

The Deming Cycle (PDCA) Concept as an Efficient Tool for Continuous Quality Improvement in the Agribusiness

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Abstract

Task statement: This article is an attempt to study the issues of quality management of business processes and production with respect to companies operating in the agricultural sector. The global agribusiness is a special sphere of production, which is aimed at meeting the most important physiological needs of people. Therefore, the quality of the products, and thus the quality of the business processes are crucial for preservation and enhancement of the health of the world's population. **The approach** of this article is based on the cross-disciplinary concept of quality management with regard to the specifics of the operation and development of agro-industrial companies. **Results:** the study of theoretical, methodological, and empirical aspects shows that, in recent decades, the dynamics of the global agribusiness has changed significantly, and it is caused by multiple objective factors. At the same time, forecasts say the world food production will fall short of the real need of the world population in this products, so further stimulation of sustainable development of the world's agribusiness can be performed through total quality management as well. For agricultural companies, quality management should be based on the Deming Cycle concept; this approach orients all business processes to implementation of the eight core principles of total quality management. **Conclusion / recommendations:** materials contained in this article show the special role of the global agribusiness in social and economic processes. The proposed scheme of quality management is recommended for use in the agricultural companies of the complete production cycle. For companies of the non-complete cycle, the scheme can be adapted by eliminating unused links.

Keywords: agribusiness, food industry, agriculture, total quality management, quality management system

1. Introduction

In today's global society, many yet unsolved problems are directly related to the standard of living of the population of our planet. One of these serious problems is the ensuring of the quality of food products, agricultural products, and drinking water (Directorate-General for Research and Innovation Biotechnologies, Agriculture, Food 2010). Ensuring proper quality of food products and drinking water is a very important aspect in the current context, as it is the most important condition for formation of the healthy human potential on the national and global levels. In turn, the development of healthy human potential is the basis for the transition to the new social and economic relations, based on knowledge. New socioeconomic relations suggest that the cognitive basis is fundamental for savior of the modern civilization and transfer of the World System to sustainable development. Accordingly, the relevance and importance of the issues of quality management in the field of food, water supply, and generally in the field of agricultural production is undeniable.

Speaking of quality management, it is worth noting in a general sense that the concept of quality management as a scientific theory is relatively new on the one hand, but the problems of ensuring quality of food and production of food products accompany the modern civilization on its whole historical development path. It is no secret that the modern quality management in the field of agricultural production is in many respects not so perfect and efficient, as the adopted quality standards require even in developed countries. In particular, the standards of agricultural products' quality adopted in the European Union are not complied with by all countries. More often

violations of the standards of quality of agricultural raw materials and the production of food products from them are detected in countries that are associate members of the European Union (Agricultural quality standards in European Union 2011). Problems of quality management as a whole (Ishikawa 1985), and particularly the problems of the agricultural production quality management increasingly become the subject of consideration and scientific discussions at various levels. At the same time, we must not forget that the efficiency of quality management of agricultural products is directly related to public health in the regions of the world (Water Quality and Agriculture 2012). That is why the issues of improving the quality management of agricultural products and its safety for the environment and consumers are included in the scope of the public interest to ensure the national security of virtually all developed and developing countries.

2. Methodology

The presented article uses a combination of methods of the theoretical, economic, functional, and environmental analysis, as well as methods and empirical models of quality management of the business processes and products manufacture organization. The analytical data and information materials obtained during preparation of the article were properly compiled and structured in terms of the general requirements for development of scientific and methodological foundations for the research topic.

3. Results

Over the past half a century, the global agribusiness field has changed significantly: not only have new methods and tools for processing of agricultural land appeared, but also the diversity of crop varieties, animal breeds, methods, techniques and technologies for processing raw materials into finished products increased. At the beginning of the first quarter of the twentieth century, the main requirement for agribusiness was the sufficiency of food production needed to provide for the basic needs of consumers. But even within the framework of the scientific and technical progress proliferation, which has led to formation of the first industrial and later post-industrial society, the requirements for the production of products from agricultural raw materials began to increase steadily (Water Quality and Agriculture 2012). If we trace the trends in the global agribusiness in the twentieth century, we can note a few key periods that determined the changes of scientific concepts and practical knowledge on quality management in this area:

- I. from the beginning to the middle of the twentieth century, the development of the global agricultural sector demonstrated constant expansion of production facilities, including the expansion of arable land and pastures. In this case, steady increase in the volume of cultivation and production of products in the global agribusiness was based on the principle of extensiveness (priority in the field of agricultural production was given to the quantitative economic growth in the absence of the valuable economic growth);
- II. in the second half of the twentieth century, the world agricultural sector came to the realization that the extensive method of production leads to degradation of the industry and decline, so the transition to intensive methods of organization and management of agricultural enterprises was made partly (the priority values of agricultural production have become more important than the priorities of the product manufacture quantity);
- III. at the late twentieth century, the scientific and empirical paradigm in the industry in question began to change. In particular, people started to understand that population growth requires increase in the intensity of agricultural production, but the reserves of intensification of the traditional methods had been exhausted. Excessive intensification of agro-industrial production on the global level in the previous periods disturbed the ecological balance; the use of various chemicals to stimulate growth of agricultural raw materials and to protect from pests exhausted the land and water resources.

Thus, to date the issues of consumer quality of manufactured products in the agricultural sector are acute, but at the same time, along with ensuring the quality of production, there are the acute problems of ecological safety of production. For example, at the late twentieth century, a very negative trend of insufficient water resources for agricultural purposes took place in many regions of the world. There has begun shallowing of medium and large rivers in such industrialized countries and countries with transition economy such as: the USA, China, India, the European Union, and the Russian Federation (Water Quality and Agriculture, 2012).

At the same time, these trends objectively indicate that the volume of world trade in agricultural products and food products in general reduces due to the rising objective and normal desire of many countries to self-provisioning of the required food by the population. On the other hand, it is also obvious that despite the achievements in the development of the global agribusiness, the insufficiency and in some cases the lack of access to basic groceries continue for the population of some (mostly developing) countries. Below, Figure 1

shows the ratio of the needs and volume of global production and consumption of agricultural products in the forecast until 2030.

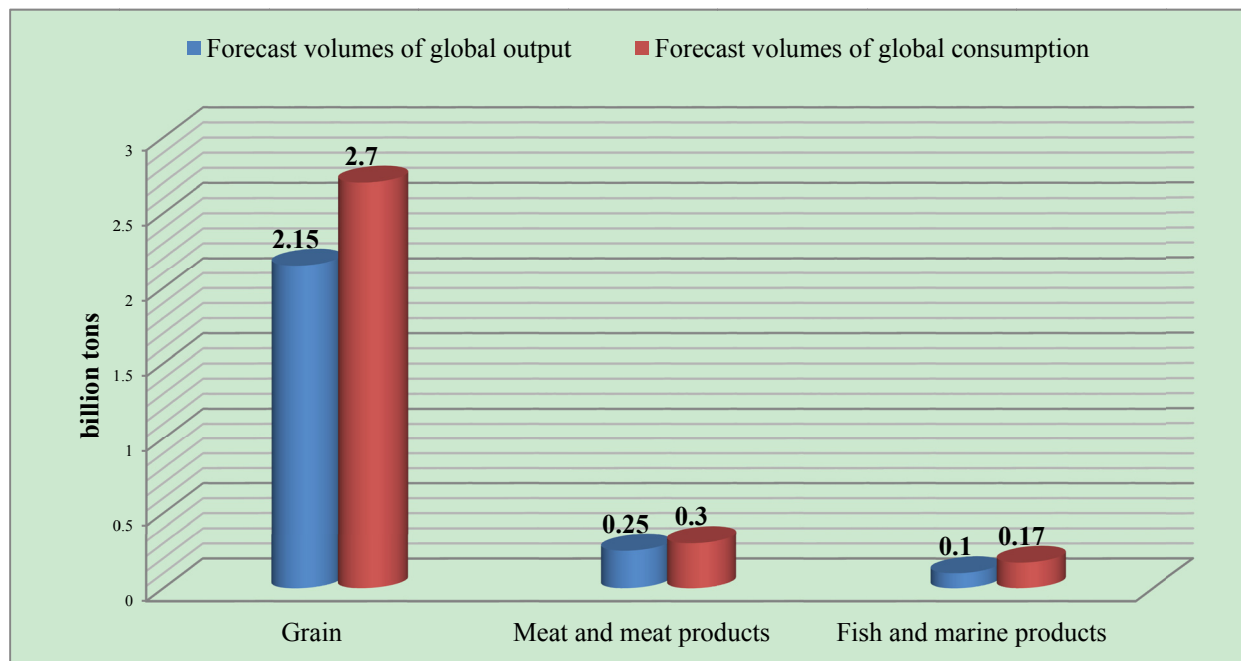


Figure 1. Requirements and scope of production of agricultural products in the forecast until 2030 (Directorate-General for Research and Innovation Biotechnologies, Agriculture, Food, 2010)

As we can see from the provided data, according to the forecast until 2030, on the average the population of third world countries will receive from 15% to 70% less food resources, which are absolutely necessary for normal life activity and for ensuring the quality of life.

Thus, to date, it is obvious that a sufficient number of problems have accumulated in the global agribusiness that adversely affect the development and evolution of this sphere of production. In addition, we should not forget the polemical problem of ensuring quality of agricultural products based on two diametrically opposite positions: "organic products manufacture" and "manufacture of genetically modified products". In recent years, many researchers at the international level agree that the global agribusiness should be focused on production of "organic products", as the use of genetically modified products in the human diet can lead to fatal consequences.

At the same time, it should be clearly understood that the real danger of genetically modified agricultural products (products of processing agricultural raw materials) to human health is not totally, completely, and absolutely proven. Equally, the absolute use of consumption of the so-called "organic food (organic groceries)" has not been proven (Dudin et al., 2014a). Consumption of "organic products" has its downside in the form of the potential danger of bacteriological contamination. This is due to the use of organic fertilizers.

One must remember also that the production of "organic products" as a result of the use of the aforementioned organic fertilizer greatly increases the adverse impact on the environment, and by now many developed and developing countries face the problem of soil erosion, degradation of the fertile layer, and the need for urgent conservation of land as a result of the "organic approach" to agricultural land cultivation. It is reasonable to assume that the issues of quality management in the agribusiness become more relevant and important to ensure the sustainable development of the global socioeconomic and ecological systems.

4. Discussion

To date, the experience of quality management of production organization and of products in various industrial and processing sectors comprises many methodological approaches: starting with local measures on quality management for separate elements in business processes and ending with the modern philosophy of overall quality management. It is worth noting that the modern understanding of the term "quality" is based on the original philosophical view, in which the quality is a much different characteristic of a certain object, giving

certainty to this object (Total Quality Management And Six Sigma, 2012). On the other hand, the concept of "quality" is considered in the economic aspect, as well. In terms of economics, quality is the ability of a product to satisfy adequately the needs in accordance with the purpose of the product (Gupta et al., 2005). There are also reasons to say that quality is the degree to which a set of inherent characteristics of the product conforms to the requirements of consumers. Hence, quality management in the global agribusiness is a systematic process aimed at production of the desired products from agricultural raw materials, the characteristics of which are oriented to the determined or assumed needs of the population in groceries (food products).

Basic needs of the population at consumption of agricultural products can be structured as follows: sufficiency and security. In all fairness, it should be noted that based on the basic needs the needs of higher level are formed (for example, requirements for flavor specifications, requirements for the aesthetic appearance of a product and its packaging, requirements for the storage conditions and term). But in reality, sufficiency and safety of food products are the conceptual conditions that form their quality.

The concept of sufficiency of agricultural products also includes the concept of availability of food resources, i.e. it is the physical and economic availability of groceries for all population layers that provides for meeting their needs in the food having the required nutritional value. Safety of agricultural products is considered from the point of view of reasonable assurance that the groceries made of agricultural raw materials (in normal consumption conditions) are not harmful and do not pose a risk to the health of the present and future generations (Directorate-General for Research and Innovation Biotechnologies, Agriculture, Food 2010; Agricultural quality standards in European Union, 2011).

In the international standards of the ISO 9000:2005 and ISO 9004:2009 series (Quality management principles, 2012), the eight basic principles are provided, the use of which in practice allows companies to operate in the agricultural sector, build their business processes properly, and guarantee the quality of their products to consumers:

- the first principle: orientation of the manufacturer's activities to the client (to meet current and future needs of the client);
- the second principle: desire for leadership;
- the third principle: involvement of all employees in the process of quality assurance within the framework of production and sales;
- the fourth principle: process management;
- the fifth principle: systematic approach to management of the manufacturer's activity;
- the sixth principle: orientation of the manufacturer to continuous improvement of all of its internal and external processes;
- the seventh principle: adoption by the management of the manufacturer of managerial decisions based on objective facts;
- the eighth principle: mutually beneficial relationship of the manufacturer with all suppliers.

Let us briefly review each of the principles conducive to the formation of such a basis for organization of business processes in agro-industrial companies, which allows producing products of the desired quality and sufficient quantity to meet consumer demands.

Therefore, the first principle of quality assurance is that the effectiveness and sustainability of any company's operation, and especially of agro-industrial companies' operation, depends on consumers: their behavior and stability of demand. Therefore, manufacturing companies focused on improving the quality of business processes organization and the released products not only must understand the current and future needs of their customers, but also need to strive to exceed continually their expectations related to the quality of the manufactured products.

The second principle of quality assurance is that the leaders (executives) of agro-industrial companies establish the unity of purposes and activities (areas of strategic development). The main task of leadership is to create such internal environment in an agro-industrial company, which will ensure full involvement of employees and motivate them to achieve the set strategic goals of development.

The third principle of quality assurance is a direct consequence of the second principle and comprises full involvement of employees and full understanding of the goals and objectives of the strategic development of the manufacturer, which allow the latter to accumulate organizational knowledge and use it to continue to receive economic and non-economic benefits.

The fourth principle of quality assurance is that the goals of functioning and development of agro-industrial companies are achieved more efficiently if management of all resources and activities is an ordered hierarchy of processes.

The fifth principle of quality assurance logically follows from the fourth principle. The essence of the fifth principle is that a systematic approach to the management of processes, resources, and staff of the manufacturer improves efficiency at achieving the strategic goals and performance at solving strategic tasks.

The sixth principle of quality assurance is that the continual improvement of the manufacturer's performance and efficiency of business processes and production organization is the general aim of the current operation and future development of the agro-industrial companies in the circumstances of the steadily increasing demand and reducing resource production base.

The seventh principle of quality assurance is that the effectiveness of decisions taken depends on the state of information support of the executive staff; therefore, in order to improve the products quality and the overall performance of agro-industrial companies, the decisions should be based on objective, reliable, and relevant facts.

The eighth principle of quality assurance is that the quality of products of agro-industrial companies depends on the efficiency of interaction with suppliers. Therefore, agro-industrial companies focusing on improving the quality of their products must build mutually beneficial relationships with suppliers.

The above principles of quality management (business processes and products manufacture organization) at agro-industrial companies can be practically implemented as separate models used in national systems of business management. Perhaps, each national socioeconomic system has its own model of quality management and model of quality assurance of production and sales. Therefore, we can identify about ten national quality models, including those well-functioning in the agro-industrial production area. However, many models are duplicates or replications of each other. Therefore, we are going to review briefly the national models of quality management: the Japanese, American, and European models.

Thus, in particular, we can highlight the Japanese model (Ishikawa, 1985), in which the management of quality, first, is always focused on the needs (even unconscious needs) of the customers. Secondly, the Japanese model of quality management is based on the continuous training of staff rules and principles of manufacturing high quality products and forming their proper motivation.

In addition, there is the European model of quality management. The European model is based on the methodology proposed by the European Foundation for Quality Management and assumes a multi-criteria approach (Understanding Quality Management System, 2011). The essence of this approach is that in addition to the traditional involvement of staff in the processes of manufacture of high quality products and the focus on the full and anticipatory satisfaction of customers' needs, it also takes into account the impact of products manufacture on the society. In fact, the European model of quality management (both business processes and goods manufacture organization) is based not only on the social orientation, but also on the full social responsibility.

We should also mention the American model, which is the concentration of the Japanese and European national models, while the American model, on the one hand, may seem more simplified (liberal) compared to the Japanese model, but, on the other hand, more rigid compared to the European model of quality management.

As part of the national models, various concepts of manufacture organization (including the organization of agricultural production), aimed at improving the quality of products may be used. Among these models of quality management in particular, we should highlight the following most famous developments (Total Quality Management And Six Sigma, 2012; Zineldin, 2001):

- the rule of "Six Sigma" assumes increasing the quality of the output of each business process implemented in the company, with the aim of minimizing the defects of operations, as well as reducing variations in operating activities. This allows gaining more than 99.99% of high-quality products at the output that meet the requirements (the current and future needs) of customers;
- the "lean production" concept requires consistent and total elimination of overt and covert (latent) losses in production, auxiliary, and managerial business processes. Reducing unproductive losses allows the manufacturer to increase the manufacture flexibility and adaptability in line with changes in customers' needs;
- the "SIPOC" concept is generally similar to the rule of "Six Sigma" (Lim & Tang, 2000) and involves building dependence diagrams in all business processes of the manufacturer in the "supplier → input →

process → output → customer" continuum. This allows building each business process so as to determine the resource providers at the input, and the result recipients at the output. This approach facilitates planning and product manufacture quality assurance as well as quality assurance of the sale of these products to the end consumer.

Above, we have provided not an exhaustive list of the existing concepts of organization of production aimed at continuous improvement of product quality and complete satisfaction of current and future needs of customers of manufacturing companies.

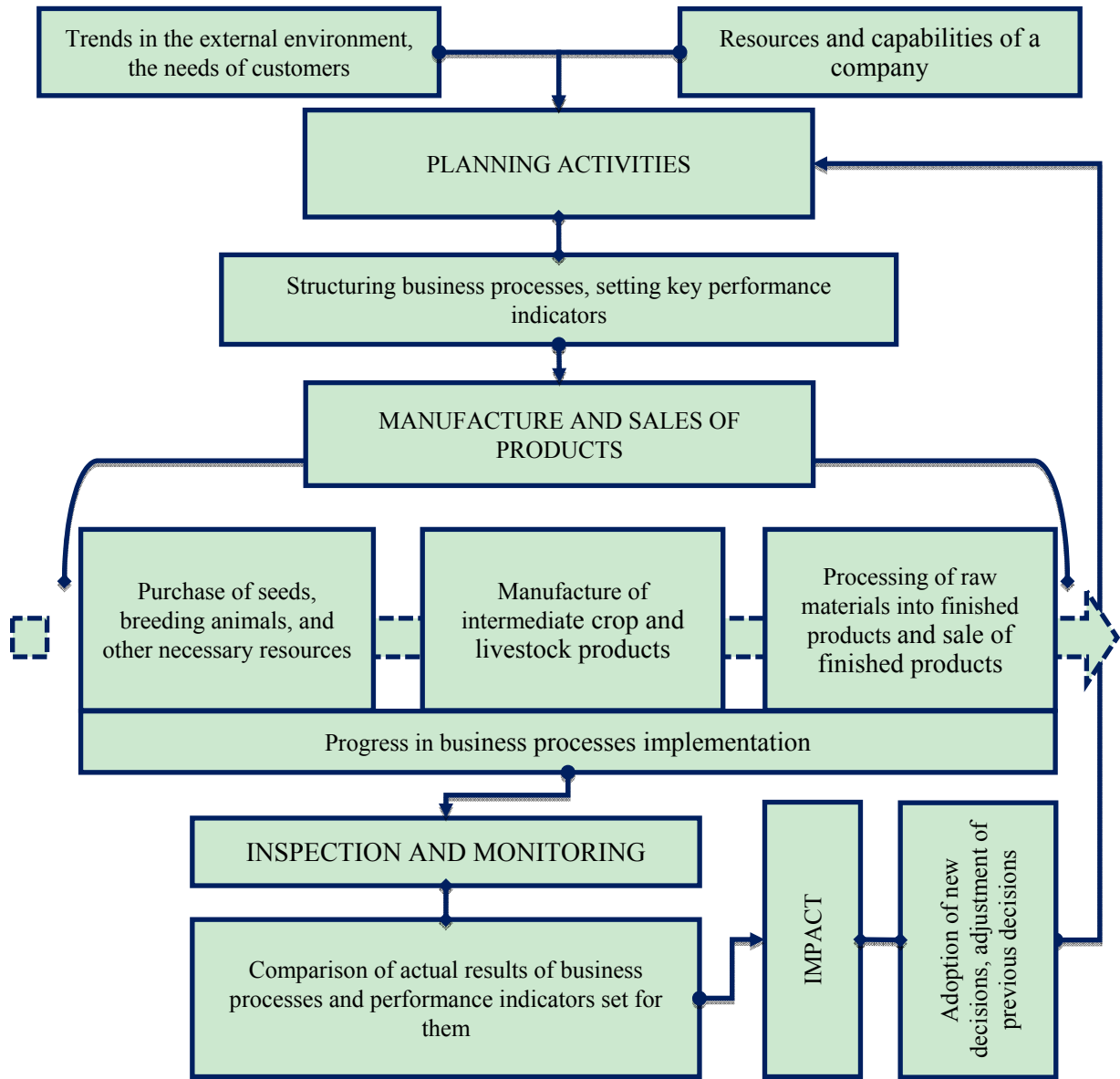


Figure 2. The scheme of quality management in agribusiness companies

Thus, the above gives reasons to say that implementation of a quality management system in the operation of agro-industrial companies has eight fundamental bases of total quality management (TQM). In this case, the quality management system involves special structuring of company management (based on business processes) and development of special methodological support, as well as providing with necessary resources. The main purpose of the quality management system in an agro-industrial company is not only to ensure long-term sustainable and competitive business development, but also to ensure its social responsibility (Nickols, 2011) through manufacture of quality products oriented to meeting the current and future customer demand in conjunction with optimization of the production burden on the environment. In our opinion, the construction of a

quality management system in agro-industrial companies should be based on the so-called "Deming Cycle" concept, which does not lose its relevance.

The Deming Cycle concept is based on four key management categories, which in different interpretations can be considered as both management functions and basic management procedures: planning activities of the company; manufacture (including sale) of products; quality assurance and monitoring of the products manufactured and sold (including addressing consumer claims) (Baranenko et al., 2013). The scheme of quality management in companies operating in the field of agricultural production based on the Deming Cycle concept is shown in Figure 2.

Thus, we believe that quality management of business processes and production in agribusiness companies should be based on the Deming Cycle concept. As part of the business cycle, activities of the company are planned with account of the state of the environment, consumer demand and behavior (in this case, it is necessary to take into account not only the current trends, but also the forecast ones), the availability of resources and abilities to carry out activities in the company itself.

One must express planning through the coordinates of the Balanced Scorecard and set key performance indicators for each business process (Kaplan & Norton, 2006). The Balanced Scorecard paradigm has occurred in the management theory and the theory of strategic management relatively recently. This paradigm was suggested by R. Kaplan and D. Norton in the late 1990s; it incorporates four key aspects: finance, customers, training and development, and internal business processes. Obviously, the Balanced Scorecard to some extent overlaps with the Deming Cycle concept, which we are considering. In fact, integrating the concept of quality management with the paradigm of the Balanced Scorecard, a company that carries out its activities in the field of agricultural production can implement optimal indicative planning of its activities oriented to the prospective sustainable development. We would especially like to draw your attention to the fact that the plan should not be a rigid regulatory hierarchy alignment; on the contrary, planning should be indicative. The essence of indicative planning and its main difference from the regulatory planning is that indicative planning creates certain boundaries of the capability of sustainable development of agro-industrial companies, while the regulatory plan specifies the quantitative values of the companies' activity. Accordingly, any changes that occur in the environment cause very negative impact on the company that uses normative planning, which impact results in irreversible transformations that can lead a company conducting its activities in the agribusiness to change the development type (from the progressive development to the regressive one and, as a consequence, to abandoning the market by the company).

In turn, manufacture and sale of products generates a certain amount of results of business processes. These results (indicators of sustainable development, as well as indicators of the quality of manufactured products) undergo testing and control. If there are both positive and negative deviations, it is necessary to make informed managerial decisions (as well as to correct previous decisions), which will be considered during the planning of a new business cycle of the company. In our opinion, the use of the Deming Cycle allows agribusiness companies consistently and systematically align their business processes for the implementation of the principles of total quality management (the TQM philosophy) and the achievement of the strategic objectives with the greatest efficiency and effectiveness (Abell & Oxbrow, 2002).

5. Summary

Having examined the basic concepts and models of quality management in the sphere of agricultural production, we can say that the quality management from the theoretical and methodological point of view (i.e. as a science) is based on the cross-disciplinary approach. From the practical point of view, quality management is the activity of operational nature, which assumes implementation of basic management functions. But at the same time, the results of quality management activities are of strategic importance for the operation and development of agro-industrial companies.

The activity of agribusiness companies is of high strategic importance and aims to meet the needs of the population in groceries. Taking into account that the specific nutrition and health are directly interrelated characteristics, manufacture of high quality food products plays an increasingly important role in ensuring the required level of living of the population of the world. Therefore, agribusiness companies should strive to ensure that their business processes are always focused on manufacturing high-quality products. This is not only a strategic goal of business development, but also the social responsibility of agribusiness companies.

In this article, we have examined the concept of quality management in agro-industrial companies, whose business is a full cycle: from the purchase of necessary resources, including seed and breeding agricultural animals to production of a finished product for final consumption. The proposed concept of quality management

of the products manufactured is based on the Deming Cycle and the Balanced Scorecard. These two tools (the Deming Cycle and the Balanced Scorecard) allow to structure business processes and to monitor the effectiveness of their implementation within the given conditions for the development of an agro-industrial company. The key performance indicators set for each business process form the information base for making administrative decisions that are objectively correct and oriented to practical implementation of the total quality management principles.

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