	9.4%
Greece	167.2	169.2	1.2%
Spain	801.5	853.9	6.5%
Portugal	156.8	142.6	-9.1%
UE	**2,655.6**	**2,508.2**	**-5.6%**

Source: Ente Nazionale Risi

As regards world consumption, with the current rate of increase of the world population (the FAO estimates an increase by 20% of the world population by 2010) and on the basis of the current levels of per capita consumption, it has been estimated that there is a very high potential demand (+113 million tons of rough rice) and a situation of substantial equilibrium, in the middle term, as regards international commercial exchange; therefore, unless there is an exponential increase in the areas involved, the increase of world demand should ensure satisfactory sales of the product. The Asian area remains, however, the main area of consumption, with a per capita consumption of rough rice of 159kg for China, 126kg for India, 179kg for the Philippines and over 250kg for Vietnam, Bangladesh and Thailand.

At the Community level, the demand of rice exhibits highly differentiated situations (table 2).

Table 2: Consumption of rice in Europe (kg per capita)

Paesi	Kg/per capita	Paesi	Kg/ per capita
Portugal	14.6	Finland	3.9
Spain	6.3	France	3.8
Autriche	5.7	Danemark	3.3
Italy	5.3	Netherlands	2.6
Greece	5.0	Germany	2.2
Sweden	4.0	Benelux	1.9
United Kingdom	3.9	Ireland	1.5

Italy, Greece, Spain and Portugal are the main consumers of rice, confirming the close correlation between production zones and demand.

The per capita consumption of rice in Italy is higher than the European average (4.2 kg), but is actually due to different local eating habits with the North-East being the area of major consumption on the national level.

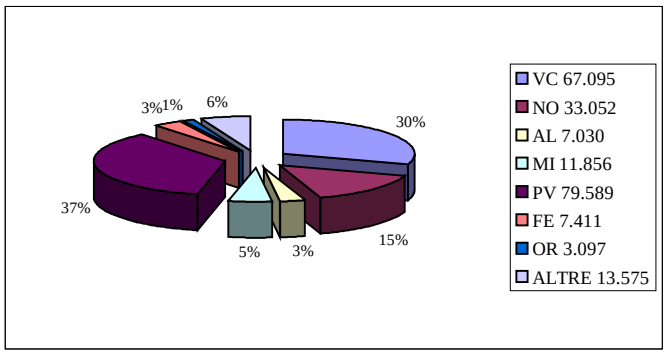
In Italy, for one thing, the demand of rice has remained largely the same in the last thirty years and this, aside from dietary traditions, is also due to the fact that it is more expensive than its natural “competitor”, pasta made from durum wheat.

At the Community level, consumption has steadily increased, and in the season 98/99 reached a level of 1,729,000 tons of processed rice, an increase of about 20% over the 94/95 season; this thus confirms a demand that is much higher than the domestic production of 1,465,000 tons of white rice (average 94/99).

1.2 Rice production in Italy

Italy is the major European rice producer with a gross marketable production of about 1,400 billion. This production is highly localized (Fig. 1) and is characterized by a reduction in the number of farms and an increase in the average crop area (Fig. 2).

Figure 1: Cultivated land in Italy (per province)



(VC: Vercelli; NO: Novara; AL: Alessandria; MI: Milano; PV: Pavia; FE: Ferrara; OR: Oristano)

An analysis of the division by classes of cultivated area of the number of farms (Tab. 3), reveals, in fact, that the average area (the data refer to 1997) is about 38 hectares, much larger than the area devoted to other national crops.

It can also be seen that there is a strong concentration of production in the larger classes of area: 66% of the national crop is grown on farms with an area of more than 50 hectares.

Figure 2: Evolution of farms and cultivated area

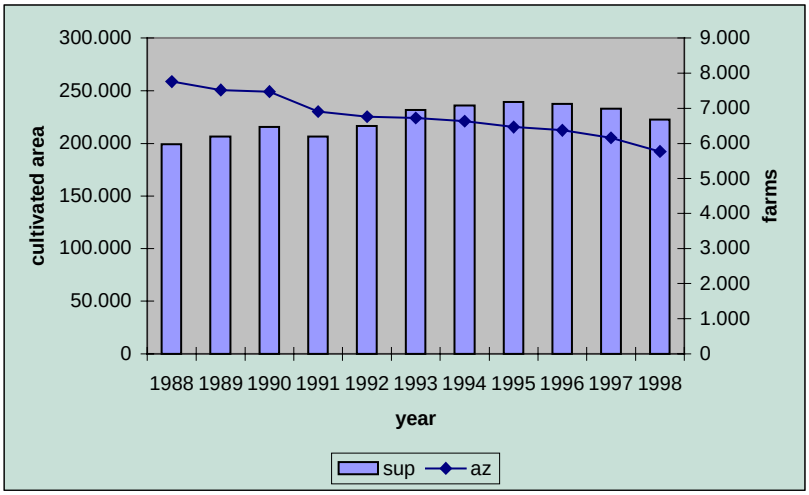


Table 3: Concentration process (1990-1997)

	Dimension (ha)		Number		Var. %
	1990	**%**	**1997**	**%**	
Fino a 3 ettari	1,281	17	524	9	-59
Da 3,01 a 10 ettari	1,742	23	1,197	20	-31
Da 10,1 a 25 ettari	1,751	23	1,480	24	-15
Da 25,01 a 50 ettari	1,372	18	1,392	23	1
Da 50,01 a 100 ettari	944	13	1,055	17	12
Oltre 100 ettari	391	5	487	8	25
Totale	7,481	100	6,135	100	-18
Superficie media	28.08		37.95		

Source: Nomisma

1.2.1 Territorial distribution

From the territorial point of view, although there were no significant changes in 2000, we can see how the fundamental, traditional zones of rice production – consisting of the provinces of Pavia, Vercelli, Novara and Milan – maintain the same general levels of area which, if anything, appear to have expanded slightly (table 4).

Among these four provinces, indeed, there has been a slight growth in the growing area of Pavia (0.24%), Vercelli (1.49%), corresponding to just a little over a thousand hectares, and Milan (2.67%), while only Novara shows a slight reduction (-0.89%). These provinces accounted, in 2000, for as much as 87% of the entire Italian rice crop.

On the one hand, therefore, some growth has taken place in the Piedmont and Lombardy regions, while there has been some decline in Veneto, Emilia Romagna and above all in Sardinia.

Table 4: Territorial distribution of rice cultivated area

Region	**1999**	**%**	**2000**	**%**	**Var. % 1999/2000**
Piemonte	113,139	51.2	113,897	51.7	0.67
Lombardia	91,719	41.5	92,429	41.9	0.77
Veneto e Friuli	3,987	1.8	3,848	1.7	-3.49
Emilia Romagna	7,897	3.6	7,575	3.4	-4.08
Italy	**220,795**	**100.0**	**220,348**	**100.0**	**-0.20**

Source: our calculations on data *Ente Nazionale Risi*

1.2.2 Rice production in 2000/2001

The area of rice production in Italy in 2000 consisted of 220,348 hectares, slightly below the area of the previous year (220,795 hectares). This small negative variation is part, however, of a negative trend that has characterized rice production for the past few years, considering that in the last five years the total reduction amounted to 7.2% (table 5).

Table 5: Supply and demand of rice

	1996-1997	1997-1998	1998-1999	1999-2000[1]	2000-2001[2]
Cultivated area (ha)	237,551	232,853	222,705	220,795	220,348
Gross production (tons)	1,367,535	1,466,238	1,407,735	1,427,130	1,229,767
Yeald (t/ha)	5.76	6.30	6.32	6.46	5.58
Net production (tons)	830,626	920,341	841,983	884,159	727,627
Import (t)	35,561	34,282	25,322	22,217	25,000
Total availability (t)	837,631	829,092	825,466	802,422	759,335
Internal market (t)	281,118	295,146	272,231	639,954	640,000
EU market (t)	343,520	335,391	351,861		
Third countries (t)	212,993	198,555	201,374	162,468	119,335

1 Provisional data

2 Estimation

Source: our calculations on data *Ente Nazionale Risi*

A much more significant decline in the last year is on record as regards production. Estimates made by the National Rice Board of sales in the season 2000/2001 showed that the gross production of rough rice was 1,229,767 tons, down 13.8% with respect to the production of 1999/2000. This heavy decline is attributable to yield, with passed from 6.46 tons/hectare for the 1999 crop to 5.58 in 2000, largely due to weather conditions. Consequently, there was a drop in the net production of processed rice, estimated at 727,627 tons. If on the one hand the decline in production expresses the difficulties of the producers to deal with a market decline that has already lasted several years, on the other it seems to have positive repercussions on market opportunities for the existing production.

Traditionally, domestic production of rice is much higher than domestic demand, with the result that a good part of the production is exported to foreign markets. In 1998/1999, the last year for which disaggregated data are available, the rice sold on the domestic market accounted for 33% of the total sellable availability, while the Community market absorbed 42.6% and the international market 24.4%.

However, in the last few years there have been clear signs of a serious imbalance of the market, denoted by the consistent amounts allocated to government price support measures. In the 1999/2000 season, as many as 180,125 tons, representing 12.6% of the gross production of rough rice were allocated to these measures, while in the same season the total level of stockpiled rice reached 374,028 tons. But even other EU countries are experiencing an increase in the amounts of rice subject to price support measures, for example, Spain, Greece and France. In 1999/2000 the Community stockpiles reached 696,336 tons. Thus the conditions of the entire Community market appear troubled.

If we also consider the central points foreseen by the new price support measures (reduction of the levels of guaranteed prices, limitation of the mechanisms of support for exports, redimensioning of the protective role of allocation; even to the point of discussing the very reasons for price support intervention) it appears clear that the strategies at the disposal of the producers can no longer be based on a comparison of prices with foreign products, but must necessarily be based on a qualitative (i.e. vertical) differentiation, based on the characteristics that distinguish the product.

Traceability is, for example, one strategy of differentiation that reduces the informative asymmetry between the producer and the consumer and effectively fills an information gap relative to the most important characteristics connected with the origin of the

raw material/commodity, the processes it has undergone, etc., and in the specific case examined here, also the hygienic and sanitary conditions of the product, including contamination with GMOs.

2. The CVR (Consortium for the Sale of Rough Rice) of Vercelli

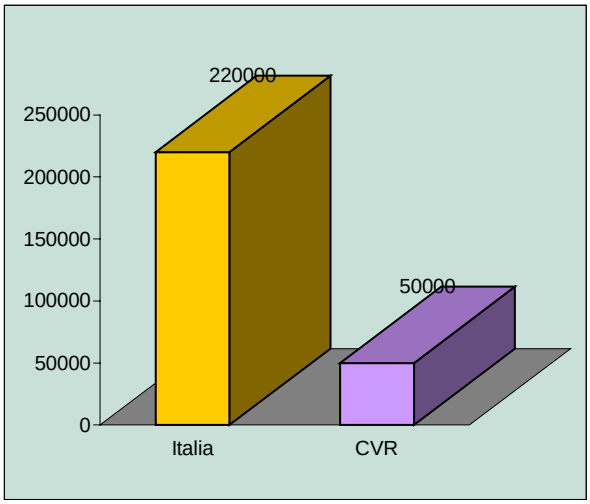
The CVR (Consorzio Vendita Risone) is an initiative of the Interprovincial Agricultural Association of Vercelli and Biella. First as a consortium of enterprises and later as a cooperative company, for a long time, operating directly as an exporter, it privileged the stipulation of contracts covering export operations.

More recently, however, it has embraced a trade policy addressed toward satisfaction of domestic demand and is thus more attentive to the requests of the consumers as regards the quality and safety of agricultural and food products. Among the primary objectives of the CVR is the fundamental goal of aiding its members in all operations, ranging all the way from the purchase of seeds to marketing of the product.

Recently the CVR added another far from secondary goal which is that of promoting and organizing courses for the training of technical personnel capable of assisting the members who are interested in providing traceability of their products.

With 800 members for a growing area of over 50,000 hectares and over 100,000 tons of rough rice sold in the 1999/2000 season, the CVR is now the most important economic organization of rice growers (Figure 3).

Figure 3: Hectares farmed by CVR members with respect to the national total



In this sense, it is a privileged reference for the operators in the rice-growing sector and at the same time it is the main supplier of rice for the Italian and foreign food industries that base their company policy on the quality of the products they sell.

2.1 The case study

Before we analyze the case in point, it seems useful to us to outline briefly all the elements of the rice chain. It is divided into three main parts: growing, primary storage and processing.

Figure 4: The rice chain

1) ***growing stages***
   - working the soil
   - regulating the water supply
   - purchase of seeds
   - sowing and fertilizing
   - weeding
   - sanitary defense
   - harvesting

2) ***primary storage stages***
   - drying
   - sanitary defense
   - refrigeration
   - ventilation
   - monitoring
   - shipment

3) ***processing stages***
   - acceptance
   - cleaning
   - parboiling
   - pearling
   - bleaching
   - cleaning
   - selection
   - storage
   - packing
   - shipment

This is not the place for a detailed description of every stage of the rice chain, but we wish to point out that the stages subject to the CVR traceability and hygienic-sanitary control project are those of *growing and primary storage*.

So, the project don't cover from "Farm to Fork" but it's from "Farm to Firm". The firms interested in will join the project or keep the traceability from "Farm to Firm" and connect it with firm traceability (ISO 9000 standard).

2.1.1 The CVR rice traceability project: from farm traceability to chain traceability

This project devoted to traceability and safety from the hygienic-sanitary point of view, will make it possible to know not only the origin but the entire life history of CVR rice, from the paddy to the processing plant.

The companies that participate in the Consortium's "pilot" project are, in fact, subjected to a series of controls designed to ensure the traceability and quality, in hygienic and sanitary terms, of the raw product.

By traceability is meant a documented identification of all the steps in the chain and all the operators who contribute to the production of a "finished" product ready for sale to the consumer. In this context, the steps in the chain include the raw materials, as well as all additives, semi-processed materials and packing materials that enter into the production process at any point of the chain.

Therefore, among the many requisites that agricultural and food products must have today, traceability is one that is growing in importance and is currently in demand; the system of traceability must make it possible, from any point in the production chain, to go all the way back to the origin of the production cycle through a series of linked, univocal documents.

In more specific terms, traceability is an element to be associated unequivocally with the safety of the product. This means that, in addition to documenting the movements of goods, for each step in the chain there must be a set of procedures, controls and recorded data inherent to the hygienic and sanitary requisites as well as to good, correct production practices adopted by each company participating in the production of the finished product for the end consumer.

Today the concept of "Traceability through the chain" is very much in vogue, although it actually lacks an official or universally accepted definition.

Generally, by traceability through the chain is meant the system that, for a specific product, makes it possible to quickly and definitely go from any step in the chain through all the previous steps in production and all the subsequent steps in distribution.

This system serves the purpose of enabling the consumer, upon purchasing a product, to ascertain, thanks to a label showing certain codes or symbols, all the various steps in production and processing, starting from the field or breeding shed, down to the sales outlet.

Through traceability the consumer can discover the entire production process and obtain information for various purposes:

- to improve risk management in view of the numerous opportunities for contamination in every step of the production process and the extreme sensitivity of the systems of analysis now available and applied;
- to enable producers to present themselves to the consumers with the maximum transparency, providing them with the instruments they need to recognize and choose what they buy.

This means that there is not just one company behind the production chain, but a group of companies, all of which contribute to it in various ways.

Traceability through the chain is thus the most complete involvement of effective responsibilities and a model of vertical integration of all the companies involved in the chain. We can even say that traceability through the chain is the most solid documentary supporting structure for any certification regarding the quality or safety of products. It is tempting to suggest that without the guarantee of traceability, that is, without knowing clearly and completely the identify of the companies that have contributed to the development of the product, no claims of quality can be fully reliable and credible.

What is therefore essential for purposes of traceability is not so much the geographical origin or location of the processing or packaging plant, as much as the names of the companies that participated in its production and are therefore responsible for it.

We could sum this up by saying that what really counts is “traceability of responsibility”. It is very clear how important this information is, from the juridical point of view and that of product control, in those cases in which we have to discover the causes of any non-conformity or when it is necessary to isolate a chain in case of danger for the consumers.

Traceability must therefore refer to every single portion or package of the product and must enable us to locate all the companies that have had a critical role in the development of that specific portion or package of the product. The focus of traceability is thus on every product, individually identified.

It is understandable, if viewed in these terms, that traceability through the chain is in itself an interesting guarantee for the consumer, even without any further specification regarding the quality or origin or the adoption of particular techniques. Naturally, this guarantee becomes effective only if:

- the consumer understands the significance of traceability in terms of the transparency of the production process, the identity of the product, the acceptance of responsibility by the producers;
- the traced product is marked and distinguished by a seal or logo on the label or package, readily recognizable by the consumer at the time of making the purchase.

In this case, from what has been said above, it becomes clear that the traceability project promoted by the CVR, while more than a mere company traceability, does not go as far as traceability through the chain because it stops at the point where industrial processing begins. It is, however, a potential opportunity for subsequent steps in particular for large enterprises and big retailers that follow ISO 9000 standards.

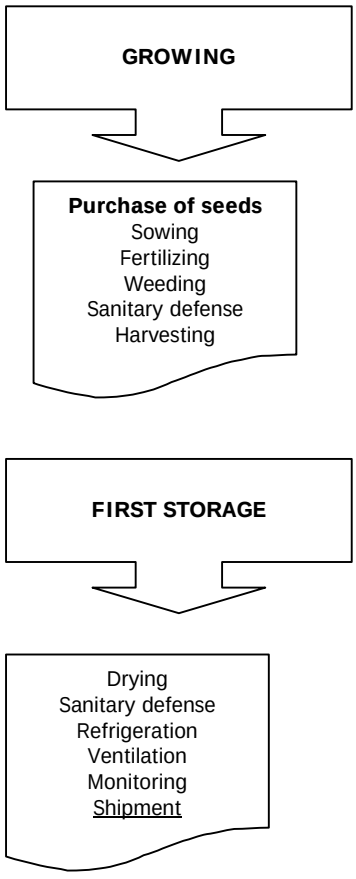
2.2 The project

The project, which got under way in the spring of 1999 and will lead in a very short time to sales of rough rice with a real passport of origin, takes its cue from the White Paper on food safety published by the European Commission, and from the Italian and European regulations on the subject of hygiene and controls on food products (Directive 93/43/CEE and Legislative Decree 155/97).

The project, whose technical name is <<system of traceability and control of marketed rice>>, was drawn up by the CVR with the collaboration of the Centro Assistenza e Consulenza (CAC) of Ravenna. The objective was to valorize Italian rice in Europe and try to beat the foreign competition that often presents products at low cost but of poor quality and doubtful origin.

CVR and CAC developed a system of controls that starts from purchase of the seeds, continues through the stages of cultivation and harvest of the rough rice and that of processing (drying and cleaning included) to arrive as far as the individual storage facility (Fig. 4).

Figure 5: Stages covered by the CVR system of traceability and hygienic-sanitary control



From this point, the system makes it possible to identify every truck and follow the route taken by the rough rice to the processing plant (descending traceability). This will also enable the processing plant to offer the consumer a product whose origin is known right down to the field where it was grown on the farm (and any treatment undergone there, on the basis of the documentation provided by the farms that apply the methods of production with low environmental impact set forth in EEC regulation 2078/92) and back all the way to the supplier of the seeds (ascending traceability).

Having determined the history of the rice, the system also provides for qualitative and sanitary controls to identify any agents of contamination foreseen by HACCP system, such as fungi, microtoxins, residues of pesticides. The moisture content and any residual impurities in the rough rice will also be monitored.

Even GMOs are subject to control, initially through a request of a declaration by the supplier of the seed (lot and variety) and later by tests made during storage in the warehouses.

Briefly, there are two main stages of control:

- **During growing:**

- controls on the origin of the seeds;
- geographical localization in the land registry of the site of cultivation
- registration of all treatments with controls
- analyses during growing

➢ **During storage:**

- control of the origin of the product;
- mapping of the separate deposits
- periodical sampling of lots representative of every variety for the hygienic and sanitary analysis of GMOs.

After, during shipment, logistic enterprise must fit the HACCP rules for transport of food (Not compulsory for the transport of commodities)

Here enclosed the description of the actors (Fig. 6), the Flow – sheet of "semi" chain traceability (Fig. 7) . A traceability system must enable the process to be traced back to the origin of the production chain starting from any point of the production chain, by means of a series of interconnected, homogeneous documents (Fig. 8).

Fig. 6: Actors

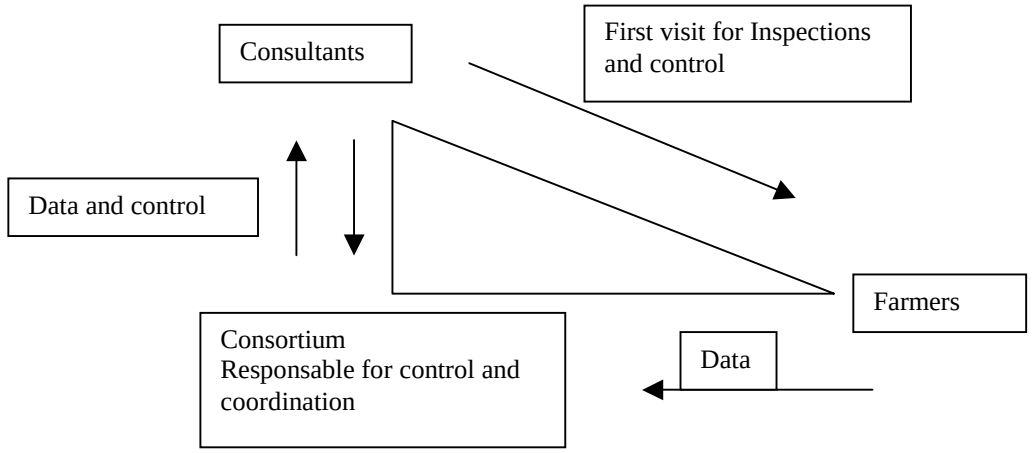


Fig. 7: Flow – sheet of "semi" chain traceability

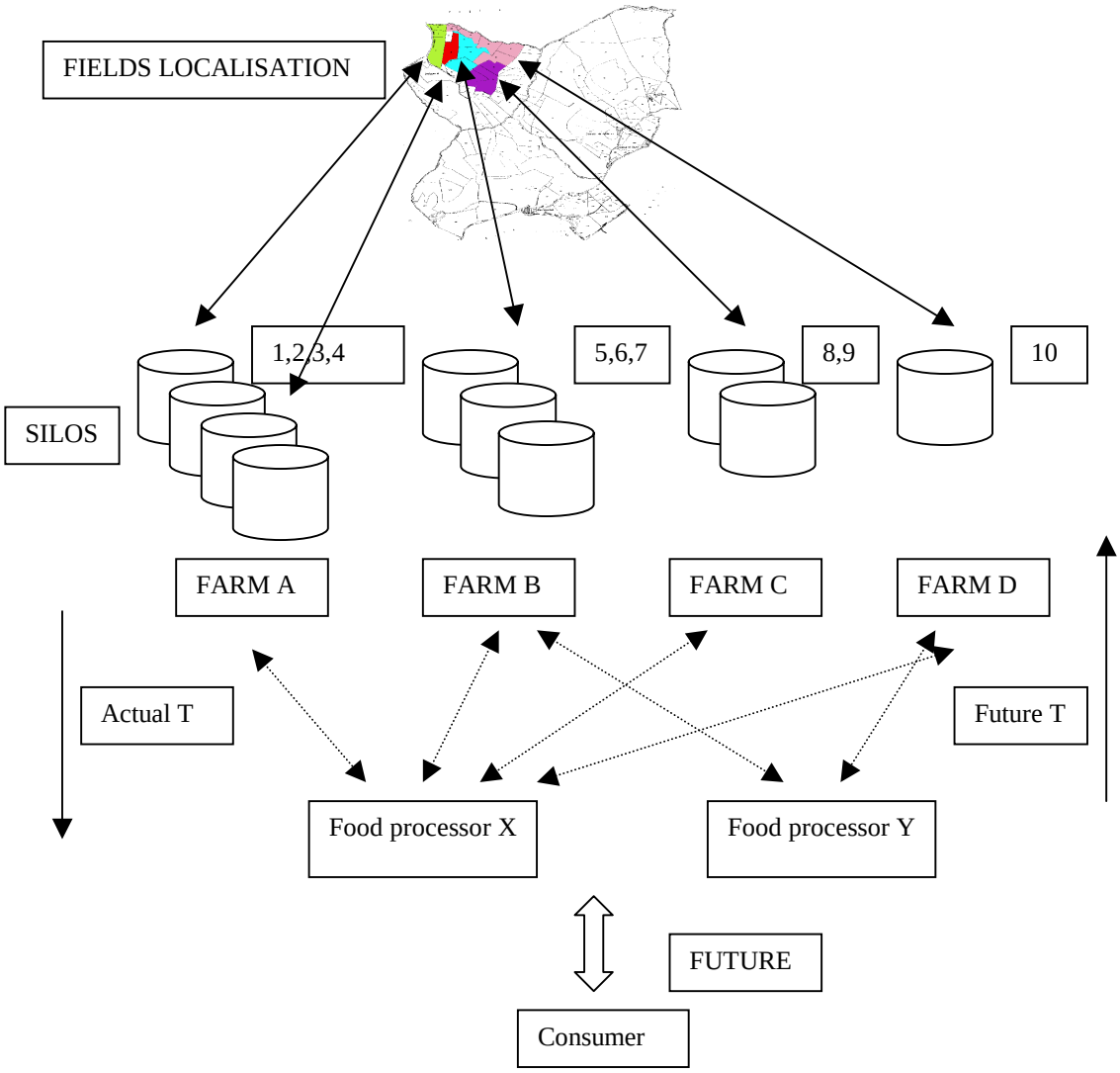


Fig. 8: List of documents necessary to trace the rice

	Documents
1	Seeds Supplier declaration (up to now general but in the near future specific for each supply)
2	Self-control procedures in farms (Reg. 2078/92)
3	MOD.01 Traceability and control
4	Marketing contract
5	Loading preparation
6	Accompanying table of the control sample in the shipping stage
7	CVR verifications on traceability and HACCP manual

2.2.1 The Check list

Each farms give a written "Declaration of Intention" to the Consortium showing their intention to partecipate in the project . Then, when farms decide to participate in the traceability project, the Center for Aid and Consultation performs an inspection of their facility and compiles a check list; this is a sort of questionnaire, drawn up according to the criteria of "Mash 2000". After entering the name of the company and describing the number of people who work there and their duties, the check list is divided into ten sections:

Vertical silos.

The first section describes the vertical silos used by the company, indicating the total number, dimensions, theoretical capacity in tons, capacity in extraction and basal vault. A drawing is provided in the ninth section.

Horizontal deposits.

The next section lists the total number of horizontal deposits of which the company disposes. For every deposit the dimensions, theoretical capacity in tons, method by which the grain is introduced in each deposit, the effective hourly capacity and the system of basal channeling are indicated. In this case, also, the ninth section will contain a drawing.

System of transportation.

The third section concerns the method by which the grain is brought into the plant. In particular the processor is asked to indicate the number of discharge holes through which the grain is introduced and the number of elevators to which these holes lead. The dynamics of transportation are then sketched roughly in the ninth section.

Control instruments.

This section is very important for the plant as it describes the equipment used to inspect the grain on arrival, during storage, during drying and shipment. The company is asked to specify the limits, if any, placed on acceptance of the raw material and during storage. Any instruments used for control and analysis are listed, and the company has to indicate how it controls quality and how often controls and tests are made. It is also important to indicate whether there is a program for rodent control and if so to describe it in detail.

Conservation of the grain.

The fifth section deals with conservation of the grain: the physical and chemical methods used in the plant are described and the critical limits undertaken. A list is made of any instruments used for cleaning and disinfecting prior to storage.

General information on grains received and marketed.

The sixth section concerns general information on the types of grains received and marketed. In particular, it is necessary to indicate the types of grains and respective amounts and the approximate number of suppliers for the total number of hectares farmed. Note is also made of any special crop disciplines applied to production (2078, QC, etc.), and national and/or Community programs (organic, DOP, IGP, etc.) in which the suppliers participate, the type and amount of grains involved in crop disciplines and the person in charge of keeping the ledgers and performing the tests relative to unconventional production. It is also necessary, where possible, to describe the method of differentiation among incoming lots between conventional and unconventional grains or between different varieties and/or qualities. The last indication is that of the commercial destination of the products by type and quantity, distinguishing between those for human consumption and those for use as animal fodder.

General plant information.

As regards the plant, it is necessary to indicate the number of the Sanitary Certificate issued to the company with the relative product. The company is asked to specify whether other goods and/or materials are ever stored (even temporarily) in the same deposits as the grains, if the HACCP control manual exists and if the company has applied for registration of a quality system in conformity with ISO9000. The company is asked to describe the motor vehicles, if any, used for shipment of the grain. It would also be advisable to include some photographs of the plant (external view and partial internal views).

Other notes.

The eighth section is left for any other notes or comments of significance.

Drawings.

The ninth section contains drawings of the vertical silos, the horizontal deposits and the layout of the different sectors of the plant.

Flow chart.

The company is asked to produce a drawing of the flow chart with all the steps of the production process.

2.2.2 The situation described by the check-list

In numerical terms, of the 800 members of the CVR, about 30 have agreed to participate in the traceability project. It should be obvious that these are the larger companies both as regards the size of the area farmed and the extent of the storage facilities. In terms of amount of rice marketed annually by the Consortium, in fact, out of 100,000 tons marketed about 40,000 tons are traced.

On the basis of the check-list evaluation is made of any changes applied to the companies as a whole.

Analyzing the changes that had to be applied in order to implement the project, it came out that before participating in the traceability project, the companies already enacted controls during the stages of acceptance of raw materials and drying, while no controls were made during storage, relying either on a good previous drying cycle or on subsequent treatment with pesticides. It was found that many of the participants also disposed (and still do) of instruments for the control of moisture, used during the drying stage, although they had not been calibrated; this practice was subsequently introduced with the project so that they would

all have the certainty of a correct reading by the instrument. Other instruments relative to quality control were found and were considered sufficient within the structure of the Consortium.

As regards hygienic-sanitary tests (residues, heavy metals, fungi and bacteria, GMOs and microtoxins) not previously required, with the adoption of the project procedures were developed to include them (tests made by accredited outside laboratories); the participants were also required to make collective purchases of thermometric probes for control of the temperature during storage of the rough rice. Also as regards programs of rodent control, the procedures already in use were not considered sufficient. Different procedures and forms were introduced that now make it possible to detect the presence of rodents in relation to the consumption of bait placed inside safety distributors.

One completely new element was the introduction of HACCP manuals that did not exist prior to the project.

We can therefore state that most of the instruments and facilities found in the companies were considered sufficient and adequate to undertake the project; practically 70% of the required procedures were carried out though not in any formal way, while now they are formally documented in every stage.

In operating terms, a few activities were modified:

- Periodical controls during storage;
- Rodent control;
- Periodical tests to evaluate factors of contamination;
- Requesting the seed suppliers to declare them GMO free;
- Traceability scheme : from seed to field to drying process to silos.
- Farm cahier de charges (when not yet in use).

2.3 Estimation of costs and benefits of the project

2.3.1 Expenses for Traceability and Safety at the grower level (from planting to storage of harvested product)

The farmers involved have contributed to the project of the CVR which is independent of the size of the Producer concerned. This contribution which stands at 1,000 Euros includes a visit by the CAC technicians to verify the Check List; the HACCP manual distributed to each of the producers; the control visit and the training courses created for the CVR technicians and for the farmers participating in the project. This is a fixed cost.

The Consortium has contributed a higher figure (5,000 Euros) for the creation of a specific manual which will contain all pertinent information.

No cost is incurred in the creation of disciplinary codes as the Regional Authority codes relating to financing covered by CEE Regulations 2078/92 (integrated and organic agriculture) have been used. The same is true for the verification of compliance with the disciplinary codes as the latter is covered by public authorities and by the Consortium which carries out verification in its own right.

Today this process is only paper and phone based and no dedicated software has been acquired.

This will lead to longer registration lead times and data control times in particular for the Consortium that act as “Capo Fila” and it represents the “Coordination Agency”.

As far as the costs pertaining to upgrading hygiene and safety, there is no General agreement that rice growers do actually come under the Italian Decree 155/97, and therefore the associated costs are incurred through voluntary inclusion in the project.

The costs listed are plant upgrade costs, product analysis costs (analysis carried out by external certified laboratories), etc..

2.3.2 Adoption of the H.A.C.C.P. (from planting to storage of the product)
Overall analysis

The CAC has undergone an anonymous verification of a check list of elements in order to evaluate upgrades necessary for the successful application of the system for each partecipants in to the project.

This stage has allowed us to identify areas where each single Producer is inadequate (Table 6).

Table 6: Overview of the upgrades required by each individual Producer.

Farm N°	Does the produce own a vacuum cleaner for the convey or belts?	The produc er already verifies the cereal produc e during storage ?	The produc er owns humidi ty control device s	Vermi n (rat) control was sufficie nt	The Produc er is 2078/9 2 compli ant ?	The produc er handle s a variety of produc e	If yes, does it use the same proce sses for all produ ce?	Who wrote the HACC P manual s? Is there a QA manag er?	What is the percenta ge of system complia nce before joining the project?
1	Yes	Yes	Yes	Yes	Yes	Yes	No	CAC	70 %
2	Yes	Yes	Yes	No	Yes	Yes	No	CAC	40 %
3	Yes	Yes	Yes	Yes	Yes	Yes	No	CAC	60 %
4	Yes	Yes	Yes	No	Yes	No	-	CAC	60 %
5	Yes	Yes	Yes	No	Yes	Yes	No	CAC	50 %
6	Yes	Yes	Yes	No	Yes	Yes	No	CAC	60 %
7	Yes	Yes	Yes	No	No	No	-	CAC	60 %
8	Yes	Yes	Yes	No	No	No	-	CAC	70 %
9	Yes	No	Yes	No	Yes	No	-	CAC	60 %
10	Yes	Yes	Yes	No	Yes	Yes	No	CAC	70 %
11	Yes	Yes	Yes	No	No	No	-	CAC	50%
12	Yes	Yes	Yes	No	Yes	Yes	No	CAC	50 %
13	No	Yes	Yes	No	No	No	-	CAC	60 %
14	Yes	Yes	Yes	No	Yes	Yes	No	CAC	50 %
15	Yes	Yes	Yes	No	No	Yes	No	CAC	50 %
16	Yes	No	No	No	No	No	-	CAC	70 %
17	Yes	Yes	Yes	Yes	No	Yes	No	CAC	70 %

18	Yes	Yes	Yes	Yes	No	Yes	No	CAC	60 %
19	Yes	Yes	Yes	No	No	No	-	CAC	70 %
20	Yes	Yes	Yes	Yes	No	Yes	No	CAC	70 %
21	Yes	Yes	Yes	No	Yes	No	-	CAC	60 %
22	Yes	Yes	Yes	No	Yes	Yes	No	CAC	60 %
23	Yes	Yes	Yes	Yes	No	Yes	No	CAC	40 %
24	Yes	Yes	Yes	No	No	No	-	CAC	40 %
25	Yes	Yes	Yes	Yes	No	Yes	No	CAC	40 %
26	Yes	No	Yes	Yes	Yes	Yes	No	CAC	50 %
27	Yes	Yes	Yes	No	Yes	Yes	No	CAC	70 %
28	Yes	Yes	Yes	Yes	Yes	Yes	No	CAC	80 %
29	Yes	No	Yes	No	No	Yes	No	CAC	60 %
30	Yes	Yes	Yes	Yes	Yes	No	-	CAC	80 %
31	Yes	Yes	Yes	Yes	No	No	-	CAC	80 %

Source: our calculations after "farm – visit"

Overall the companies already carried out 70% of the activities required by the traceability system, especially the larger ones.

Today we are carrying out an estimation of the cost to each individual producer of upgrading to the standards required by the project. Some of these relate to plant upgrade and are therefore fixed costs and others are proportional to the quantity of product.

2.3.3 Costs of identity preservation in Italian "GMO context"

GMOs are subject to control, initially through a request of a declaration by the supplier of the seed (lot and variety) that the seed are GMO free and later by tests carried out during the storage in warehouses. The above are a way of reaching voluntary Identity Preservation (IP) in the GMO context.

Additional costs of IP arise with the additional work involved in growing, handling, storage, transport, processing, cleaning and administration but in Italy, thanks to our legislation this declaration is easy to obtain and no IP costs arise. In the future, or if import of rough rice will become important, if may arise at different stages of the chain: seed production but also farming and transport as well as further storage, processing, labelling and distribution.

So, the cost for IP for seed production depends on the price for seed and the area of production.

According the literature, in the USA GMO free seed prices depend on the level of tolerance. Currently farmers obtain a premium of 15-20% for their extra work required for IP as compared with normal seed.

The in-farm costs comprise transaction costs for all contracting parts and time devoted to negotiation, accurate record keeping etc. Some estimations range from an additional 4% to 10% of price.

However if all the farms in the area follow the same guidelines for good agricultural practices most of the additional costs at the farm level would be avoided if full production

were to be switched to a single type of IP system. The area would also save on testing and separate storage costs.

In short, the summing different costs along the production chain allows the total cost of IP to be estimated at between 5 and 15% for wheat on farmgate prices.

In our case-study some farmers produce seeds so the cost of future IP can be reduced.

2.3.4 "Possible" Direct and Indirect costs and benefits

The project has created a certain level of co-operation between members of the consortium and has improved the efficiency of the growers organisation, reduced the cost of growers for higher quality and improved production hygiene and safety and improved the technical efficiency of farmers.

An example of this technical efficiency is connected to the reduction of post-emergency treatment (and associated costs) due to the fact that the products have a better state of storage than in the case without HACCP scheme.

Since traceable rice is not yet available for retail per se and therefore no added value is attached to it, today we are unable to estimate the higher product value against cost reduction and greater competitively of the chain.

The greatest problems arise with the involvement of the lower levels of the production hierarchy. Including industry and large scale distribution could bring advantages such as the reduction of transaction costs and greater competitively of the Italian production chain.

We think that the future is connected to the possibility for food processor to link theirs in-firm traceability scheme (ISO 9000 standard) with the rough rice traceability scheme in a unique scheme of chain traceability.

In this perspective the final benefits will be a *premium price* for the rough rice commercialised.

From the social point of view the consumer might expect a higher level of food hygiene and safety and more information on labels, depending on the entity labelling the produce.

Table 7: Preliminary Summary of Cost and Benefit of the Project

Source of Cost / Benefit	Fixed Cost	Variable Cost	Benefit
Contribution to the project	X		
Disciplinary codes (EEC Regulations 2078/92)	-	X	X
Dedicated software (future)	X		
Hardware (future)	X		
HACCP:			
Vacuum cleaner			
Storage control			
Humidity control device			
PLANT UPGRADING ??			
New sheet metal silos***	XX		
New cool store	XX		
New Elevator	XX (300 milioni per silos)		
HACCP Manual compilation *		X	
Traceability			
Traceability document compilation *		X	
Cost for Sampling and Testing *		X	
Rat control		X (2-3 million lire/year) for 16000 tons	
Storage costs			
Increase in seeds price**		-	
Identity preservation costs**			
Time devoted to record keeping	X	X	
Integrated production cost			
New accountancy system (direct cost)	X		X
Transaction cost between seed supplier and farmer	X		

Transaction cost between farmer and CVR			
Transaction cost between CVR and food processor			
Co-operation between members of CVR			
Higher level of food hygiene and safety			X
Improved farm technical efficiency (for movement)			X
Efficiency of growers organisation			X
Improced rice competitivity			X
Less Reduction in yeld (+20%)			X
Expectation in Quality more procise			X
Better processing quality and less reject at sorting (+ 1,5% pq)			X
More information on the chain			

*: The CVR estimate Variable Cost (the sum for cost sampling and testing and time in 50-100 £ per q.l, that range from 0.2% to 0.3% of the rough rice off-farm price).
**: Up to now the sedds suppliers (80% of the seeds are certified up to now) give the documents free of charge to farmers.
*** This is the case of farms that results insufficient during the visit.

Conclusions

The case outlined here is an example of an attempt to answer to the consumer's pressing requirement for "Safer food".

The CVR project responds to three needs seen as essential by the consumer:

- food safety and hygiene;
- non GMO rice;
- a traceability chain.

Traceability, as is clear from the project, to be complete requires the following stages of production and storage to be involved, including the industrial processing phase, with which we have no contractual ties but with which we do have discussions. The industrial phase of production is certainly dominated by a need to control costs and is not particularly interested in quality improvement of agricultural raw materials if this increases prices, so as not to reduce profit margins that remain relatively high.

This project could be of interest to large scale distribution where proprietary brands are involved.

The CVR has envisaged applying added value to traceable rice which could be expressed in one of two different ways: attaching higher value to the produce through Protected Geographical Identification or through attaching higher value to the whole production chain (or to the producer through the CVR itself) under recent UNI standards (today only UNI 10939 has been published, the production chain traceability standard while the standard on in-farm traceability is in preparation).

The method to be adopted will depend on the development of the traceability project and after evaluation of the true level of interest of the industrial world especially on the distribution front in terms of willingness to pay a higher price.

Another factor to remember regarding the project is the CVR's B2B goals: electronic bidding has created greater clarity in the market and paper documentation will become an essential prerequisite to sales.

Production chain traceability is an attempt to shed light on the whole food system, an instrument to bring food producers and consumers in touch with each other.

Three questions arise urgently:

- the Common Market Organisation for rice will provide more subsidies connected to the respect of environment and consumer safety ?
- the structural funds would give provision also for big farms that follow this type of project ?
- italian legislation would aid the farm to reduce the fragmentation problem of holdings in italian rice sector ?.

REFERENCES

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COMMISSION OF THE EUROPEAN COMMUNITIES (2001), Proposal for a Regulation of the European Parliament and the Council concerning traceability and labelling of genetically modified organisms and traceability of food and feed produced from genetically modified organisms.

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LEGAL FRAMEWORK

⇒ Dir CEE 93/43 on Food Safety and Hygiene

⇒ Italian Law (D.L.) 15597 on HACCP

⇒ White Paper on food safety and hygiene approved by the European Commission 12.1.2000

⇒ Regulation CEE/49/2000 on limits to GMO use

⇒ Regulation CEE/50/2000 on limits to GMO use

⇒ Italian law DPR 4 August 2000 on GMO (suspension of use)

⇒ Regulation CE 1525/98 on Aflatoxine limits

⇒ Italian Health Ministry order N° 10 of 9th June 1999 on Microtoxines

⇒ Draft Agriculture bill (march 2001)

⇒ Draft UNI standard in traceability (Now UNI 10939:2001).