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Food Quality and Safety Standards at a Glance

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FOOD QUALITY AND SAFETY STANDARDS AT A GLANCE

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ABSTRACT

The paper discusses food quality and safety standards that are critically important not only for developed, but also for developing economies, where the consumers' safety is among the primary issues to be considered in food supply chain management. After the rapid development of many economies, quality standards have focused on consumers' demand for safe food and beverage. The documents, certifying food quality and safety are getting much more attention, together with the production supervision and control from the starting phase, i.e. the producer, up to the market chain's end. General ecological factors and influences, such as chemicals, pesticides, food hygiene, ethical trade and production, are among the components of a quality standard set. Clients' higher expectations result in higher requirements on producers and exporters, which need to ensure higher food safety to enter internal and external markets. Quality concept in the food industry puts an emphasis on three factors: conformity with product's intended purpose; safety; satisfaction of consumer's expectations and perceptions. In general, most consumers pay attention to the first two, but their expectations involve a lot of different factors, such as price, taste, appearance, production system, nutritious content and fair trade, among others.

The product quality needs to be sound and reliable, but at affordable prices, so the companies must develop standardized procedures for production and selling processes. The needed quality standards are designed to meet the requirements of European consumers and regulators. The EU Food Law concerns food content, product description, chemical safety, sanitary conditions, among others. According to the law, farmers and processing companies have the greatest responsibility for food safety assurance. In addition, they need to prove that they have applied diligence and traceability practices. Therefore, the paper presents a number of international standards followed by food producers and distributors: ISO 9000 (International Standartization Organization), HACCP (Hazard Analysis Critical Control Points), EUREP (Euro Retailer Produce Working Group), GFSI (Global Food Safety Initiative), EN 45000 (European Quality Assurance Standards).

Food : Definition

Food is any substance and/or product that can be eaten or drunk by people and/or animals. It maintains and increases living standards or is used as nutrition or medical supplement. Therefore, its quality and safety are critically important for underdeveloped and developing economies. Moreover, the consumers' safety is among the primary issues to be considered in food supply chain management.

After the rapid development of many economies, quality standards, imposed by and over the food industry, are getting much more focused on consumers' rising and persistent demand for safe food and better quality of food and beverage. Consumers' expectations and perceptions (taste, smell, freshness, appearance) are getting more important, as well. A list of demands that are popular on the market may contain comparative food taste standards, such as juice concentrate, water and sugar content, acidity or dry substance content.

The documents, known as phytosanitary certificates, are getting more attention, together with the requirement for production supervision and control from the starting phase, i.e. the producer, up to the market chain's end. General ecological factors and influences, such as chemicals, pesticides, food hygiene, ethical trading and production methods, are among the components of a "quality standard" set.

Fresh produce industry is well accepted by societies that respect food safety. Its higher status is mainly due to the fact that consumers regard fresh produce as "natural" and, therefore, inherently "healthy". As they pay special attention to pesticide content and contamination dangers, they expect fresh food to be processed in clean sanitary conditions. Clients' higher expectations result in higher requirements, imposed on producers and exporters, whose products must be approved for sale on the global markets. Companies level their efforts for upgrade, while needing to ensure higher food safety and making efforts to gain access to more demanding and cost rising internal and external markets. Thus, the companies definitely understand that respecting the quality standards may answer consumers' demands, and satisfy regulatory criteria on the European market.

The quality of the product is one of the most important elements for every organization that offers goods and/or services. The quality concept may have a number of different aspects, but is interpreted within the following broad definition of *"superiority (non-inferiority or excellence) of a product or a system"*.

Quality concept within the food industry puts an emphasis on three key factors:

- Conformity with product's intended purpose;
- Safety;
- Satisfaction of consumer's expectations and perceptions.

In general, most consumers pay attention to the first two, but their potential expectations with respect to quality involve a lot of different factors. Price, taste, and appearance are among the basic properties for assessment of product's quality. However, more considerate and picky customers may take into account the producing country, production systems, packing, nutritious content and criteria for fair trade and ethical production.

Few consumers would tolerate lower quality of goods and services. Besides, if the quality of the product or service fluctuates unsteadily, consumers may not know what to expect and would stop buying the unreliable products. Therefore, the product quality needs to be sound and reliable, but at affordable prices. To meet this requirement, the company needs to develop and approve high standards to produce and sell a product within a standardized process. Each staff member should be trained to follow and apply the quality standards.

The most important components of the food quality assurance system are expressed in the following:

- Owners, managers and employees should participate in and be committed to maintaining and keeping good quality of the products and procedures;
- All employees are trained with respect to their job positions and responsibilities;
- Risk prevention, its solving and constant improvement and upgrade are key aspects of the production process;
- The company organizes document management system that is easily traceable and changeable if necessary.

Food Quality Standards

If an economy or a company wants to maintain its good quality standards and market image, appropriate specification schemes should be developed for all its products. Most companies need product specifications, which define the standard quality of their products and production procedures, such as picking, storage, delivery, supply and transportation. Companies that have not introduced control criteria may score sporadic success on the market. Moreover, they would not be able to produce more valuable services, if insisting on acceptance of all production, without assessment of its quality and availability on the market.

Food Safety Legislation

Quality standards are important factor on the European market, as they are designed to meet consumers' and regulatory bodies' requirements. The EU Food Law concerns food content and ingredients, food product description, chemical safety, sanitary conditions and hygiene, and a number of other regulations of product specification. EU laws are coordinated by the European Food Safety Authority (EFSA), but every EU country has its own national regulatory bodies, responsible for the national production conformity to national and European standards.

Although fresh produce is considered low-risk, consumers' health and safety hazards may occur during production process and its further handling and management. Common sources of hazard are:

- Physical hazards: staples (packing boxes), nails, screws, bolts, glass particles, splinters.
- Chemical hazards: pesticides, mould, herbicides, contamination from rodents, grease, heavy metals (lead, mercury, arsenic), washing and sanitary compounds.
- Environmental pollution and pollution caused by human activity: pathogenic bacteria from soil, excrements, parasites and viruses. They can be transferred by different means, including poor hygiene, human diseases, contaminated water or compost.

Physical hazards may be prevented during washing, packing and transportation, but hazards related to microbes and chemicals are usually present during cultivation and picking. Thus, good management and governance practices should be applied during the entire production and distribution process to prevent physical, chemical and human contamination and environmental risks.

Most countries have introduced standards for safe chemical content in products. The EU is currently debating the European criteria for chemical content threshold. Substances that are not covered by national and/or European threshold legislation, must obtain certificates for "import margin". Some countries have imposed other restrictions, e.g. in antibiotics, wax or genetically modified products. Picky consumers require routine analysis of accidental pesticide content. Procedure and test frequency vary depending on risks and control, exercised by packagers and exporters over producers and their processing procedures.

All EU member countries have strict laws on food import. Safety standards imposed on fruit and vegetables are harshly enforced, as well. Food legislations allow authorized persons and companies to check food products that will be eaten or drunk by humans and to ban them if they do not meet safety standards. If the experts select a container for inspection, they can retain it for two to three days, while investigating its content. If the freight does not pass all the tests, goods can be banned from the market. Legally speaking, the importer bears sole responsibility whether products meet or do not meet national safety regulations. Failing to satisfy the Food Safety Law and subsequent sentence has already resulted in imprisonment in a few cases. Violating a signed contract may result in large trade losses, expropriation of products from the market and may have devastating effect on the trade mark.

If the product has been approved by a licensed body and/ or originated from a country, approved as a country of origin, especially in case of trade between EU member countries, the product undergoes more compliant checks.

Diligence and Traceability

According to the EU Food Law, farmers and processing companies have the greatest responsibility for food safety assurance. However, quite often the importing company's single protection against a legal prosecution for food safety accidents is to prove that it has applied diligence practices. So to say, the company needs to demonstrate that its products have been diligently treated in the production chain.

Diligence principle protection is applied by two measures:

- Performance of all sensible protection measures, including identification of potential hazards and provision of instruments for their prevention and reduction.

- Availability of documents to prove action on preventive measures; they can demonstrate that every member of the production chain has been risk aware and has undertaken appropriate actions.

The traceability is a key factor for imposing food safety standards. An effective and economically sound tracing system should identify specific areas, where the problems stem from, e.g. packing device, group of farmers or a particular farmer, or even the field where the product has been cultivated.

Some agricultural farms and companies start with the cheaper option of developing their own expert-assisted production system. Their systems are additionally supervised by internal and external experts, and adjusted to be inspected by third parties (such as technologists). This whole supervisory process is designed to guarantee quality to the clients. However, professional retail traders may prefer performing their own food safety checks, especially if they affect new products or products, received from new suppliers. Their systems consist of checking all ingredients and chemical content, even the rooms, used by the supplier.

In the long-term, systems that are externally organized and supervised are much more cost- and quality-effective. Organizations may hire external experts and companies to test a specific industry, sector, company or product like the ones that are checked by trade associations, supermarkets or producer groups. Their schemes should demonstrate company's responsibility to the whole supply chain. However, they are also intended to impose trade advantages by giving more sound guarantees to clients.

Instructions for fresh produce traceability (FPT) have been developed by EHI Retail Institute (Eurohandelinstitute, EHI), European Association of Fresh Produce Importers (CIMO), Euro Retailer Produce Working Group (EUREP), European Union of the Fruit and Vegetable Wholesale, Import and Export Trade (EUCOFEL), Southern Hemisphere Association of Fresh Fruit Exporters (SHAFFE). Introduction of instructions for fresh produce traceability is voluntary. Companies must pay special attention to numbers and bar code application of EAN-UCC to facilitate fresh produce tracing. Instructions concern trade packing (such as cardboard and metal boxes) and transportation containers (pallets), but do not cover consumer units (such as bulk or pre-packaged goods).

International standards

There are more than 20 systems for food safety assurance, on top of multiple trade codes, retail trade systems and certification systems that are in force in Europe. These non-obligatory standards have been developed by the industry to impose standards on a great variety of food products. They often affect other areas, such as environmental protection. However, although food safety standards cover about 80% of the food production in Europe, consumers may still find it difficult to choose the right product, as standards differ in action, documentation, transparency, control and logo. Some widely applied systems are discussed below.

ISO 9000

ISO 9000 (International Organization for Standardization) is a quality standard system with a main focus on finding and preventing nonconformities during production and supply process and preventing their recurring appearance. ISO has been initially adopted by the food industrial sector. Later, it has been extended to other areas, such as production of fresh fruit and vegetables, packing and distribution.

ISO requires reasonable assessment of:

- Organizational structure;
- Administrative and operating procedures;
- Staff, equipment and material sources;
- Working areas, operations and processes;
- Conformity with standards and specifications;
- Documentation and archive.

The system has detailed 20 requirements to be addressed and controlled:

1. Management responsibility
2. System for quality documentation management
3. Contracts overhaul
4. Design control
5. Data and documentation control
6. Purchase (materials, skills and services)
7. Control of production and data provided by the customer
8. Product identification and traceability
9. Control of processing
10. Inspection and tests
11. Inspection, measuring, and test instruments
12. Status of inspection and test procedures
13. Control of non-conformable products
14. Correction and prevention measures
15. Processing, storage, packing, conservation and supply
16. Quality assurance documentation archive
17. Internal quality supervision

18. Training
19. Service and maintenance
20. Statistical methods

Hazard Analysis Critical Control Points (HACCP)

A living plant is not controllable yet, at least not in the way we can control a production line. Therefore, despite good supervision, poor quality products and/or services can be produced. Thus, the main purpose of the risk management is to identify and minimize potential hazards. The HACCP system has been introduced as the most effective "diligence" demonstration instrument to control food safety. The product must be traceable during its journey from the farmer/producer to the consumer. That is to say, HACCP is a structured preventive system, identifying hazards at each step of the process and introducing relevant measures.

In addition, the traceability is ensured by supplier codes or consignment tags for potential failures and defective functions to be traced back to their source. It is an important component of the food industry regulation within the EU.

The three main stages in treating potential hazards are:

• Identification of potential hazards;
• Determination of the critical ones;
• Development of control, documentation and inspection procedures at each critical point.

The overall assessment process starts from the harvest cultivation before picking, continues through picking, transportation, production processing, packing and storage stages, up to the supply to clients. However, the chain is usually too long to be thoroughly evaluated. A better strategy would separate smaller and easier to handle sectors, e.g. from harvest cultivation to transportation of products to the packing areas; or from the fresh produce entering the packing plant to the moment when the product is ready for freight and market distribution.

The first important step is to draw a diagram of the process and its stages. Hazards that may emerge should be identified at each stage and get their unique identification number. The outlined list contains all identified hazard points from the diagram, corresponding to every stage of the process.

Critical control points are processes or activities assisting in elimination or reduction of hazards to safe level, if controllable. Hazards are found in biological, chemical or physical content that may have harmful potential.

A farm or a company should assess the chance of hazard occurrence, whether its extent is significantly big (a life threating hazard, if not addressed), medium (risky for consumers, but controllable) or small (a non-significant risk for consumers, but better to be controlled). If the hazard assessment has not been correctly performed and documented, the failure of doing so may have serious consequences. Each potential risk is identified by a relevant identification number.

Further, every participant in the production chain should understand the risks and undertake relevant measures. The product's source must be traceable in the production and marketing chain, i.e. at stages of cultivation, picking, storage, packing, transportation and supply to consumers. Traceability is often completed following the supply code.

Quality standard assurance procedures must be developed at every stage and documented by protocols in details. A quality standard assurance system requires keeping protocols for all processes and operations. For example, a farmer keeps protocols on pesticides, and the packing company/person, documents numbers/quantity and weight of the product. Protocols must be clearly and accurately organized, with corresponding date and signature of the person that has prepared them. Internal supervision standards guarantee that the working standards are not under the required level.

Whatever the production range is, control systems must cover all production stages. At each stage a report documents:

• Condition of the product and its changes;
• Date and time of its arrival and check up;
• Source, code and/or name of the producer;
• Entire consignment checked;
• Packed product weight (or quantity) and content net weight;
• Temperature at the time of arriving;
• Quality and condition of the product;
• Decision – to approve or reject (arguments), to approve (on condition of a future settlement).

Producers should receive basic instructions in areas, such as how to keep a diary for seed sorts, processing and chemicals, and the used fertilizers. The access of animals to production fields or irrigation reservoirs should be restricted. Irrigation water should be safeguard against potential contamination from soil or surface.

All activities, accompanying the picking stage, even without packing, should be controlled. Control is obligatory if the production is picked by hand and does not undergo any obligatory processing, such as washing, but will be consumed fresh, such as apples, raspberry, and salad, among others. Toilet and bathrooms with a wash basin must be built on fields with high-risk plants.

The picked production must be put in clean containers. Containers, made of washable materials, are preferred. If the products are put right into containers to be sold, empty containers must be stored in clean and disinfected rooms to be inspected right before their use. Containers, especially cardboard boxes, must be protected against moist or from getting dirty when placed on the ground. Therefore, carriers should be hired.

Sheds and constructions, used for production processing on field, must be kept clean. Waste depots and waste products must be inspected against hazards, such as insects and pests. Seats and tables should be made of washable materials. The

products must be washed with drinking water, and kept in clean, closed containers.

Basic instructions respect supply and control of fresh produce that is intended for processing and packing. The production working list includes fresh material sort, its source, production volume, and information about the end product, such as weight or number in one pack, quality, size and data on label, if necessary. Fresh materials must come from licensed producers; their origin should be traceable in the course of the processing chain up to the point, imposed by specific production cycle and regulations. Package, equipment and materials used in production process, must meet specifications and requirements, formulated by clients and/or national and local legislation bodies. Easily damageable products should not be stored in string bags or sacks.

Suppliers of fresh materials, including packing and equipment, should conform to supply conditions, imposed by the exporter. Every product must be accompanied by specification of fresh materials, negotiated with the producer. They include product description, sort and quality. The package should be clean, with clearly identifiable name/code of the supplier and picking date. Specification of fresh material must be annually updated, with relevant date and signatures of supplier and buyer.

Supplied production must be clean, undamaged, fresh and pest free. This corresponds to characteristics that are typical for the sort of product and within the eligible norms for weight/size, indicated in the fresh material specification. All received consignments must have producer code and date to guarantee correct, successive order of periodic shipments. This same system ensures product traceability. Products that pass initial inspection are stored at appropriate temperature and clean sanitary conditions, without risk of contamination. All relevant measures must be taken against contamination or perish after the indicated date.

The company provides equipment for observation, appropriate light and devices. Product inspection should be performed by well trained and competent experts. Exporters need to keep inspection protocols with clear indicators of the procedures performed. Protocols are kept by a certain employee and performed in strict time intervals during the production process. Their purpose is to follow production quality and, therefore, need to be performed in defined time intervals, e.g. every half an hour, or quantity, e.g. every 500 packages.

Packing plants should prevent contamination from local industrial areas, e.g. smoke or smell. Surroundings must be kept clean to prevent the cumulation of insects, pests and contamination hazards.

Street doors should be well congested if possible, while doors and windows should be covered with nets. Infestation of insects, birds and domestic animals must be prevented inside, as well as outside the factory. In sectors, where packed products are stored, traps are set and regularly checked. Compounds against pests and insects can be used in the factory and their efficiency regularly controlled.

Packing factories, that give the products their final appearance, must have solid construction, resistant to bad weather conditions. Buildings must be secured against potential breaks of window glass or equipment that may contaminate the production. All processes of packing and processing are performed in clean rooms and good sanitary conditions. It should be kept in mind that hygiene standards are also related to potential hazards. Fruit that will be eaten fresh or peeled and cut require better hygiene than products that will be cooked or processed at high temperature before consumption.

Disposition of rooms inside the factory allows for easier transportation of the product from the moment when the fresh material is received until its processing and packing as end product in storage and loading sectors. The location of the rooms ensures separation of fresh material and end products. Minimal requirement for all packed materials is that they should be moved into a refrigerator room as soon as possible after packing to cool them down to temperature that is recommended for transportation.

All waste materials must be taken out of the production area as soon as possible. The necessary equipment for regular (at least once a day) disposal of waste, residual material and soil needs to be built on time. Most soil, residual and waste production are accumulated in the sorting and selection areas.

Drainage system should be built in the floors to facilitate cleaning. It should be constructed from materials that can be easily cleaned and endure potential pressure and wear and tear. Lighting, especially over production lines, should allow for effective control on production process.

The entire equipment must be thoroughly cleaned at the end of the work day and need to be kept in good working condition. All hand-operated instruments, such as knives, scissors and chisels, should be made of stainless material. All appliances and devices for weighing, sorting, measuring of temperature, and all other measuring instruments should be regularly checked to guarantee that troubles and malfunctions shall be identified on time. All production equipment and appliances should be inspected at least once a week to be kept clean, safe, and well functioning. Protocols and operating lists are needed, as well.

The factory must have staff and dressing rooms, equipped with lockers for personal belongings, wash basins, toilets, and separated rooms for eating and drinking. All protective clothing and garments need to be kept clean and in good condition in this area. Wash rooms and toilets, and bathrooms must be constructed according to the staff needs and kept in good sanitary conditions. They are separated from the packing area by at least one door, but two doors are preferable.

All employees must be familiar with all potential risks and hazards and be aware of the importance of good hygiene with respect to hand washing and personal habits. Employees that are afflicted with gastric diseases, causing nausea, vomiting

and/or diarrhea, should not have access to and be allowed to work with food products. All inflammations, cuts and other skin conditions should be covered with blue water-proof dressing. Use of perfumes, aromatized creams or powder on the hands of employees, who have direct access to products, should be avoided. Wearing jewelry and accessories that can fall and/or mix with the production is forbidden. Smoking is also strictly forbidden in all production areas.

Packing materials are kept in clean, dry and good sanitary conditions. They are checked for pests and other infections before use. Precise information on labels must be legally conformant. Use of metal staples and braces, wires and non-food materials is not allowed, so all packing must be kept in clean and dry storage facilities, protected against potential contamination.

Preparation of special protocol forms for particular products, showing significant defects, is recommended. If these defects appear in other cultures and crops, protocols will be consulted. The obligatory delivery details are:

- Date and time;
- Transportation vehicle number;
- Product temperature and conditions of freight, e.g. damages;
- Freight identification number, producers or packing employees;
- Customer (if having special requirements).

HACCP procedures are usually described in the product protocol, which must be available for inspection at any time. Protocols are important measure for a company that has planned preparation of quality assurance system. They should contain information on management practices, more specifically:

- Farm or company statement on quality policies. This is a common obligation, undertaken by the production group with regard to quality standards. Group members and clients are constantly reminded to follow it.
- Procedures which are intended to maintain the product's sound and continuous quality and cover all stages and elements of the process.
- Governance structure/farm structure, employees' and team members' obligations – working and reporting tasks. Staff structure map gives the external observer clear and quick picture of farm or company's governance practices. It contains details on obligations and tasks of every member/employee and is updated in case of farm/company expansion and staff restructuring. Short descriptions of managers' and employees' obligations are necessary.
- Brochure with information about the company – one page at most, freely available to customers, including valid communication and contact information that must be updated.
- Documentation and archive management system to prove the efficiency of the quality assurance system.

The company is obliged to keep protocols of governance and product handling practices. They are not intended to satisfy current international quality standards, as specified by ISO. These production protocols introduce and develop the concept and philosophy of an integral quality management among all operations. It is a manual for food safety management. The structure of the document aims at meeting specifications and regulations for every product, and serves as a manual for staff training. Every member of the picking group should pick the product carefully and in a certain manner, in the right period of its cultivation. Staff should guarantee that the product is stored at appropriate conditions and temperature and documentation is correctly kept.

Euro Retailer Produce Working Group (EUREP)

EUREP is a voluntary organization, established in 1998. It aims at imposing the concept of agricultural production safety on international level and creating international standards. Its management team involves producers and retail traders.

EUREP scheme demonstrates the progress, made by agricultural producers in the area of good agricultural practices, especially with respect to introduction of integrated drive against pests and care for crops in the agricultural production trade.

EUREP plans to encourage further action on improvement of farmers' resources for good practice introduction. It prepares a model system for current practices assessment and gives instruction for their further development. EUREP issues certificates to farmers and organizations that have met standard criteria on traceability and documentation management, soil and earth management systems, fertilizer and chemical content, irrigation, health and safety criteria, management after picking, feedback from clients (complaints and recommendations), internal supervision system.

Producers and companies that have received certificates are liable to notified and unprovoked inspections by authorized organizations.

Global Food Safety Initiative (GFSI)

Global Food Safety Initiative (GFSI) integrates various national food safety standards and systems in order that a common set of criteria and key requirements is created. Coordination and harmonization of all elements will unite different national standards and attract consumers' confidence. This would allow the national food safety assurance systems to be integrated on the basis of familiar standards.

European Quality Assurance Standards (EN)

European Quality Assurance Standards (EN 45000) include standards for environmental protection, which lately become an important factor in improvement of food safety assurance systems. Accreditation under EN 45011 is required for organic and geographically specific food products. A standard

for agricultural products is also on its way. Standards are common criteria, developed by bodies that issue certificates. Standardization bodies develop and approve quality assurance standards and control their application. The following food and beverage quality standards are the most often applied ones:

- EN 45001 General criteria for the operation of testing laboratories;
- EN 45004 General criteria for the operation of various types of bodies performing inspection;
- EN 45011 General requirements for bodies operating product certification systems;
- EN 45012 General requirements for bodies operating assessment and certification/registration of quality systems.

Acknowledgements

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