

# THE MANAGEMENT OF THE OPTIMAL CONDITIONS OF STORAGE - TRANSPORT - TRADING OF THE FOOD PRODUCTS

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*A product cannot fulfil its role, its calling, unless it enters the final consumption, satisfying the need of the consumer who has bought it. But, the road from the producer to the consumer, in the contemporary conditions is not general, nor simple, nor short, nor cheap. The processes of globalisation, the internationalisation of the markets have lead to the intensification of the distribution of products, and, at the same time, to the amplification of the distances they travel. All these have determined the awarding of greater attention on the maintenance of the quality of the food products on the entire technical-economical circuit.*

*Keywords: storage, transport, trading, food products, quality*

*Cod JEL lucrare: M31- Marketing, Q18 - Agricultural Policy; Food Policy*

## **1. Intrinsic factors that influence food quality**

The quality of the food products is a dynamic feature, a status quo which is modified in time due to certain influence factors, modification which can be done in favour of the food products (as it is in the case of the vegetables) when the storage conditions are controlled and directed, or which can damage it when the optimal conditions of transportation, storage and trading are not met.

Regardless of the technical and economical process where the food products are found, these are found in a continuous process of storage. Due to this fact, this process must be kept all the time under control and we must intervene for the product to keep its quality features, in order for the processes and the modifications that can manifest in the food products to affect its quality.

The influence of the factors which act on the quality of the food products on the path of the technical and economical circuit can be noticed during the storage, their preservation in warehouses, the transportation of the food products, as well a during their trading.

One of the main factors that have a major influence on the quality of the food products is the chemical composition of the products. The chemical composition of the live organism, animal or vegetable, is complex, including numerous chemical compounds whose structure and proportion differs a lot according to the nature of the organism, the age, the food and the environment conditions. Nevertheless, the food products have certain common features, in the limit of each group, especially related to the chemical composition. Either they are native chemical substances (water, mineral salts, sugars, fats, proteins, vitamins, pigments etc.) or they are added chemical substances (tonic substances, aromatic substances, colour substances, emulsions, stabilisers, flavours etc.) or accidental substances (herbicide, insect powder, anti fungal substances, substances from the machines and the wrappings etc.), these influence and can negatively affect the quality of the food products while preserving, transporting and trading.

The quality of a product is appreciated through the level reached by all its properties, which represent, each in part, the multiple faces of the quality. One of the ways that lead to the

knowledge of the quality of a product consists in the identification of the properties which, finally, lead to the satisfaction of the need for which they have been produced. The structure of the food products, the relations that form between the different components of the system-merchandise, the interactions products - environment and products - human being, must be known in detail in order to find the way to follow to maintain the level to which the product preserves its optimal quality.

## **2. Environmental factors that influence food storage**

The preservation, the transportation and the trading of the food products depend on the series of influence factors, internal as well as external, process during which there can appear physical changes, chemical changes or biochemical changes with more or less intense implications on their quality. These factors must find themselves in a certain balance for the preservation of the quality of the food products intact.

The maintenance of the temperature at a certain level during the storage influences the quality as well as the storage duration of the food products, for each type of product an optimal regime of temperature being necessary.

The humidity is another factor which influences the quality of the products while preserving and storing them. The relatively high humidity of the air from the storage facilities has as a result the development of the micro-organisms, the humidity of the products etc. In the case previously presented, of the horticultural products, when the humidity is too low or the temperature is too high, the water losses from the stored products are high and, thus, the vegetables and the fruit fade. Hence, the relative humidity of the air is maintained to a certain level in order to record the lowest total losses. The optimal limits of the relative humidity vary, generally, for the products stored between 55 - 95%. For the relatively high humidity (95-100%), moulds can develop on the storage walls, on the wrappings, on the products.

The air circulation also is important during the preservation and the storage of the food products, through the means of the ventilation the temperature and the humidity of the warehouse being able to adjust.

During the preservation, the products come into direct or indirect contact with the atmospheric air. Interactions with repercussions on the quality of the products can take place between the products components and the air components. The atmospheric air is a mixture of gases and liquid or solid particles, its components being: fix, variable and random. For a series of products the preservation within a controllable atmosphere is imposed, that is an adjustable atmosphere especially regarding the proportion of oxygen and carbon dioxide.

The air components can have, in certain conditions, positive effects. Thus, the ozone helps to disinfect and refresh the air in the storage, the carbon dioxide, in a certain proportion, reduces the development of the micro-organisms, and the sulphide dioxide fight mould.

The food products constitute good environments for the development of the biological agents, especially of the micro-organisms and the insects. In favourable conditions of temperature and humidity, the micro-organism develops rapidly, producing enzymatic complexes which attack the products. Among the degradations provoked by the biological agents, the most important are the ones that lead to the reduction or even to the total loss of the mechanical resistance of the products. The presence of the fungi affects the aesthetic of the products through a disagreeable aspect and through a specific smell, unpleasant, developed by moulds. Other biological factors would be the xylophages insects and the rodents, which constitute a danger for the integrity of the wrapping, the products and their hygiene.

Along with these factors we must take into account the hygiene of the storage facilities, the existence of the foreign smells in the warehouses and the principle of vicinity of the products, for the features of the products, especially the organoleptical one, not to have to suffer.

The means of transportation constitutes also an environment which can maintain or not the quality of the food products; certain measures being necessary in order to protect the food from

the potential sources of contamination, in order to protect the food from deterioration, this becoming non-fit for consumption, as well as to ensure an environment which cannot favour the development of the pathogen micro-organisms or the alteration and the production of the toxins in the food.

While transporting the products there can appear risks caused by the hygiene status and the technical status of the transport means, by the physical and the hygiene status of the transport wrapping; by the improper unfolding of the loading - unloading operations; by the hygiene of the personnel involved in the transportation activity; and the micro-climate conditions specific for the transported products etc.

The transport constitutes one of the most important stages of the food products distribution. Due to their specific and their perisability in their great majority, the condition in which the transport is executed contributes to a great extent to the maintenance of the quality features. The problems that appear in this stage refer especially to the choice of means of transportation proper to each type of product, to maintaining a constant temperature all the duration of the transport, the manner of arranging the products in that transport, the choice of the routes from the starting point to the destination point.

Taking into account the considerable size of the European Union space, the means of transport as well as the routes that those transport companies shall travel must be carefully chosen, so that to maintain between normal limits the quality features of the food products. The critical roads should be calculated between the shipment locality and the destination one, choosing the optimal variant. Any delays or distractions from the set route can affect the transported products.

In the decision regarding the transport of the food products one shall take into account the differences of temperature among the different countries and locations, according to these and according to the specific conditions of transport, storage and preservation of each product, choosing the best way to transport it.

The food products, due to their chemical composition, present a favourable environment for the development of the micro-organisms, being an excellent source of energy and development of the metabolic activity. Within the same product, there can exist more types and species of micro-organisms, but also the ones which have the optimal food, humidity, pH, oxide-reduction potential conditions shall develop. Until a certain point, there prevails a certain micro-flora, but through the modification of the environment conditions, under the influence of some micro-organisms, there starts to develop another micro-flora, which until then has been latent. For the food products, a huge interest belongs to the bacteria, moulds and the yeasts.

The humidity of the food products is a huge important factor; because for 12% under the water content, no micro-organism can attack the food products (see water in the food products).

The temperature is an external factor which contributes in a certain measure to the diversity and the variability of the micro-organisms.

The light is an external factor which can influence the activity of the micro-organisms to a great extent. If the orange and yellow radiations from the electro-magnetic spectrum are indifferent, the yellow and green radiations are active, while the ultraviolet radiations are destructive.

The level of the food products pH influences the activity of the different types of micro-organisms, taking into account the fact that the majority of the bacteria develop at a pH of 6.5 ... 7.5. The more the value of the pH exceeds these limits, the slower the development becomes, and for the limits of the pH <.4 or pH>8, it stagnates. The yeasts and the moulds do not have the same behaviour; they prefer the more acid environments, some of them being able to develop in a very low level of the pH, around 2.

Among other external factors with influence on the micro-organisms activity we enumerate: the electricity, the pressure, the osmotic pressure, the superficial tension, the ionisation radiations etc. The main micro-biological processes which can take place in the food products are: the fermentation, the rottenness and the moulding.

Within the fermentation process, many chemical compounds appear. The ones found in the greatest quantity are the main compounds, the accumulated in smaller quantities are called secondary compounds. The fermentation is called after the main product - alcoholic (ethyl alcohol), acetic (acetic acid), lactic (lactic acid) etc.

Generally, the micro-organisms need air, heat, humidity and food to exist and multiply. So, there are the following possibilities to control their evolution: the humidity change (dehydration); the thermo processing and the elimination of the air (cans conditioning); the reduction of the temperature (refrigeration and freezing); the transformation of the food into the product improper for the development of the micro-biologic life (salting, smoking, pickling, adding sugar).

Fortunately, researchers pay a special attention to the correct direction of the manufacturing processes and preservation processes which aim the reduction to a maximum of the danger of falling ill because of the pathogenic micro-flora.

As a consequence of these factors, within the food products there can take place different changes while their preservation such as: modifications due to the temperature, modifications due to the humidity, chemical changes, biochemical changes, enzymes and micro-biological changes. Thus, the preservation in optimal conditions of the products in the storage facilities means the control and the direction of the size of the atmospheric parameters - temperature, humidity, composition and the speed of the air circulation, according to the standardised stipulations.

We mention that through the storage facility we understand the means of transport (mobile storage facility) and the warehouses (fix storage facilities). The operations occasioned by the control and the direction of the size of the atmospheric parameters differ according to the type of the warehouse where the products are kept, taking into account the particular features the respective products have. These operations, connected to creation of the optimal preservation regime of the products, aim at: the control and the direction of the temperature, the humidity of the air in the warehouse, the circulation speed of the air, as well as the content of the storage facility air.

### **3. The distribution and the trading**

The distribution and the trading constitute an important stage of the technical-economic circuit of the food products, stage in which there can appear all sorts of economic and social problems. Due to the nature of these products, any distraction from the conditions of trading and any non-concordance with the technical norms stipulated for the food products can lead to the deterioration in quality of the products, becoming improper for human consumption. As a consequence, to prevent the problems that can appear along the distribution and trading path, and to maintain the quality of these products, the distribution channels of the products, the trading forms, the manner of wrapping, the manner and the conditions of transportation, the preservation and the storage facilities must be chosen carefully, all these on the background of the hygienic and sanitary conditions strictly regulated.

Due to the specific of the manufacturing process specific for the evolution of the request and the manner of organisation of the rural environment, the agricultural products are traded very differently, this fact leaving its mark on the structure of the distribution channels. The difficulties of the agricultural products trading refer mainly to the following aspects:

- the agricultural production is located very unevenly and dispersed in space and time. The products are almost all very perishable and the majority of the products appear on the market at the same time. Moreover, while the individual request is non-flexible, the industrial request is speculative, waiting for the overproduction, to obtain a reduction of the price which allows the profitable supply;

- the purchase process of the products is long and especially very expensive as a consequence of the dispersion and the dividing of the agricultural exploitations. The preservation of the agricultural products of perishable nature needs large interventions regarding the storage and the transportation, as well as the technical endowments.

Under these conditions, in distributing the fresh food products, all types of circuits must be used. Thus:

- a) the direct channels and the shortest one appear frequently in the trading of the agricultural products, because the majority of these agricultural producers sell their products directly to the final consumers, either at the residence of the producer or in the agricultural market places;
- b) the short channels are quite well used, because a part of the retail traders have the possibility of supplying directly from the agricultural exploitations and the slaughter houses, the animal farms etc. with a series of products, which they later on offer the consumers through the means of the different forms of sale;
- c) the distribution channels of medium length are used when the central unit of purchases has the possibility of purchasing the products from the agricultural exploitations, assuming the responsibility of the storage and the conditioning during these periods of storage, in order to direct towards the retail sales points;
- d) the long channels are used when a series of economic agents, specialised in the storage and the conditioning of the products for larger periods, they store the products and then they sell them either to the en-gross seller or to the retail sellers, who, in their turn, place them at the disposal of the consumers. Having as an object of activity the take over, the processing and the trading of the agricultural products, the economic agents with a mixed feature assume the responsibility for the storage and the selling by instalments to the en-gross sellers and the retail sellers existing on the internal markets, but also on the external ones.

In the choice of these distribution channels, one should take into account the expiration date of the food products which make the object of the distribution, so that the products that have a small expiration date should not stay too long on their way from the producer to the final consumer.

The food products are under the impact of the environment agents, so their properties are constantly changing from the moment of the end of the manufacturing process and until the products reach the non-edible stage when the attitude of the negative changes make an impression on the consumption, needing to take it out from the food circuit. Within this frame, one must take into account the following time parameters: the maximum duration of the product circulation, the validity period given by the manufacturer, the maximum duration to store it and the maximum duration of the edible stage. The producer guarantees the quality directly during the validity period, within this period the merchandise should be wrapped, transported, manipulated and stored according to the instructions, in order to preserve the initial quality unchanged. The validity period set forth experimentally by each manufacturer in precise conditions, is lower than the durability of the food product, which in turns is smaller than the consumption of the food product.

In order to reduce the trading risk, it is indicated that the manufacturer to deliver rhythmically food products, after the end of the technological process, in order for the validity period to be as much as possible at the disposal of the trader and the consumer.

It is mandatory to write down on the wrapping or on the label the validity period or the expiration date for consumption of the respective products. The problems connected to this can take many shapes: either the expiration date is missing from the wrapping or it is overdue, situation in which the respective products shall be pulled out of the economic circuit and destroyed, or, due to the improper conditions of storage and preservation of the respective products are altered, although they are within the normal validity period.

#### **4. The hygiene and sanitary conditions of food products**

The food products must fulfil hygiene and sanitary conditions. The food products in general and the food products of animal origin especially, must fulfil the hygiene and sanitary norms in force in the European Union.

The hygiene and sanitary conditions must be complied with starting with the hay for the animals, the sacrificial facilities, the halls of the slaughter houses, the warehouses and the preservation place until the shops.

The feeding of the animals with the hay that does not comply with the norms lead to their falling ill, the meat obtained from the animals becoming inadequate for consumption. Not a few time, the inspectors have found discrepancies in the slaughter houses halls, in the storage facilities, the respective unites being closed down, withdrawing their licence.

Even if the products reach in fairly good conditions the retail units, many irregularities have been found regarding the products trading (without being kept in the right conditions of temperature, the non-compliance with the principle of vicinity, the precarious conditions of hygiene). Including the persons from the commercial sector who come into contact with the respective products like the transport companies, the seller etc. must fulfil certain hygiene conditions.

#### **5. The wrapping conditions of the food products.**

The wrapping is the key point in maintaining the quality features of the food products along the technical and economical circuit. Besides the protection function fulfilled by the wrapping, the consumer can obtain information about the respective product through it.

The problems that appear in the case of the wrapping are connected to the manner of wrapping and the material of the wrapping. This must be chosen so that it can protect the product from the external factors and must ensure an environment for the preservation of the optimal quality of the product.

Along the technical and economic circuit of the product, an improper manipulation of the products can deteriorate the wrapping fact that might lead to the partial or total loss of the respective product to the contamination of the product or to the loss of the quality features of the product. Even the wrapping operations must be performed in such a way to avoid the contamination of the products or their deterioration.

#### **6. The products traceability**

The traceability of the food products, of the animals from which the food products are obtained and of any substance destined to the incorporation into a food product is set forth for all the stages of the production, manufacturing and distribution. The operators from the food sectors and the operators with an activity in the field of animal food must be able to identify any person who has provided them with a food product, food for the animal, an animal from which food products are obtained or any other substance destined to be incorporated into a food products or animal food. To this purpose, these operators dispose of the systems and procedures which allow this information to be placed at the disposal of the competent authorities, upon request.

The food products which are introduced on the market or are expected to be introduced on the market in the Community are labelled or identified accordingly for the facilitation of their traceability, through documentation or adequate information, according to the relevant requirements of the special dispositions.

There are specialists who state that the complete traceability is impossible to achieve. A system which follows every input and process, with an adequate degree of accuracy, is almost impossible. In essence, according to the EU Directive no. 178/2002, the concept of traceability means the ability to follow the agricultural product or the hay, an animal which produces food or a substance which is about to be incorporated in a food product or in the hay, in all the stage of the production, processing and distribution. For the European countries, the traceability has become a key concept in the are of the logistics, in the context of the crises from the '90, related to the mad cow disease which appeared first in Great Britain and then in other EU countries, as well as in the context of the very powerful debates referring to the genetically modified organisms or bio terrorism.

The concept of traceability refers not only to the upstream sequence, but also to the downstream sequence of the marketing channels. Besides the ability to identify the supply sources, any operator must dispose of the ability to identify the organisations which have supplied its products.

The specification of each operator's obligation to ensure the traceability is a real challenge under the organisational and informational aspects. Each economic agent from the production, processing and distribution field of the agricultural food products and of the hay must dispose of the systems and procedures which allow the information to be available at any time within the organisation and to be place at the disposal of the competent authorities, upon their request.

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