FOOD CONSUMPTION OF AGRIBUSINESS ENTERPRISES: MATHEMATICAL MODEL OF DEMAND

GUDZ IURII

Candidate of science in Economics (PhD),
AssociateProfessor, Chair of Finance and Banking
Donetsk National Universityof Economics and Trade
named after MykhayiloTugan-Baranovsky, Krivoy Rog, Ukraine

Abstract. *The purpose of the article is to study the regional analysis of demand for food products of processing agro-industrial complexes by applying the economic and mathematical model.*
In the course of investigation the regional model of demand for food products of processing agro-industrial complexes, the methods of correlation and regression analysis and economic and mathematical modeling have been used.
On the ground of the conucted research, economic and mathematical model of regional demand for products of processing agro-industrial complexes has been reviewed and developed. By means of mathematical transformations using methods of A.A. Konyus' differential geometry, we have received an equation to analyze the regional demand for products of processing agro-industrial complexes to detect the features of food consumption influenced by income levels, the ratio between its individual socio-economic groups and distribution of productive forces in the region.
The regional model of demand food products of processing agro-industrial complexes has been built and key factors of this model have been identified. The developed structural model of demand is based on the fact that each consumer group which is classified by income, according to the budget survey, inherent relevant structure of demand.
The proposed regional model of demand for food products of processing agro-industrial complexes allows calculating the scale of advantages, applying the average price index for individual products without quantitative measurement of marginal utility. This model makes it possible to improve the formation and use of enterprises economic potential.

Key words*: processing agribusiness enterprises, regional demand, economic and mathematical model, scale advantages, price index, food products.*

Introduction. One of the problems of processing agro-industrial complexes at the present stage of market transformations in society is the lack of quantitative indicators, which are able to make a real assessment of this business sector at the regional level and predict the dynamics of their future development.

Presently available indices such as the number of processing enterprises, contribution of processing enreprises to the GDP of the state, the volume of manufactured goods and services can not be objective enough in the whole across Ukraine and other countries, as each country has its own specific socio-economic characteristics, resource and primary conditions of economic management. One of the important conditions for creating a modern area of processing agro-industrial complexes are evaluating the status, identify trends and determine the main directions of its development. Note that quantitative indicators determine the important role of processing agribusiness enterprises in regional terms. Scope of agro-industrial complexes, in its turn, depends on the choice of criteria and indicators that characterize the degree of its development.

The urgency of the research is determined by the necessity of constructing the economic, mathematical and econometric models that may be useful while describing the developing dynamics of processing enterprises and the ability to generate optimal structure processing enterprises in a regional viewpoint. In addition, it is a way to

ISSN: 0075-5222

improve the system of strategic management of formation and development the economic potential of agro-industrial complexes in modern conditions.

Materials and methods. Possibilities of using the framework of economic and mathematical modeling for studying the regional demand using economic indicators examined in the works of foreign scientists: E. Engel, A. Quetelet, A. Konyus and in the works of local scientists: O. Buzhyna T. Grigoriev T. Golubev, I. Tkachenko. Despite a sufficient number of publications, the issues of regional demand for products of processing agro-industrial complexes have not been studied enough. Besides that, the level of application the framework of economic and mathematical modeling at identifying the promising directions of developing processing enterprises is insufficient.

Problem definition. The model analysis and development of regional demand for products of processing agro-industrial complexes using economic and mathematical methods. The ultimate result of the research is to build an econometric model based on the use of selective studying of consumer demand and methods of applied statistics.

Discussion results. For assessing the quantitative status of the development of processing agro-industrial complexes the following indicators can be applied: total number of processing enterprises, their capacity and number of employees, the density in the region etc. To create a normal competitive environment the number of processing enterprises should be greater. These calculations are based on the same definition of density "indicator".

Therefore, according to the author's point of view, it is very important task of processing enterprises development in a particular region is to determine their optimal number, location and volume of production. Hence the number of processing enterprises mainly driven by consumer needs and capabilities of the local market, volume and structure of population demand of given administrative unit or region.

In this connection, the issue of studying the areas of processing agro-industrial complexes from the standpoint of economic theory is obtaining a particular relevance, including methods of economic and mathematical modeling. The study showed that in domestic scientific literature there is a lack of works about economic and mathematical modeling of processing agricultural enterprises activities. Therefore, it is advisable to give the author's approaches to building economic, mathematical and econometric models that may be useful to describe the dynamics of processing enterprises and give the opportunity to form an optimal structure of the processing enterprises from the regional viewpoint.

It should be noted that modeling is a convenient tool for analyzing, simulating and forecasting the economic processes. Given method is used to analyze the characteristics of the regional economy as a complex dynamic system to short-term and long-term forecasting of its behavior and constructing models. The model is an object that replaces the original and reflects the most important features for this study and original properties. Therefore, under the model of regional structure of processing enterprises we should understand its condition, where it consists of a specified amount of organized information that allows to investigate it. There is a chance to construct a variety of possibilities depending on the angles and degree of detalization of investigated phenomenon. The attention is drawn by building econometric models based on the use of selective study of consumer demand and methods of applied statistics according to the results of this study.

The main stages of constructing econometric models of processing agro-industrial complexes structure on the regional level are:

ISSN: 0075-5222

1. definition of consumer demand for food products at the level of administrative-territorial units;
2. analysis of factors affecting the demand and their quantitative assessment;
3. economic and mathematical modeling of processing enterprises structure at regional level;
4. developing recommendations to promote development of processing enterprises within certain administrative units.

E. Engel was the first who built the first model of analysis of consumption dependence on consumers age composition. He developed the scale of expenditure on food products of various age groups and sex, taking one of them by the consumer unit [1]. This unit he called 'keta' after the famous Belgian statistics A. Quetelet [2], comparing it as equal to consumption of unborn child. Each year, this value was added by 0.1 keta.

Later the calculation of consumer scales was engaged by many researchers. Most of them belonged only to the consumption expenditures, consumer rates were based on physiological norms in terms of value or based on the consumption of proteins, fats and carbohydrates.

However, it should be noted that the consumption is influenced, except age and gender, by other factors such as the ratio of retail food prices, the level of income, habits and so on. Because calculations of sex and age norms require elimination of these factors, and for this purpose, public budgets should be grouped considering a significant number of features. With a group, you can eliminate the influence on consumption of all factors other than age and gender of consumers, and to calculate the appropriate scale. Accordingly, the construction of such scales require a significant amount of information, and it is possible only by special sample surveys.

The essence of modern econometric models of consumption demand is the description of the economy in the form of quantitative relationships of various types. With the help of modeling it is possible to identify and quantitatively measure the correlation of certain foods consumption with the factors that determine them. To specify how a quantitative change in each factor affects the demand, it is necessary to calculate some specific indicators - elasticity coefficient of demand, parameters of regression equation.

It should be noted that econometric methods play a significant role in demand forecasting. At the same time the quality of forecasting, using econometric modeling depends on how reliable the model simulates the real process of consumption. This condition can be achieved by deep analysis of the specific demand generation, identifying the factors that have a decisive influence on its size.

In many econometric models the demand is defined as a function of factors that affect it. In particular, static models take into account the factors which values are fixed in time. In dynamic models the values of factors are considered as such that change in time.

Depending on the methods used in economic and mathematical models of demand, there are structural, correlated and other models.

The static models of demand and consumption take into account the level of income in different family categories, family structure and size, the level of savings. The influence of savings is taken into account by entering into the model, as a factor, consumer spendings for account of accumulation.

Therefore, consumer demand is calculated as a function of all the mentioned above factors:

$$Пj = f(z, l, b, H, П, Pj), \qquad (1)$$

where $Пj$ - demand for a product J; z – income level; l – family size; b – family structure; H – amount of savings; П – consumption from the personal subsidiary household; Pj – price level.

The structural models of demand, which are calculated by the formula (1) are based on the fact that each group of consumers who are classified by income level according to the budget surveys, has correspondent structure of demand. It is believed that the main factor that affects this structure is the consumers income, and indicators such as price, size and family structure - does not significantly vary and can be considered as permanent. Change in revenue is considered as moving some families from one group to another. It is believed that these families have the same consumption patterns that prevailed from families with the same income in the recent past. Such assertion is false and can distort the results of calculations. Therefore, these models may be eligible for payments for small periods of time. In fact, they consider the demand as a function of consumption distribution according to income level.

In general, the overall structure of demand is calculated by a formula:

$$C = \sum Czчz \, , \qquad (2)$$

where C - general structure of demand; Cz – the structure of demand in the group of families with income z; чz – frequency of families distribution with income z.

It should also be mentioned that there is another drawback of a structural model of demand, which is calculated on the basis of the formula (2) which uses empirical ‘per capita’ consumption rates, they are inherent random deviations and errors, as these data are selective. Using empirical ‘per capita’ norms of consumption forecasting calculations show that such deviations and errors are automatically transferred into the future.

According to the author, the most appropriate factor for forecasting is to construct an equation in which consumption is considered as a function of all the factors affecting it. This reduces the likelihood and mistake and allows the use of mathematical criteria for assessing the closeness of interaction and the significance of connection between consumption and factors-arguments. If the factors are variables for a given point of time, then the corresponding functional relationship is the basis for building a single-factor and multifactor functional models of demand.

The first attempts to construct functional models that take into account the dependence of demand on income were E. Engel curves. Based on the conducted researches, E. Engel concluded that with an increasing income, a consumption ratio is reduced and the share of spendings on clothing and housing does not change, while the education and treatment expenditures are increasing [1].

T. Grigorieva and S. Tkachenko have built the model which allow on the basis of existing information to calculate age and sex norms of consumption [3]. It defines the consumption rates of two age groups - adults and children, and then it displays a generalized formula for all these groups:

$$\sum_j a_{ij} \; П_j = b_j + E \qquad (3)$$

 ISSN: 0075-5222

where: a_{ij} - number of members of sex and age group j in families with i level of person's money income; b_j - general quantity of goods, which consume i group of families; E – deviation of normative consumption from factual.

Scientists have proposed the correlated multifactorial model of calculating consumer scales, which take into account the level of income, family size, age and sex family structure:

$$П= a_o + a_1 z + a_2 z^2 + a_3 l^{a4} + a_3 x_4^{a6} + ... + a_{n+1} x_n^{a(n+2)} \tag{4}$$

where $x_4 x_n$ - number of family members with the defined age and gender.

In more complex multifactorial correlation models that take into account family members, is offered the following formula to calculate the cost of food:

$$B_x = a_0 + \frac{a_1 z}{z + a_2} + \frac{a_4}{1} + a_3 \delta \tag{5}$$

where B_x - food expenditures; д – share of children in families;

As it was mentioned above, the static correlation models can be used not only to analyze the demand but also for its forecast in the near future. This is especially true nowadays, as level of income of Ukrainian families is the most influential factor in determining demand. According to some studies, the static multifactorial correlation models give a good approximation to the actual data.

The dynamic models of demand analysis and forecasting contain more factors that affect consumption. All the factors influencing the consumption in statistics, change over time - is the tradition, the cultural level of the population. It should be noted that an important factor in the change of demand dynamics is the price which is taken into consideration in dynamic models.

A. Konyus [4] believes that a more accurate metering of consumption results can be obtained in the preliminary analysis of the budgetary consumption, in which, despite the change in the ratio between prices and changes in the composition of consumed goods, overall "consumption level" remained unchanged. The author suggests to use the term "consumption level" instead of the term "useful" because it is a characteristic of the consumption of certain goods, but in this case it is a question of products that make consumers' budget.

Mathematical interpretation needs clarifying limitations: the identity of family needs structures, which are compared in different time periods, the possibility of using the analyses of infinitely small quantities. To ensure the continuity of changes in the values that are considered, it is a question of average values of consumption levels among the groups of families with income in specified narrow limits. It is believed that the difference in a consumption composition is caused by changes in prices and total families spendings. With the growth of national income, the food expenditure ratio decreases, and the acquisition of material goods, durable goods (automobiles, housing), and later on luxury goods and leisure, is increasing [5].

The mathematical consistency of consumption level is characterized in case of two products – by the level of constant consumption curve or indifference curve, in the case of three products – by equation of constant consumption level, in case of many products - hypersurface equation of constant consumption level.

The problem is to detect the hypersurface of constant level of consumption, but eventually - in the identification of families of such hypersurfaces, characterized by

ISSN: 0075-5222

high levels of consumption. This allows us to define the demand as a function from price and overall consumer spending. The solution is on the way of applying CPI theory.

Changing the level of retail prices is measured with index I:

$$I = \sum p_1 g_1 * \sum p_0 g_1 \tag{6}$$

where p_1 - price in the reporting period; p_0 - price in the base period; g_1 - consumption in a reporting period.

If nominal consumers income (I) changes from I_0 in base period to I_1 in reporting period, so the real income changes as the correlation of I_1 to I_0. In this case, the price index is calculated independently of changes in real income. This follows from the fact that the price index does not convert nominal income into real because at this index was taken the weight of the current period.

But when when the question concerning the cost of living, it is clear that the change in prices of goods and services differently affects the wellbeing of individual families. Therefore, it makes sense to consider the change in the cost of living of families in the corresponding period as the change in income, which is necessary to maintain an appropriate standard of families living of this type. Changing the cost of living index should be measured with a budget index:

$$I= \sum p_1 g_0 * \sum p_0 g_0 \tag{6a}$$

However, this index should be built specifically for different economic and social groups and for families of different age structure.

The starting material for calculating the price index is a budgetary statistic.

There are two ways of calculating the aggregate price indices:

1. Laspeyres index:

$$\frac{\sum p_1^i g_0^i}{p_0^i g_0} \tag{7}$$

2. Pasch index:

$$\frac{\sum p_1^i g_1^i}{p_0^i g_1^i} \tag{8}$$

These indices are not equal to each other, because they have incomplete saturation of needs, quantity of consumed goods, changes depending on changes in commodity prices p^i and general consumer spending:

$$g_i = g_1(p_1, p_2 \cdots p_m, D) \,, \tag{9}$$

If, according to the Laspeyersa index, a consumer is given the same amount of money, on which he or she can buy the same products as before, but at new prices, he or she will buy a new quantity of goods to increase his or her level of consumption. That is to say, the Laspeyersa index increases "true" prices index. Accordingly, Pasch index reduces it.

If the level of consumption in the base and current period are the same, the "true" price level is defined as the ratio:

ISSN: 0075-5222

$$I = \frac{\sum p_1^i g_1^i}{p_0^i g_0^i} \tag{10}$$

So $$\frac{\sum p_1^i g_0^i}{p_0^i g_0^i} > \frac{\sum p_1^i g_1^i}{p_0^i g_0^i} > \frac{\sum p_1^i g_1^i}{p_0^i g_1^i} \tag{11}$$

Conditions of approximate equation of the two consumption levels:

$$\frac{\sum p_1^i g_1^i}{p_0^i g_0^i} = \frac{\sum p_1^i g_0^i}{p_0^i g_1^i} \tag{12}$$

This equation can be considered as a differential equation hypersurface of constant consumption. In case of two items we obtain the hyperbola equation centered at origin. Indices Lospayersa and Pasch are coincide and if the price of the current and base periods differ only in small increments dp^1, $dp^2, \ldots dp^m$. Then the quantity of consumed goods will receive the same low gains $dg^1, dg^2, \ldots dg^m$. After completing the appropriate substitutions in the indices and dismissing infinitely small indexes of the second order, we will get two conditions of constant level of consumption:

1. First, $dD = \sum g^i dp^i$ (that is the level of consumption remains constant if the amount of small price increments multiplied by the quantity of goods equal to the growth of total costs).
2. Secondly, $\sum p^i dg^i = 0$ (that is the level of consumption remains constant if the amount of increase of quantities of goods (positive and negative), multiplied by the price is zero).

Having in mind, that $D = \sum p^i g^i$ i $D_0 = \sum p_0^i g_0^i$ we obtain

$$I = D \div D_0 \tag{13}$$

We have marked the relative changes in prices in the current period compared with baseline period through x^1, $x^2 \cdots x^m$, let us define «true index» of consumption level prices, characterized consumer spending in the base period D_0, as a function of relative price changes:

$$I = I(x^1, x^2 \cdots x^m, D_0) \tag{14}$$

We have denominated the quantity of goods at prices of base period through Q_1, $Q_2 \cdots Q_m$ we will receive:

$$D_0 I = \sum Q^i x^i \tag{15}$$

Conequently, the first condition of consumption level constancy:

$$D_0 d\ I = \sum Q^i dx^i \tag{16}$$

ISSN: 0075-5222

An equation for a separate product, describing the dependence of demand from prices of all commodities at a given level of consumption D_0: will look like:

$$Q^i = D_0 \frac{\partial I}{\partial x^i} \tag{17}$$

The proposed mathematical consumption model of overall consumer spending in the current period is described by the equation:

$$Z = x_i g_i + \dots + x_n g_n \tag{18}$$

where Z – overall consumer spending in the current period; g_i - the volume of goods that are consumed in the current period (i=1…n); x_i - prices of these goods.

In accordance with the main precondition, the user can determine for each set g_i, g_n of consumed goods a reference level of consumption F, which is characterized by general consumer spending in the base period. This means that F is a function from g_i.

Above mentioned model consideres such diverse sets of goods which are determined by the level of hypersurface of constant consumption level:

$$F\ (g_i \dots, g_n) = const \tag{19}$$

Since the term "consumer" in this context do not mean a single individual family, but the average aggregate of many families, whose spending is limited by the same narrow limits, so the function assumes as twice differentiated.

It should be noted that the level of consumption in a given period of time is conventionally characterized by the total consumer expenses in the base period for the unit of account of each product accepted quantity of goods that can be purchased in the base period on one monetary unit. In this case x_i,…., x_n is the ratio of the prices in the current period to prices in the base period, each unchanged from the base period in "index units of account" account, multiplied by the regular prices of the base period.

At constant consumption level the overall consumption expenses in the current period Z connected with changes in prices x_i,…., x_n equation:

$$F\ (g_i \dots, g_n) = \bar{F}(x_i \dots x_n, z) = const \tag{20}$$

This equation is an indirect expression of hypersurface of constant consumption and is similar to the above mentioned one. The hyphen above F indicates that new variables have been taken.

With the help of mathematical transformations using methods of differential geometry, the author of this article has obtained through the following equation:

$$\frac{\partial F}{\partial g_i} = x\lambda_i, \dots, \frac{\partial F}{\partial g_n} = x_n \lambda (F = const) \tag{21}$$

λ - Lagrange multiplier

$$-\frac{\partial \bar{F}}{\partial x_i} = g_i \frac{\partial F}{\partial z}, \dots, -\frac{\partial \bar{F}}{\partial x_n} = g_n \frac{\partial \bar{F}}{\partial z} (F = const), \tag{22}$$

similar to the previous one, which can also be obtained on the basis of maximizing the utility function under the condition of consumer's budget constraint. Moreover, the

ISSN: 0075-5222

Lagrange multiplier explanes the purchasing power of the minimalmonetary unit for a consumer's income from that, taken in this case, equal to its total costs:

$$z\lambda(x_i,.....,x_n) = K\ ;\ (K = const, F = const)\,, \tag{23}$$

where K – constant integration, which is conventionally equals the total cost of the consumer in the base period.

This means that in the base period when all prices are equal to one, equation (19) will look like:

$$\overline{F} = (1,.....,1K) = K\ ;(F = K = const)\,, \tag{24}$$

In this case, the total expenses of the consumer K in the base period is conditionally in a consumption level.

From the equations (18) and (21) taking into account (23) we will receive our uwn equation:

$$\frac{\partial F}{\partial g_i} g_i + \frac{\partial F}{\partial g_n} g_n = K\ ;\ \text{(F=const, K=const)} \tag{25}$$

A value K can be found in as in the right side of this equation and in its constant parameters.

The value K, as a homogeneous function of the first degree from $g_i,....,g_n$, at F=const, is explained so that at credit units at suitable index values of goods $g_i,....,g_n$ and K depend on one or another currency unit. Uniformity of function (25) shows that while changing $g_i,....,g_n$ by the same number of times (due to changes of currency) general consumer spending in the base period K vary in the same correlation.

From the equation (23), it follows that at the same level of consumption F=const and and at the same expenses z=const, the purchasing power of the monetary unit should also be constant.

This conclusion shows that the equation (25) is a condition of perfect form of hypersurface equation of constant consumption level.

As it was noted above, the consumption price index is defined as a hypersurface equation of constant consumption level of tangential coordinates $x_i,....,x_n$, I_k. It is a function:

$$I_k = I(\ x_i,....,x_n) \tag{26}$$

On condition $I_k = \frac{z}{K}$, (F=const)

For two independent groups of goods, the additional condition is taken:

$$\frac{\partial^2 F}{\partial g_i \partial g_i} = 0\ ;\ i,j = 1,....n, i \neq j\ \ \text{(F=const)} \tag{27}$$

The term "independence of goods" in this case means that the degree of saturation of this group of products at constant overall level of consumption depends on the amount of goods but not on the number of other products. These independent interconnected groups of goods are food, clothing, shoes etc. For each group of goods their "physical volumes" are considered.

Using mathematical transformations in the case of independent product groups, hypersurface equation of constant consumption level (25) is as follows:

 ISSN: 0075-5222

$$b_i g_i^{\tau} + ... = b_n g_n^{\tau} = K^{\tau} \text{ (K=F=const)} \tag{28}$$

where $\tau = \rho + 1, b_j = \dfrac{C_j}{\rho + 1}, \rho = const$; C_j - constant of integration.

From the equation (28) taking into account the formula (21) based on input index I_k, and bearing in mind that F=K, we have received a demand function from prices, independent of one another groups of products at constant consumption level:

$$g_i = K\left(\frac{1}{b_j}\right)^{\frac{1}{\tau-1}}\left(\frac{x_j}{I_r}\right)^{\frac{1}{\tau-1}}(K = const) \tag{29}$$

Substituting values g_i from (28) into (29) we will receive:

$$\sum b_i K^{\tau}\left(\frac{1}{b_j}\right)^{\frac{\tau}{\tau-1}}\left(\frac{x_j}{I_k}\right)^{\frac{\tau}{\tau-1}} = K^t \tag{30}$$

Hence it was found: $I^{\frac{\tau}{\tau-1}} = \sum b_i^{\frac{1}{1-\tau}} x_i^{\frac{\tau}{\tau-1}}$ (31),

specified: $\dfrac{\tau}{\tau-1} = t, b_i^{\frac{1}{1-\tau}} = \dfrac{c_i}{\sum c_i}$.

We have received the true expression of consumption price index for the "independent" of one another groups of products as average among relative prices:

$$I_k = \left[\frac{\sum C_i \cdot X_i^t}{\sum C_i}\right]^{\frac{1}{t}}, \text{(K=const)}, \tag{32}$$

To calculate the composition of consumer budgets it is necessary to determine the parameters of the received levels, meaning that they are undefined functions of total consumer spending in the base period K.

In the case of independent products for which the equation (28) have been derived, hypersurface of constant consumption must not cross the axis, because it would mean the possibility of terminating the consumption of some product groups by increasing consumption of other groups. The intersection of the axes is possible only with a negative index t in the formula index. Thus, the index t must be greater than zero but less than or equal to one.

The simplest assumption that satisfies these inequalities is:

$$\tau = \frac{K}{K_{\max}} \tag{33}$$

To determine $K_{\max}$ theoretically we need Engel curve not only for the reference period but also for a current period which differs from the baseline value prices. In this case, the independent groups of products which consumption are always growing with an increase in overall costs the consumer, it can be assumed that there is a price system in which the growth of total consumption, independent groups of goods consumed proportionately. For example, in normal conditions the food consumption growth slow down with the increase of total consumption. But if the prices of food products were

ISSN: 0075-5222

relatively high, so a complete saturation of food products at these prices would not have happened so soon.

It is impossible to predict in advance what the prices and the structure of consumer budget will be. However, our hypotheses is useful for determining the Engel curve levels and ascertain the level of consumption, which is achieved by full saturation of a certain product groups.

Conclusions. In general, the proposed model allows to calculate the scale advantages of using the average price index for individual products without quantitative measurement of marginal utility. The first step in modeling the structure of processing plants in food production at regional level is the determination the food market capacity. Regional demand analysis allows to determine the consumption patterns in areas influenced by income levels and the ratio between its individual socio-economic groups, distribution of productive forces.

Current economic conditions of processing enterprises economic management require maximum expansion and use of forecasting, economic and mathematical modeling, and further improve of methodology and techniques of their development, which directly affects the processes of processing agricultural enterprises, their functionality and profit. Nowadays in Ukraine there is an efficient management of processing enterprises, which should be based on the following mathematical and economic models, which will display basic patterns of activity. These common factors must express the objective economic ties in operation of an enterprise and consider when making decisions in planning the necessary volume of resources at the enterprise, using a ratio of own and borrowed funds, cost and profit, and taking into account the demand for food products. According to the author, the main issue is to define and achieve this mutual compliance of resources available, which provides the necessary profitability level, sufficient for stable operation and development of processing enterprises and create conditions for the expansion of its production. So, taking into account the above mentioned facts, we can conclude that modeling is a basis for economic activity and management solutions at processing agricultural enterprises to improve the efficiency of economic potential. In addition, there is a problem of theoretical and practical grounding concerning the use of modeling as a essential component of management in modern market conditions at operating the processing agricultural enterprises that require further research on the methodology, techniques and technology of applying reasonable prediction and modeling economic development processing enterprises.

It should be noted that the significant disadvantage of reported budget studies methodology is that it operates only with income, received and confirmed officially. Taking into account the existence of the shadow economy in Ukraine, information about family income includes significant deviations from the actual level that is untrue. The obtained results show that the procedure for determining the standard of living is quite a challenge for statistics in the developed world, not to mention those in which a significant portion of the economy holds informal sector. This complexity gives a wide scope for conscious or unconscious manipulation of public opinion and speculation and pseudo-grounded impacts on state decisions.

Now again, the proposed model can be used for small periods of time in a relatively stable economic situation. In terms of sharp fluctuations in prices of basic product groups during short periods of time, changes in the structure of consumer spending take place quite rapidly. Therefore, it is advisable to analyze the structure of consumer spending and the changes occurring in the structure annually. This is necessary to obtain more accurate predicted results.

References:

[1] Engel E. (1881), Das Rechnungsbuch der Hausfrau und seine Bedeutung im Wirtschaftleben der Nation / E. Engel. – Berlin, – p.39.

[2] Ketle A. (1913), Social physics, or experience of research about development of human capabilities [Sotsialnaya fizika, ili opyit issledovaniya o razvitii chelovecheskih sposobnostey] / A.Ketle. - K., – T.1 i 2 (ukr)

[3] Grigor'Eva T. V. , Tkachenko I. S. (1999), Ekonomiko mathematical design of structure of small business in the field of services at regional level [EkonomIko-matematichne modelyuvannya strukturi malogo biznesu u sferi poslug na regionalnomu rivni] . – T.: Ekon. dumka , – 151 s.

[4] Konyus A.A. (1974) Method of calculation of composition of consumer byudzhetov// ekonomiko-mathematical methods in foreign statistics [Metod rascheta sostava potrebitelskih byudzhetov// Ekonomiko-matematicheskie metodyi v zarubezhnoy statistike]. – M.: Statistika, – 208 s. (rus)

[5] Bell D. (1999), Coming postindustrial society. Experience of social prognostication [Gryaduschee postindustrialnoe obschestvo. Opyit sotsialnogo prognozirovaniya] / D. Bell. – M. : Academia, 1999. – 956 s. (rus)