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QUALITY AND PRODUCTION MANAGEMENT IN PRACTICE

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THE POSSIBILITIES OF APPLYING STATISTICAL METHODS TO THE PROCESS OF ENHANCING QUALITY MANAGEMENT OF CHICKEN FODDER PRODUCTION

20.1. Introduction

One of the most essential problems that each enterprise faces is the unceasing drive towards perfection manifesting itself in the highest possible quality of the goods produced. Today, when competition in each and every branch of economy is far more pronounced than ever before, it is indeed the quality of the final product which helps earn and maintain a stable and fixed position on the market. Such status quo indisputably stems from the fact that quality signifies efficiency, reliability, durability, compatibility, that is, the overall characteristics of product which decide about its capacity to satisfy acknowledged and confirmed, as well as expected, needs [20.11]. That strongly proves that decisions pertaining to quality management, in particular during the process of quality directing, must be in all circumstances taken relying on facts from the past, the present, and also with regard to forecasts carried out on the basis of these facts. Since the variables taking part in the process of quality directing are chance variables, the statistical methods play an essential role here [20.3].

Statistical Quality Control as a discipline of the technical academia has been developing in the United States since the beginning of the 20th century. The Bella concern was an unquestionable pioneer in the field. What prompted the emergence of this discipline was the growth of mass production, mostly in electro-tech and electronic industries. Statistical methods were the main tool of quality control during World War II when military requirements necessitated a mass production of a variety of goods [20.5].

20.2. Methods

Statistical methods of quality control include also Fail Assessment Methods FAM. It is the main objective of the proposed thesis to devise and present an up-to-date conception of modern system of decision-making assistance and quality management by the term of *Management Fail System (FAM)*.

At the core of the system referred to as **Management Fail System (MFS)** from this point onwards lie two particular methods, also described in a book under the same title:

- Hellwig's multidimensional analysis method,
- Fail Assesment Method (FAM),
- Bellinger's multicriterion assessment method [9].

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Devising a decision-making assistance and quality management system in the fodder industry was rendered possible owing to the application of:

- Poll questions, as the main source of information regarding the chicken farms' actual production results and as an assessment of the fodder products practical features. The poll consisted of 4 basic questions. On the basis of information from 30 fodder keepers (4,000 – 8,000 birds), the following characteristics have been determined:
1. Egg productivity (the number of eggs per month),
2. Therapeutical efficiency (loss in flock),
3. Expiry date of the product,
4. The market price of the product [20.2, 20.6, 20.7, 20.8].
- A multidimensional statistical analysis, including Wroclaw taxonomy and Hellwig's measure, which enables constructing products' development levels assessment [20.1, 20.4, 20.9, 20.10].
- Laboratory method: in the course of the carried out experiments several additions to fodder mixes were applied, in accordance with the norms in motion that govern the making of a fodder formula [20.7, 20.8].

20.3. Methodology

The main objective of the proposed system of decision-making assistance and quality management Management Fail System (MFS) is to warn and monitor the products' quality levels.

A reliable quality control entails the assessment of the products' qualititative features of products and grouping them into classes of development-differentiated products. The essence of problem-solving in the MFS system does not consist in a direct application of any of the popular multicriterion and multidimensional analysis methods, but in a unification of these methods into a coherent whole.

The presented system is made up of three phases:

Phase I: The foundations and conditions of quality management system (for departments and products) are defined.

Phase II: The actual condition of existing companies is defined.

Phase III: A complex assessment of the level of quality management is carried out

With the aid of the MFS system the level of the products' development may be assessed at any given moment; moreover, at each stage it is possible to determine whether measure values of elements (indicators) fixed with accordance to the experts' requirements call for a verification of products utilized in varying environments.

The MFS system takes account not only of the present-day reality, but also of the immediate conditions of the products' quality improvement through an identification of quality characteristics and the possibilities of the latter's measuring, with the aim of determining the desired values for each of the products' quality characteristic in the conditions and environments analysed [20.7, 20.8, 20.9].
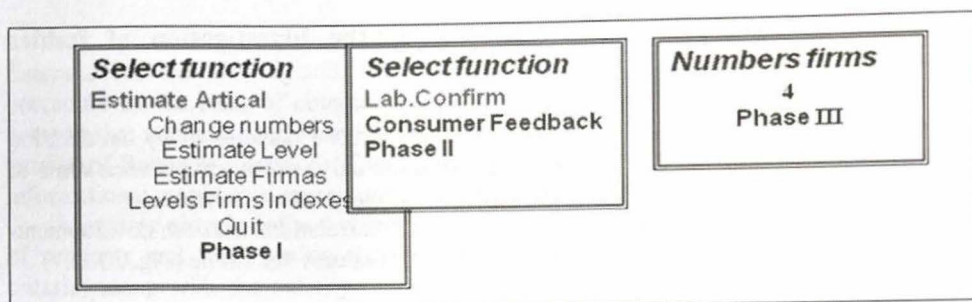
Select function	Select function	Numbers firms
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Quit		
Phase I		

Fig. 20.1. Products' quality according to laboratorial research studies.

Source: Self-summary of the Authors

Since the MFS System postulates constant vigilance of developmental level in terms of Quality, it is congruent with reality and exposes an exploratory asset in laying down guidelines for the direction and size of ISO standards in the given conditions.

The identification of fodder ingredients

For the calculations process, only the basic information is sufficient:

1. Information obtained from poultry keeper on the practical features such as:
   - egg productivity CW1 (the number of eggs per month),
   - therapeutical efficiency CW2 (the loss in flock),
   - expiry date CW3,
   - market price of the product CW4.

2. The information obtained from the producers on the factors affecting practical features of fodders:
   - fiber content F1,
   - antibiotics, vitamins and/or other pharmacological elements content F2,
   - preservatives (formic acid, emulgators) content F3,
   - synthetic ingredients content (premixes) F4.

The cause-effect relation between the above-presented decisive features C and factors F which condition them has been formulated as follows:

$F_1 = f(C_1); F_2 = f(C_2); F_3 = f(C_3); F_4 = f(C_4).$

There can be no denying that in order for these independent variables to reach a suitable level it is essential that they undergo various technological processes whose aims are, to name a few, increasing the productivity of eggs or decreasing losses in flocks. This, in turn, improves the results of the chicken farm's activity, ensuring at the same time that the keepers will continue to purchase fodders prepared by a proper producer. Owing to this, only the fodders presented in picture 3 have been deemed suitable to perform the roles of the independent variables. It can be expected that the richer fodders are in fiber and the more proper amounts of pharmacological elements they contain, the bigger is egg productivity and the smaller the loss in flock which all amounts to better results at chicken battery farms.

In practice, the vast majority of these parameters is closely interrelated with one another. Frequent are situations when there exist relations and dependencies between many features describing objects (products, organizational conditions) but it is not determined either between which features exactly or what form these relations should take on [20.4, 20.10].

20.4. The assessment of products after the investigation of fodder recipients' preferences

The recently obtained research study results will be made us of by the decision maker as a springboard for the assessment of a mutual dependency between some of the economic values on the background of a such sequenced correlation:
1. First, the decision maker will investigate correlations between development-decisive features and factors which those features determine (Fig. 20.2).

	F1	F2	F3	F4
C1	0,917	-0,824	-0,542	-0,804
C2	0,795	-0,922	-0,653	-0,898
C3	0,836	-0,913	-0,629	-0,849
C4	-0,836	0,586	0,253	0,649

Fig. 20.2. Correlations: Decisive features, factors.

Source: Self-summary of the Authors

2. Then, the decision maker will conduct a classification of the products. The new classification shows that product P10 of the development degree 0,4767 (negatively received owing to egg productivity) which according to original assessment belonged in the CL2 class of products is now qualified to a new class C1.

20.5. Results

It has been found that the assessment of products' degree of development as a factor of early alarming about the worsening quality of fodder mixes production is rendered possible through the application of the multicriterion analysis method, i.e., algorithms verifying products on the basis of their development level. In this approach, the variant deemed best (of the highest development level in a given context) is the one in which the sum of difference between the highest development degree (which is the desired one) in a given class and between the least desirable degree (the lowest level) is the greatest from the perspective of partial criteria.

1. In the practical application, the decision maker working in the FMS system has the ability to form new products.
2. The system allows the decision maker to examine the relations between some of economic values of his choosing in the form of various assessment factors of particular levels, such as, to name a few, the level of finance or the level of "Market," which all implies also verifying those relations, as stated by the research study aims.

Essential for the MFS system designed and developed in this work assessment procedure on the basis of obtained fodder mixes uses methods of multidimensional comparative analysis (taxonomy) and multicriterion variants assessment (a modified version of Bellinger's method). This makes up a system typical of farm enterprise and informational monitoring management.

Accepting already defined objectives as to the desired standards of the "newness" of products and their quality (in reference to particular features and assessment criteria) along with the validity of particular factors enables the application of the multicriterion assessment of the examined products and their subsequent ranking on the basis of a distanced scalaring function.

An issue to which much attention is paid in modern quality management systems is the question of prevention. That is why in the proposed here MFS system, apart from the level of alarming (complaints, profit loss, low efficiency), also discerned has been the level of prevention (low quality, substantial lacks, considerable costs). Overall, taking account of the observations and studies conducted in the proposed work, the following conclusion might be drawn:

1. Owing to the vigilant monitoring conducted with the help of the MFS system it is feasible to direct the WMP process in such a way so that the quality of goods produced does not steer away from the provisional quality.

2. With the MFS system it is also rendered possible to improve the formulae of fodder mixes and verify the prospect of their practical usability during every single stage of the production process, with adherence to the ISO or CEN norms in Libyan conditions.

3. It is possible to define a set of quality parameters which strongly affect the proper staging of the WMP technological processes.

4. The MFS system opens up a plethora of opportunities for the decision maker (i.e., director, quality manager) to freely choose those combinations of features and factors among the total number of all features and factors which the decision maker deems important. Moreover, the MFS system enables the decision maker to change the above-mentioned features' weight and importance.

5. It has been shown that the post of quality manager, which has not been formally presented in the organizational structures of Libyan companies, does indeed play an important part in the overall process and thus, must be supervised by the chief executive directly.

6. Working within the MFS system means such organization and management of a company so that the flow of information both inside and outside the firm is free, undisturbed and effective.

7. The proposed system might be treated as a supplement to the already existing systems of quality directing and managing.

8. A vital feature of the system presented in the research studies is its simplicity and user-friendliness: the user does not need to possess an exhaustive knowledge of various statistical methods which demand from their practitioners masterful skills of abstract thinking.

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