

Magdalena Paździor

University of Technology and Humanities, Faculty of Material Science, Technology and Design, Department of Design and Technology, Radom
m.pazdzior@uthrad.pl

QUALITY ASSURANCE SYSTEMS IN FOOD PRODUCTION

Abstract: Food production is the subject of numerous systemic solutions within the scope of health quality assurance. A common purpose for all the pro-quality actions taken in a production organisation is constituted by the achievement of the products' quality level consistent with the preferences of the customers. Health quality of food is closely related to the quality of its materials and semi-finished products from so-called primary production. Food business operators must comply with the requirements of material protection from possible contamination and with the relevant EU and national legislation referring to hazard control in the area of primary production.

This paper includes an analysis of systems supporting the organisations manufacturing primary products in their efforts to provide their proper health quality. Production organisations operating in the area of food primary production have usually the obligation to implement the quality assurance systems ensuring the health quality of food offered to the consumers. In addition, the paper identifies the EU and domestic legislation providing the obligation of applying the health quality of food' assurance systems in the primary production implemented on the level of farms. It outlines regulations applicable to the primary production and related actions for the benefit of improved food safety.

Keywords: quality systems, food safety, primary production, food industry.

JEL classification: L66.

SYSTEMY ZAPEWNIENIA JAKOŚCI W PRODUKCJI ŻYWNOSCI

Streszczenie: Produkcja żywności podlega licznym rozwiązaniom systemowym z zakresu zapewnienia jakości zdrowotnej. Wspólnym celem dla ogółu projakściowych działań podejmowanych w organizacji produkcyjnej jest osiągnięcie poziomu jakości produktów zgodnego z preferencjami klientów. Poziom jakości zdrowotnej żywności jest ściśle zależny od jakości zastosowanych do jej produkcji surowców i półproduktów, które są wytworem tzw. produkcji pierwotnej. Przedsiębiorstwa sektora spożywczego muszą spełniać warunki ochrony surowców przed ewentualnymi zanieczyszczeniami oraz przestrzegać właściwych wspólnotowych i krajowych przepisów prawnych odnoszących się do kontroli zagrożeń w obszarze produkcji podstawowej.

W artykule dokonano analizy systemów wspomagających dążenia organizacji wytwarzających produkty pierwotne do zapewnienia ich właściwej jakości zdrowotnej. Organizacje produkcyjne funkcjonujące w obszarze produkcji pierwotnej żywności mają w większości przypadków obowiązek wdrożenia systemów zapewnienia jakości gwarantujących bezpieczeństwo zdrowotne oferowanej konsumentom żywności. Wskazano również uregulowania prawne na poziomie unijnym i krajowym wprowadzające obowiązek stosowania systemów zapewnienia jakości zdrowotnej żywności w produkcji podstawowej realizowanej na poziomie gospodarstw rolnych. Nakreślono przepisy mające zastosowanie do produkcji podstawowej i działań powiązanych na rzecz podnoszenia stanu bezpieczeństwa żywności.

Słowa kluczowe: systemy jakości, bezpieczeństwo żywności, produkcja pierwotna, przemysł spożywczy.

Introduction

Producers have at their disposal the range of tools and systemic solutions that may efficiently affect the quality of food offered to the consumer. The product quality must consider all the forecasted, programmed and planned processes it will undergo throughout its lifecycle [Haffer 2002, s. 297]. In a time of increasing production globalisation, quality has become an important characteristic of enterprises operating on the market [Popek and Kłak 2009, pp. 27–38]. The quality assurance issue constitutes, thus, the key purpose of every organisation (producer, service provider and their sub-contractors) that wants to achieve market success. Table 1 includes the definitions of the quality assurance according to various literature sources.

The quality assurance process is a continuous action. Quality assurance systems constitute the tools ordering and supporting the organisations' efforts to

Table 1. Definitions of the quality assurance

Source of definition	Definition/interpretation
PN EN ISO 9000:2006 standard	A part of quality management oriented towards the increased capacity of meeting the requirements concerning quality
Founded in 1946 American Society for Quality Control (ASQC, now American Society for Quality, ASQ)	All the planned and regular measures necessary to obtain an appropriate level of credibility that the service will comply with the established qualitative requirements
Traditional approach	A task of quality control services, including the verification, measurement or testing of one or more characteristics of a product or a service, and then the comparison of obtained results with the specification of assumed values, in order to confirm the product or service's compliance with the requirements. Products inconsistent with the specifications are rejected or transferred for improvement, while products meeting the requirements are handed over to an external or internal customer
Modern approach (in a new management paradigm)	Delivery of excellence of the production and supply process. The quality level of work performed at each stage of the process translates directly to the high quality of a product manufactured as an exit effect of this process. If the production process includes places resulting in the reduced quality of an end product, the causes of imperfection should be identified and then removed
Commodity science approach	Performance of regular and planned actions (systematic inspections, reviews, audits, external assessment to provide quality on an on-going basis), oriented towards manufacturing of products compliant with the specifications, defined with measurable qualitative parameters

Source: Based on: [PN-EN ISO 9000:2006; Hamrol 2008].

accomplish this objective. Due to the definition [Kopaliński 2007], the system is a comprehensive and ordered set of interrelated elements and rules of proceedings. A quality assurance system should be understood as a set of actions oriented towards the performance of tasks to achieve a common goal. Production organisations from the food sector can, but also often are obligated to, implement the quality assurance systems that enable them to:

- accomplish the objectives concerning the compliance with the requirements and customers' expectations,
- improve the organisation's functioning,
- assure health quality of products offered for the consumers.

The scope of quality assurance systems includes customers, employees and suppliers.

The aim of this paper was to identify areas of quality activities in food enterprises regulated by mandatory and voluntary quality assurance systems. The scope of the analysis concerned raw materials from plant and animal production.

1. Area of primary production

Two basic stages may be distinguished in food production:

- primary production on the level of farms,
- food production executed in food business operators.

Primary production is defined in Article 3 item 17 of the Regulation (EC) no. 178/2002 of the European Parliament and of the Council laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety [Regulation (EC) no. 178/2002]: “Primary production” means the production, rearing or growing of primary products including harvesting, milking and farmed animal production prior to slaughter. It also includes hunting and fishing and the harvesting of wild products”.

Primary production on the level of farms or on a similar level also includes the accompanying actions related to the internal transport, storage and proceedings with products without a significant change of their character and in transport to a processing plant. Annex I, part A, item I (1) of the Regulation (EC) [Regulation (EC) no. 852/2004] specifies the general hygiene provisions for primary production and associated operations and recommendations for guides to good hygiene practice.

The main domestic legal act in the area of food, the Act of 25 August 2006 on the food and nutrition safety, section 1, Article 3 item 28, defines the primary production as a basic production within the meaning of Article 3 item 17 of the Regulation (EC) no. 178/2002. This Act, also in section 1, Article 1, item 40, defines the primary production products as materials [Journal of Laws of 2010 no. 136, item 914 as amended].

In Poland, the food law system is based on the regulations of the European Union – directives and regulations. In matters related to food safety in the area of primary production and in the processing of its products within the food production, the so-called *Codex Alimentarius*, should be

treated as an internationally superior set of guidelines and recommendations. This document concerns the area of food primary production, sanitary surveillance over production processes, the sanitary condition of plants, and the hygiene of employees. In addition, it constitutes the area of mutual actions for the UN organisations: FAO (Food and Agriculture Organization of the United Nations) and WHO (World Health Organization) for the benefit of improved food safety conditions. Adoption of the Codex-developed standards and guidelines by countries is theoretically optional. However, they are more and more often treated by the WTO (World Trade Organization) as a reference point in solving international commercial disputes concerning food [www.mg.gov.pl].

Apart from global considerations, food production is subject to numerous systemic solutions within the scope of quality assurance. Due to the diversity of food products and to a different character of requirements posed against the producers and products, quality assurance systems may be divided into the following areas:

- primary production (materials – Table 2),
- food production.

Table 2. Quality assurance systems operating in the primary production

QUALITY ASSURANCE SYSTEMS in the primary production (materials)
agricultural, horticultural and aquaculture products: GLOBAL GAP (Good Agricultural Practice)
cultivation of crops (agricultural, vegetable and fruit): ICM (IP) Integrated Production IPO Integrated Fruit Production
feed sector: GMP + (Good Manufacturing Practice plus) GMP + FSA (Feed Safety Assurance) GMP + FR (Feed Responsibility Assurance) GHP (Good Hygienic Practice) ISO 22000:2005 (replaced with the Polish version PN-EN ISO 22000:2006) Food safety management systems – Requirements for any organization in the food chain FAMI-QS (Quality and Safety System for Specialty Feed Ingredients and their Mixtures)
meat products: QMP (Quality Meat Program) – beef PQS (Pork Quality System) – pork QAFP (Quality Assurance for Food Products) – pork, poultry, poultry and pork-beef cooked meats

Table 2 – cont.

QUALITY ASSURANCE SYSTEMS in the primary production (materials)
coffee, cocoa, tea: UTZ Certified
products suspected of genetic modifications, e.g. soya, corn, rice, tomatoes, potatoes: non-GMO (Genetically Modified Organisms) IP-CERT * IP NON-GMO Standard

2. An analysis of the quality assurance systems in the primary production operations in Poland

Annex I to the Regulation (EC) no. 852/2004 defines the general requirements for primary production and food business operators producing or collecting vegetable products and breeding animals or producing animal materials in order to ensure their proper health quality. Pursuant to the hygiene provisions in this document, food business operators should ensure that primary products are protected from contamination, in regards to any processing that primary products will subsequently undergo. Additionally, they need to comply with the appropriate Community and domestic legal provisions related to hazard control in the primary production and associated operations [Regulation (EC) no. 852/2004].

Provision for the health quality of food is related to the implementation of proper management systems. Table 2 indicates the systems that may be implemented at the stage of primary production for the needs of hazard prevention. In order to ensure the safety of food offered to consumers, it is necessary to consider all stages in the food production chain in accordance with the “farm-to-table” rule.

GLOBAL GAP. Good Agricultural Practice constitutes an international, independent, optional system of food safety assurance for primary agricultural production (agricultural, horticultural and aquaculture products) and for the preparation of products for sale. The system is based on compliance with good agricultural practice, application of an integrated system of plant protection and annual farm control.

One of the main objectives of the standard includes the minimisation of the application of fertilisers and protection chemicals in order to reduce the adverse environmental impact of agriculture and to provide the use of agricultural lands for as long as possible. Standards include the safety

requirements concerning food, labour safety, environmental protection and animal welfare [www.haccp-polska.pl]. The system determines the minimum production standards in order to obtain the high quality of primary products based on the criteria:

- deriving from the HACCP system,
- provisions of the domestic and international law,
- environmental impact of agricultural production.

In 2015, the new fifth edition of the GLOBAL GAP standard came into effect.

Integrated Production (IP). IP is a food quality system, using in a sustainable way the technical and biological progress in the cultivation of crops, plant protection and emphasising particularly the environmental protection and human health. The system's legal guidelines are included in the Regulation of the Minister of Agriculture and Rural Development of 16 December 2010 concerning the integrated production (Journal of Laws of 2010 no. 256 item 1722) The regulation specifies:

- the way and mode of documenting the actions related to integrated production,
- the way and mode of exercising the supervision of integrated production,
- organisational units entitled to issue the certificates of compliance with the acceptable levels of the residues of crop protection chemicals, heavy metals, nitrates and other elements and harmful substances in plants and plant products [Journal of Laws of 2010 no. 256 item 1722].

Measures within the scope of integrated protection for the cultivation of crops (agricultural, vegetable and fruit) are documented in the Integrated Production Book, the model of which is defined in the annex to the Regulation. Since 2015, the Main Inspectorate of Plant Health and Seed Inspection (PIORIN) has resigned from the direct certification of the plant Integrated Production for agricultural producers. The basic form of exercising supervision by PIORIN of the Integrated Production system shall be constituted by the authorisation and control of entities conducting the activity with an IP certification.

Integrated Fruit Production (IPO). IPO includes basic requirements posed by supermarkets in Poland, regarded as a lighter form of the EUREP GAP fruit certification system. Prevention of the occurrence of harmful organisms in horticulture constitutes the main principle of the IPO system. Firstly, biological, physical and other non-chemical methods should be applied to destroy crop pests, if they provide protection. Crop protec-

tion chemicals should be applied only in the end. Methods of limiting the application of chemical procedures meeting the IP requirements include:

- application of selective preparations,
- introduction of helpful organisms,
- application of biotechnical methods (disorientation of pest males with use of pheromone traps),
- application of selective biological preparations including viruses pathogenic for pests.

Good Manufacturing Practice plus (GMP+) is a certification program developed in 1992 by the Dutch feed industry as a response to the incidents with contaminations in feed materials. GMP+ has been developed into an international system managed by GMP+ International in cooperation with numerous international entities [www.gmpplus.org].

The standard includes manufacturers of feeds for animals and their components, as well as transportation and trade enterprises (including inland shipping) of this sector. GMP+ system constitutes a group of detailed standards, including the GMP (Good Manufacturing Practice) and HACCP system requirements. In 2014, the standard concerning the responsibility for feed safety was published. Two modules were developed:

GMP+ Feed Safety Assurance (GMP+FSA), concentrated on feed safety,

GMP+ Feed Responsibility Assurance, (GMP+FR), concentrated on the assurance of responsibility, in which the animal feed industry has been extended with responsible labour. GMP+ includes also GMP B1-B10 standards referring to the area of production, trade, transport, storage, cultivation of materials and laboratory tests of animals feeds and feed components, with consideration of feed for pets [www.bestquality.pl].

ISO 22000 An international standard of food and feed safety management (based on the HACCP rules) has been developed for all organisations participating in the food chain. The HACCP system (hazard analysis and critical control points) constitutes the EU law [Regulation (EC) no. 1831/2003] provision establishing the requirements concerning feed hygiene in the area of enterprises producing feed materials, mixtures, feed additives (including transport, storage and sale).

Quality and Safety System for Specialty Feed Ingredients and their Mixtures

(FAMI – QS) Production of feed additives constitutes one of links in the food chain holding the responsibility for production and marketing of products that are safe and in line with legal regulations. Hence, more and more feed producers require from their suppliers, manufacturers,

and distributors of feed additives certification consistent with the requirements of this standard. This is a response to the requirements of the Regulation (EC) no. 183/2005 of the European Parliament and of the Council of 12 January 2005 laying down requirements for feed hygiene [Regulation (EC) no. 183/2005].

The certified FAMI-QS system is an alternative for companies producing feed additives and premixes due to the lesser requirements concerning purchase as compared with the GMP B1 (Production, Trade and Services in the Feed Sector) and GMP B2 (Production of Feed Ingredients). The companies operating in the industry of feed additives and premixes need to have the FAMI-QS certificate for deliveries to the markets in the Netherlands, Great Britain and Scandinavia [www.grepcon.pl].

Food quality systems for meat products: QMP, PQS, QAFP.

Quality Meat Program System (QMP) QMP beef quality assurance system constitutes the first domestic, optional system providing consumers and retailers with the guarantee and basis for an increased trust in Polish beef quality. The QMP system includes regulations referring to the conditions of animal welfare within the scope of raising them in free-stall barns. QMP system is open to cattle producers, feed manufacturers, livestock transporters, meat processors. One of its basic principles includes the possibility of identifying an animal from which a product originates.

The system is composed of four categories:

- beef livestock production: QMP – cattle,
- feed processing: QMP – feeds,
- animal transportation: QMP – transport,
- meat processing: QMP – meat.

The quality of beef and young beef produced within the QMP system results from the detailed obligations of the livestock producers, referring to [www.minrol.gov.pl]:

- the selection of breeds appropriate to the production of qualification animals,
- the way of proceeding with animals (application of a free-stall system in a farm),
- the application of recommendations concerning the slaughter weight and carcass parameters for animals in a required age.

The QMP system also defines the standards concerning animal transportation and principles of proceeding with them in slaughterhouses. The Polish Association of Cattle Producers (PZPBM) is an owner of the QMP system and sign.

Pork Quality System (PQS) PQS constitutes an optional domestic system developed by the Polish Association of Pig Breeders and Producers “POLSUS” and the “Polskie Mięso” Association. It includes breeding and growing, as well as trade before slaughter with processing. The system guarantees full traceability of an obtained product and enables one to track the meat’s origin from the meat batch to the herd from which it comes. The quality of pork produced within the PQS system results from the detailed obligations of livestock producers, which guarantees the compliance with requirements defined in the standard and referring to the production process concerning:

- use in outcrossing of animals free from a gene responsible for increased frequency of occurrence of the PSE-type meat quality defects,
- use in commercial crossing of pig races and intercrosses from the planned crossing [www.minrol.gov.pl].

The system requirements include also the qualitative parameters of an end product: colour, water absorption, fat content, fat colour, fat consistency, and flavour.

Quality Assurance for Food Products (QAFP) The system was developed by the sectoral organisation associating meat business operators: the Union of Meat Business Producers and Employers. In 2009, the Minister of Agriculture and Rural Development assigned the role of a national food quality system to that system. Participation in it is optional. The QAFP system defines the detailed requirements that need to be met so that the end product is of as high quality as possible. It is a multi-product system, constantly extended with the quality standards concerning different groups of food products: pork, poultry, poultry and pork-beef cooked meats [www.minrol.gov.pl]. The system includes the production stages from breeding, feeding animals and conditions of their breeding, through slaughter, cutting, processing, transport, conditioning and packaging, to storage and sale.

non-GMO (Genetically Modified Organisms):

IP-CERT * IP NON-GMO Standard The non-GMO standard is oriented towards all food producers and processors, regardless of their size or place in the production chain. It is an objective proof that food produced in an enterprise is 100% free from genetically modified components. It especially concerns producers and processors of the products suspected of genetic modifications, e.g. soya, corn, rice, tomatoes, potatoes. The certification system is adjusted both to the specificity of production based on plant and animal materials [www.dekra-certification.com.pl; www.sgs.pl].

The non-GMO certification confirms that a given organisation has implemented and maintained the Food Safety Management System within the scope of compliance with the following requirements:

- Regulation (EC) no. 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed,
- Regulation (EC) no. 1830/2003 of the European Parliament and of the Council of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms.

Entrepreneurs operating in the food market are obligated to transfer and store the required documentation of materials and finished products including GMOs. Traceability is one of basic requirements of the Regulation (EC) no. 178/2002 of the European Parliament and of the Council laying down the general principles and requirements of food law. This obligation concerns both producers marketing their GMO products and those who receive such a product from the suppliers inside the EU.

UTZ Certified UTZ, which means “good coffee” in the Mayan language Quiché, enables clients and brands to be sure of maintenance of the expected social and environmental quality standards in production of coffee, cocoa and tea. UTZ Certified constitutes a global certification program within the scope of product origin control [www.sgs.pl].

The system results from care for the sustainable production of the high-quality products. It draws attention to efficient farm management (measures preventing from the soil erosion, minimised water consumption and contamination production, responsible application of chemicals, environmental protection) [Sara Woźny]. It defines the quality criteria for coffee, tea, and cocoa and guarantees the traceability within the supply chain.

Conclusions

The results of the conducted analysis allow the researcher to declare that food manufactures have the tools in the form of efficient systems that guarantee offering consumers safe and good quality products.

Juxtaposition of systems and the identification of regulation areas confirm that there is no area in food production which is out of control and beyond the range of pro-quality requirements.

Considering the above, it can be concluded that safe primary production is a crucial stage in obtaining ultimately a healthy food product.

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