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THE PROPOSAL SYSTEM OF SUPPORTING ECONOMIC EFFECTS FOR INTRODUCING NEW EDIBLE OILS TO THE LIBYAN MARKET

ABSTRACT

There are two food production processes that involve the replacement of one ingredient with other substance or a mixture of two or more products. One of them is adulteration of food products. This applies to high-cost and high-quality oils e.g. olive oil that is frequently subject to adulteration with other edible oils of lower value. Such a food fraud affects the quality of the gentle oil and the foods the ingredient of which is olive oil. The second action often applied to the oils is blending of the variety of products originating from many different regions and countries. Sometimes the oils originating from various sources and years are blended to create a consistent taste.

The subject of this paper is the application of the multi-analysis method to assess the process of the blending of several oils and thus creating a new mixture to satisfy the market demand for new hitherto unknown oils, advertised as new products. For this task we con-

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struct a new system under the label of Special Modification Oil-SMO. The system consists of three parts: 1. Theoretical part, 2. Practical part; that is, an experimental part 3. The last part is the economic justification to fulfill market demand by launching new oils of high quality serving many purposes and at the same time being cheaper. Therefore, in this paper we mainly focus on the practical aspect of the issue; however, the economic justificatory criteria are of equal importance. Economics starts to be relevant once we start considering the possibility of producing the oils in question. The proposed SMO system has been used in these calculations to obtain the required composition of the blend destined for special application. The present work shows that the chemical parameters of the final mixture can be numerically calculated when the characteristics of primary components are known. The SMO procedure can constitute input data for theoretical evaluations. The SMO procedure computes the best mixtures for the new oil demanded by the market. According to the SMO's formula, also the economic factors of a given undertaking are taken into account (that is, such technological factors as costs of different mixtures). The verification of experience finishes when certain economic ends are achieved.

Keywords: plant oils, oil blending mixtures, physicochemical properties of oils and their blends, production of special application blends, SMO system

1. INTRODUCTION

The primary motivation for choosing this area of research (as a part of economic investment (Noga, 1995, Noga, 2000) is two-fold:

1. Geographical natural factor – this is the location of Libya on the African continent, where the climate and agricultural natural resources limit development in this direction.
2. The economic factor – the exploitation of arable land towards the production of essential agricultural crops that are important for human nutrition.

Hence, when it comes to the first factor, we say that Libya is a desert country and 95% of Libya's territory is a desert with a dry climate. In addition, agriculture in Libya suffers from shortages in drinking water supplies and only a small amount of rainwater is available, and rain is a rare phenomenon in this climate.

As for the second (economic) factor, the existence of this factor is a function of the first factor: the land is not suitable for agriculture, but there are oil supplies underground. The production of this raw material compensates for losses resulting from land use in agriculture. It is the revenues from oil sales that serve to import agricultural products. Yet, it is this very oil that people as well as animals feed on. Therefore, Libya imports different oils from abroad. What's more, the authorities in Libya started to use these areas to produce viable crops for the population like wheat, corn and other crops to feed people and animals. As in the case of the need for other crops, such as vegetable seeds for the production of vegetable oils, Libya relies only on imports from abroad.

2. MATERIALS AND METHODS

VEGETABLE OILS IN LIBYA

Based on statistics, vegetable oil in Libya comes from the production of olive oil. Noting that the production of these oils satisfies a very small percentage of the needs of the country, and statistics demonstrate that the country imports different oils and spend on them a small fortune to fill the deficit in this area.

Hence, the idea of filling this deficit by finding new oils consisting of various blends of imported oils and searching for these blends are both in line with Libya's needs. Indeed, the authors of this research embarked on purely scientific investigations in this direction and bought various types of vegetable oils from several places in the world to verify or falsify the hypothesis they cherished.

VEGETABLE OILS USED IN NUTRITION OF THE POPULATION

The use of vegetable oils in Libya by customers serves two main purposes:

1. Cold use – for all vegetable dishes.
2. Hot use – is used for frying all types of meat such as mutton, beef and fish. Also, the use of hot oils is used for frying some vegetables such as fries or eggplants.

Hence, in this work, the proposed system of SMO (Special Modification Oil) is looking for such mixtures that meet the Libyan food standards and their respective economic costs

2.1. METHODOLOGY OF THE RESEARCH

To realize the practical side of the research, the authors construct computer-assisted algorithms (Radosiński, 1993, Radosiński, 2013), and the SMO system serves to synchronize the required theoretical and practical mixtures, ensuring their compliance and quality by means of laboratory tests. In particular the experiment is conducted by using the laboratory tests under the supervision of specialists in this field (Ba yasir Oil co. Ltd, 2017).

We would like to mention that these new scientific studies are very practical in the Libyan situation because the market in this country resorts to various new mixtures of oils to fulfil the demand for the Libyan milieu in the fields of nutrition, medicine and other areas.

2.2. TECHNOLOGICAL AND ECONOMIC PROBLEMS RELATED TO MIXING OILS

As already mentioned, testing and assessing blends of special oils is not possible without setting an appropriate algorithm (Khlafalla-Omar, 2012, Radosiński, 1993, Radosiński, 2013, Szołtysek, Khlafalla-Omar, & Dziuba, 2006), which is the basis for developing a program to support the blending for special oils, in the present paper the program being referred to as SMO.

The developed computer system allows, on the basis of given characteristics for 14 oils and given parameters of the desired oil Oy, to determine six best hypothetical mixtures (Surman-Kasem, & Ozaki, 2004). The mixtures can be made using 2, 3 or 4 oils. The oils are always mixed in three possible ratios. After obtaining hypothetical results, according to the calculations, the actual mixing should be made and the empirical values should be adjusted

Table 1. The selected types of 14 vegetables oils

<table>
<tr><th rowspan="2">Oils in the system</th><th colspan="4">Theoretical Parameters</th><th colspan="4">Practical Application</th></tr>
<tr><th>Basic</th><th>Thermal</th><th>Physico-chemical</th><th>Economic</th><th>Market demand</th><th>New oil</th><th>Lab Accept</th><th>Economic profitability</th></tr>
<tr><td>1. Cotton wool</td><td colspan="4" rowspan="14">Blending of the oils on the basis of the selected parameters and the economic availability of the oils at the disposal.</td><td colspan="4" rowspan="14">1. determination of the desired new oil,
2. choosing and blending oils,
3. the suggested SMO system for 6 blended oils,
4. the test of the oils in the laboratory and the correction for the desired oil,
5. economic profitability and the market satisfaction.</td></tr>
<tr><td>2.Coconut</td></tr>
<tr><td>3. Hemp</td></tr>
<tr><td>4. Corn</td></tr>
<tr><td>5. Linseed</td></tr>
<tr><td>6. Rapeseed</td></tr>
<tr><td>7. Sesame</td></tr>
<tr><td>8. Sunflower</td></tr>
<tr><td>9. Soybean</td></tr>
<tr><td>10. Wheat germ</td></tr>
<tr><td>11. Walnut</td></tr>
<tr><td>12. Pumpkin seed</td></tr>
<tr><td>13. grape seed</td></tr>
<tr><td>14. Olive</td></tr>
</table>

(corrected) to the system. The system then allows for evaluating and classifying a set of parameters of the desired oil, hypothetical mixtures and empirical mixtures (see table 1).

In the initial phase I, called the phase of research and evaluation, a system of assessments is presented. In this phase the system theoretically designs the desirable oil which is then checked in the laboratory to verify whether the oil in question satisfies customers' wishes. Also the system determines the features of specific effects for the mixed oils, through theoretical calculations (M_z) made by the adapted program, and remembers the combination and the variety of proportions for which the values of the mixed oils M_z were obtained and which most closely approximated the desired oil M_y.

According to SMO's procedure, the most important part is the one related to the economic factors (Pilawski, 1984, Pilawski, 1990) of a given undertaking (that is the technological factors such as costs of different mixtures and the availability of oils in the market). The verification of experience finishes when certain economic ends are achieved. In the research, the SMO system was used, among others, for the following purposes:

1. Evaluation of the level of adulteration of expensive oil blends with cheaper ones,
2. Assessment of the level of development of selected oils,
3. Evaluation of the level of development of similar mixtures.

Economic effects resulting from the application of SMO can be calculated from the formula similar to "Economic effect –Pilawski", as demonstrated below. Calculation of the economic effect for the plant oils by SMO looks as follows:

$$E_{neo} = [C^1_{tna} - G^1_{tna}] - [C^0_{tnb} - G^0_{tnb}],$$

where:

E_{neo} – Total cost of the desirable oil M_y (mixtures of different oils)
G^1_{tna} – Annual cost stemming from obtaining new oil M_y in TN generated by SMO
C^1_{tna} – Annual cost of similar oil on the market, current use in TN (before mixed)
G^0_{tnb} – Total cost of most similar mixtures (replacement oil) (M_z) from the six mixtures specified by the system (the replacement mixture instead of the desired mixture)
C^0_{tnb} – Total cost of similar oils on the market

3. RESULTS AND DISCUSSION

The variety of consumer preferences has resulted in the need to produce new, non-standard types of oils. These oils are produced on the consumers' special demand; nevertheless, their parameters must comply with Libyan standards as well as they must exhibit the properties demanded by the customers themselves (Ba yasir Oil co. Ltd, 2017). Deliveries of oils with specific parameters (unadulterated and of high quality) are carried out by modern companies currently operating on the market and producing edible oils (from plants) only from blends. The implementation of deliveries upon the customer's request is the fulfillment of the first principle of the TQM philosophy ("customer orientation"), with this philosophy being gradually disseminated in the free market economy (Noga, 1994). For these reasons, the companies importing vegetable oils in Libya, represented by various importers, are interested in oils of various qualities because an increasing number of recipients define the technological requirements for vegetable oils based on non-standard quality characteristics.

Commercially available oils are usually either a blend of different vegetable oils or a pressed product from one plant species. If the name of the plant is included in the name of the oil, it means that the oil was made only from it, i.e. its basis is a pure and unmixed extract. Mixing oils are referred to as table oils, edible oils or vegetable oils and are usually sold under one brand. Such a situation entails additional effects in the form of the need to develop a company's own standard. If, in a given plant, the goal is to produce a product that is completely or significantly distinct from the products of its competition – in terms of design, quality, functionality, etc., it is advisable to develop one's own standard. Based on the assessment of the external effects of the application of the standard, it is possible to define the ranges that should be normalized and to indicate the standards that should be implemented.

When it comes to the production of vegetable oils, irrespective of its uniqueness, requirements must be met regarding such basic parameters as: saturated fat [%], mono-unsaturated fat [%], omega 3 [%], omega 6 [%]. All these parameters are included in the relevant standards. And their ranges (defined by the customer) can be reflected in the company's standards. Information on the vegetable oils used may only be revealed when all of them have been exchanged for packaging (annotation of the species and percentage).

In Libya, there is no industry for the production of vegetable oils, and in this situation, the production of vegetable oil blends becomes a fundamental problem – how to make blends of finished vegetable oil species imported from different regions of the world? The process of mixing vegetable oils is based on the right selection of appropriate grades of oils to obtain the desired composition of the mixture for production or by mixing various oils already on the market according to the quality specification of customers. The entities which are responsible for the procedures (mixing different types of oils) are the variorum's oil importers in Libya.

When using the suggested method of mixing the oils, the parameters are precisely defined by both the foreign owner and users in Libya. In addition, what is required are such high production capacities that would allow for weekly operation of oil mixing. This is an extremely difficult problem, because in Libya there is no system of promoting varieties of different vegetable oils based on the assessment of oil users, and thus the feeding system. Such a system may be launched in the future.

To enable the optimal mixing process, what is necessary is the following:

- choosing the right oils (M) from the available plants (ref. Table 1),
- preparation of a blend of these oils to obtain a special oil with parameters approximating as closely as possible the ones set by the recipient ";with M_y" oils declared by the client to be checked in the laboratory after obtaining the mixture "M_Z" generated by the system SMO.

For the purpose of illustration, we assume the network of SMO project which includes only 5 activities [1,2,3,4,5] and 5 nodes [A, B, C, D, E]. In the practical application of the system, this network (Khlafalla-Omar, 1980) would be likely to contain within these activities 15 technological parameters over and above the selected economic parameters.

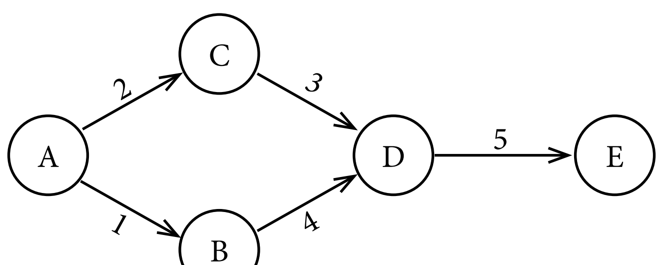

Figure 1. The network of the application of the SMO system

Specification of the activities and the nodes

Nodes	Specification	Activities	Specification
A	Input of imported oils (14)	1	Demand of the market – new oil
B	Demand of the market – new oil	2	Satisfying the demand by SMO
C	Satisfying the demand by SMO	3	Test of new oil in terms of its quality
D	Test of new oil in terms of it quality	4	Choosing a new oil
E	Calculating the economic effect	5	Launching on the market

4. CONCLUSIONS

It is important to include economic objectives (Siedlecka, 1996) in the proposed algorithm (both from the point of view of the oil producer and recipients, with the said objectives being directly related to the technological goals achieved.) The economic viability (Noga, 1994, Noga, 2000) of the project understood as obtaining new blends from the oils most available to the producer (assuming that optimal quantities are obtainable) depends on whether we can ensure the composition of the mixture approximating as closely as possible the composition, as specified by the buyer. Moreover, and most crucially, what matters from the point of view of an economic success is the highest quality possible. The resultant mixture should be reflected – on the one hand – in the return on investment (measured by costs), related to the implementation of the mixing process (in the form of possibly additional equipment and storage capacity). On the other hand, the product should lend itself to customization. After all, it is the customer who is an end recipient of oils, foods, medications and fuels. It is possible to obtain different variants of experiments – various oil mixtures. The above studies constitute a multi-stage cycle of experiments.

In this paper the first stage was described, the purpose of which was to select those elements of the SMO computer aided system (according to the FAM method) which will later be used to define the algorithm of further research, and later of the computer program itself based on the Fail Assessment Method FAM. This is an experimental method based on empirical hypothetical experiments to study, analyze and evaluate development levels of objects, both existing objects and new elements of objects, selected during the research. It is only the preliminary phase I of the research that is presented in the present paper. According to the formula S, the system calculates the dependencies between the conditional factors C and decisive features D. For this purpose, the formula S takes in account:

- types of oils, included in the M population,
- set tasks, i.e. the choice of certain blends of M_y oils (defined by the client),
- their technological features, determined by laboratory tests,
- Q results of the system calculation for M_y.

The system of calculation according to the formula S is a mapping Ω in the examined set of M_z, taking into account the requirements of the customer M_y from the existing set of quality parameters for 14 types of M oils with their qualities Q so that the customer's requirements are met (sought-for mixes satisfying the need M_y). then the hypothetical oils M_Z are empirically verified in laboratory tests according to the standard of quality based on the chosen parameters and are confirmed by the parameters of oils requested by the customer M_y.

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