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The application of index method for the analysis of the change of the harvest of agricultural crops

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This article deals with theoretical and practical aspects of factor index analysis. On the basis of the index theory the main principles of application of this method and problems are formulated. Considerations how to harmoniously join the forms of absolute and index analysis are mentioned, and the problem of choosing weighted price indexes is discussed.

On the basis of summarized information on the areas of grain crops, crop harvest and yield in Lithuania during the period 2000–2004, possibilities of applying the index method are shown. The index method may be successfully applied for the calculation of harvest of both separate and total grain crops, as well as of the impact of factors influencing it.

While analyzing the change of agricultural crops harvest, individual and aggregate indexes can be calculated.

The individual indexes are applied to analyze the harvest of a single crop, while the aggregate indexes are used for the group of the same sort of crops (homogeneous).

The use of indexes allows us to calculate not only a relative but also an absolute change of the total harvest and to determine the magnitude of factors which influence this change expressed in absolute and relative indexes. In this case the index of areas under crops of fixed composition and the index of yield are helpful.

Having the data of several years base and chain indexes may be calculated; thus an analysis may be very exhaustive.

The advantage of indexes is that they are easily interpreted and calculated.

The index method may be applied not only for the analysis of the change of the harvest (and factors which influence it) grain crops but also of other homogeneous crops (e.g. vegetables, forage crops).

When applying this method for the analysis of the total harvest of forage crops, it is essential to use coefficients of forage nutritiousness.

Key words: indexes, factor analysis, absolute change, relative change, crop harvest

INTRODUCTION

Statistical indexes are one of the most universal methods of statistical analysis. From the point of view of statistical research, the first description of statistical indexes as a method was published by a French scientist Charles Dutot in 1738. Like other statistical methods, the method of indexes appeared due to practical needs – in trade pecuniary relations people needed to calculate prices and analyze their dynamics. Therefore, at first price indexes were calculated. At the beginning they were applied only to determine relative changes and later also to determine changes in absolute quantities. At the beginning of application of indexes, aggregate indexes were calculated taking the weight of the period under review, rather than individual indexes, which are simpler according to the method of calculation.

Factor analysis of indexes does not have such a long history. This kind of research appeared in the 20th century due to the need to determine which part of the total increase of number is made by the change of different factors.

Contemporary theory of indexes allows us to apply them in business, trade and administration. By using indexes it is possible to establish the absolute and relative change of various economic phenomena, and to calculate the magnitude of factors, influencing the change.

The object of this research is total crop harvest A hypothesis is formed to check whether the index method may be applied to determine the impact of total crop harvest of homogeneous crops and the factors which influence it. The aim of this study is to show possibilities of the index method in order to determine the changes of total harvest of grain crops and calculate the magnitude of factors which influence it.

The following tasks are set in this study:

- to discuss theoretical aspects of the calculation and application of statistical indexes;
- to describe the indexes used in the study;
- to determine the change of total crop harvest and to calculate the magnitude of factors which influence it;
- to provide generalisations and recommendations.

In this article scientific literature on the subject concerned is used. Factor index analysis is based on the official information on the crop harvest during the period 2000–2004, taken from the Department of Statistics. The results of the study are provided in tables.

At the end of the article conclusion and generalisations are provided.

RESULTS AND DISCUSSION

Factor analysis of indexes is based on a few general principles and raises certain problems:

- not indexes themselves, but their systems are analyzed;
- not only indexes as relative quantities, but also absolute changes of indexes are calculated and analyzed; as well as the impact of factors influencing them;
- how to join harmoniously two forms of analysis: relative and absolute indexes;
- the problem of index weight is related to economic origin of the process analyzed.

The essence of factor analysis of indexes is that an index of certain amount of content is expanded between two – quality and quantity, in other words, it is a simple multiplicative model, namely

$$\boldsymbol{x} = \boldsymbol{ab}, \tag{1}$$

where $\boldsymbol{x}$ – result index, $\boldsymbol{a}$ and $\boldsymbol{b}$ – factors, which determine the result index.

The same kind of relation exists between indexes:

$$\boldsymbol{I_x} = \boldsymbol{I_a} \cdot \boldsymbol{I_b}. \tag{2}$$

The models of this kind are called systems of indexes. In the simplest model there are two factor indexes and one result index. It is essential to find out if there is a causal relationship between them.

This makes us search for the sense of economic content of indexes. Knowing the interrelationship of economic phenomena, we may undoubtedly state that if we divide total crop harvest by area under crops, we may calculate the average yield, hence total crop harvest is calculated as the multiplication of area under crops and yield.

If we mark the yield of separate grain crops by letter $\boldsymbol{d_i}$, and the area under crops $\boldsymbol{N_i}$, then the total harvest of separate grain crops is calculated as the multiplication of these two indexes $\boldsymbol{d_i N_i}$, and the total harvest of all grain crops is calculated as the sum of harvest of separate grain crops – $\sum_{i=1}^{n} \boldsymbol{d_i N_i}$.

Hence:

$$\boldsymbol{i_{dN}} = \boldsymbol{i_d} \cdot \boldsymbol{i_N}, \tag{3}$$

where $\boldsymbol{i_d}$ – indexes of the yield of separate grain crops of variable composition, $\boldsymbol{i_N}$ – indexes of variable composition areas of separate grain crops.

Indexes $\boldsymbol{i_d}$ and $\boldsymbol{i_N}$ are calculated as ratios of certain indexes of a base year and a year under review:

$$\boldsymbol{i_d} = \frac{\boldsymbol{d_1}}{\boldsymbol{d_0}} \text{ and } \boldsymbol{i_N} = \frac{\boldsymbol{N_1}}{\boldsymbol{N_0}}. \tag{4}$$

The indexes of harvest of separate grain crops $\boldsymbol{i_{d_i N_i}}$ are calculated in the following way:

$$\boldsymbol{i_{d_i N_i}} = \frac{\boldsymbol{d_{i1} N_{i1}}}{\boldsymbol{d_{i0} N_{i0}}}. \tag{5}$$

The aggregate index of the harvest of all grain crops is calculated according to the following formula:

$$\boldsymbol{I_{dN}} = \frac{\sum_{i=1}^{n} \boldsymbol{d_{i1} N_{i1}}}{\sum_{i=1}^{n} \boldsymbol{d_{i0} N_{i0}}}. \tag{6}$$

The aggregate index of harvest is calculated by multiplying the index of stable (fixed) composition of the area under crop plants and the index of crop yield.

$$I_{dN} = \frac{\sum_{i=1}^{n} N_{i1} d_{i0}}{\sum_{i=1}^{n} N_{i0} d_{i0}} \cdot \frac{\sum_{i=1}^{n} d_{i1} N_{i1}}{\sum_{i=1}^{n} d_{i0} N_{i1}}. \quad (7)$$

It is obvious from this formula that total harvest depends on the yield of separate grain crops and the change of their area, therefore the changes may be estimated as the reason of change of the total crop harvest. However, the statement about the existing causal relationships has to meet certain conditions. In fact, the changes of total grain crop harvest may be determined by a lot of reasons, directly unrelated with the changes of the area under separate grain crops and their yield. Algebraic multiplication ***dN*** means that all other reasons are somehow included into the factors indicated – the yield of grain crops and the area under crops, although sometimes we cannot indicate exactly which reason influences some factors in a digital form. Therefore, even in the simplest multiplicative model we have to abstract from the majority of circumstances which are sometimes significant.

The method of abstraction is frequently applied in the theory of indexes because by making any index we eliminate the impact of other factors – "what would happen if…"

Indexes may be treated as an instrument of analysis when determining the impact of factors on the result index. In the models of indexes we may never find a statement that only these two factors (in our case – the area under crops and the yield) totally determine the change of the result index (of total crop harvest).

Therefore, the choice of index formula (form) has a very significant practical meaning and the choice cannot be made barely on the basis of mathematical speculations. In order to make a choice we need to formulate the aims of research and do the analysis of a concrete economic task.

The total harvest of grain crops is determined by three factors:

1) quantitative (the area under crops);
2) qualitative (the yield);
3) structural (the structure of the area under crops).

The "units" which are in the sum of a numerator and a denominator of an index have a certain economic content – in our case it is the total harvest of crops.

In order to determine the change of a result index, we face an additive model because of the amount of impact of many factors, because:

$$\Delta = x_1 + x_2 + ... + x_k. \quad (8)$$

In other words, the sum of absolute changes due to different factors (j = *1, 2,…,* k) equate the total change of the result index. The additive model clearly defines causal relationships among factors (causes) and the consequences of the result index.

In our case

$$\Delta_{d_i N_i} = \Delta_{d_i} + \Delta_{N_i} = (N_{i1} d_{i1} - N_{i1} d_{i0}) + (N_{i1} d_{i0} - N_{i0} d_{i0}) \quad (9)$$

If we assume that one year after another the area of grain crops did not change, then the difference ($N_{i1}d_{i1}$ – $N_{i1}d_{i0}$) will show this advantage – an increase of harvest, which occurred due to the change of the yield of different grain crops. For this we need information about the size of the area under crops for the year under review. On the other hand, if we want to calculate the perspective total harvest of grain crops according to this formula, we also need to take into consideration other factors, first of all the structure of the areas under crops, which formed after the change of yield of various grain crops, because undoubtedly, the changes of yield make farmers optimize the structure of the area under crops. The impact of the size of the area under separate grain crops and its structure on the changes of total harvest of crops is calculated in difference ($N_{i1}d_{i0}$ – $N_{i0}d_{i0}$).

The total change of the harvest of all grain crops is formed as the sum of changes of crop harvest of separate grain crops:

$$\Delta_{Nd} = \sum_{i=1}^{n} N_{i1} d_{i1} - \sum_{i=1}^{n} N_{i0} d_{i0}. \quad (10)$$

This change is formed as the sum of changes due to different factors (areas and yield):

• Due to the change of yield

$$\Delta_d = \sum_{i=1}^{n} N_{i1} d_{i1} - \sum_{i=1}^{n} N_{i1} d_{i0}. \quad (11)$$

• Due to the size of areas and the change of their structure

$$\Delta_N = \sum_{i=1}^{n} N_{i1} d_{i0} - \sum_{i=1}^{n} N_{i0} d_{i0}. \quad (12)$$

• From this number only due to the change of the structure of areas

$$\Delta_N = \sum_{i=1}^{n} N_{i1} d_{i1} - \bar{d}_0 \sum_{i=1}^{n} N_{i1}. \quad (13)$$

When we compare the data of 2004 about the areas of grain crops and their yield to the base data of 2000, we calculate how the total harvest of grain crops changed:

• due to the change of yield of separate grain crops:

171.5 + 31.5 + 10.7 + 7.0 + 40.0 + 142.9 + 3.2 + 19.0 – 6.6 + 4.2 – 2.9 – 0.7 + 0.9 – 0.4 + 0.6 + 3.9 = 424.9 thousand t.

As we may see, the impact of yield of some grain crops (winter wheat, winter hybrid of rye and wheat, winter barley, oat, buckwheat, cereal mixture for grains, other summer crops, beans, lupine and other leguminous crops) influenced the total harvest in a positive way, i.e. increased it, while the impact of other grain crops, on the contrary, decreased the harvest.

Table 1. **Areas and yield of grain crops grown in Lithuania [10]**

Grain crops	Area thousand ha					Yield per hectare tons				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
Winter wheat	285.5	269.7	266.7	283.2	306.7	3.56	3.32	3.84	3.61	4.12
Winter triticale	29.1	41.6	40.5	66.1	75.9	2.77	2.57	2.82	2.75	3.18
Winter rye	133.1	110.5	74.6	59.8	55.5	2.34	2.09	2.28	2.46	2.53
Winter barley	1.2	2.8	6.9	13.0	4.6	2.25	2.64	3.00	2.67	3.76
Spring wheat	84.9	68.1	68.4	53.3	48.4	2.62	2.64	2.82	3.40	3.45
Spring barley	352.0	328.5	358.1	295.3	287.9	2.43	2.34	2.37	2.93	2.93
Spring triticale	21.7	18.0	15.5	12.4	8.0	2.31	2.04	1.99	2.64	2.71
Oats	44.3	47.6	55.0	48.2	52.8	1.87	1.77	1.77	2.38	2.23
Buckwheat	16.6	16.9	17.0	16.3	22.0	0.89	0.75	0.62	0.90	0.59
Mixed cereals	11.0	11.1	12.4	14.3	15.2	1.80	1.78	1.49	2.00	2.08
Other spring cereals	0.2	0.4	2.9	2.7	1.5	4.00	2.75	2.86	3.22	2.07
Peas	25.2	20.3	18.4	7.4	11.5	1.97	1.48	2.01	2.92	1.91
Beans	1.4	2.2	3.2	1.8	2.3	1.93	1.86	1.25	2.50	2.30
Vetches	10.0	9.5	9.9	2.2	1.4	1.68	1.51	1.54	1.91	1.43
Lupine	1.9	1.5	1.6	2.0	2.6	0.84	1.00	1.06	1.40	1.08
Other dried pulses	1.3	1.2	3.1	8.2	12.7	1.69	1.92	1.58	1.88	2.00
Total (average)	1019.4	949.9	954.2	886.2	909.0	2.68	2.52	2.73	3.02	3.21

Table 2. **The harvest of grain crops and the absolute change of harvest in Lithuania**

Grain crops	Total harvest thousand tons			The absolute change of harvest thousand tons			
	2000	2004	$N_4\boldsymbol{d}_0$	$N_0\boldsymbol{d}_4$	Δ_N	Δ_d	Δ_{str}
Winter wheat	1015.3	1263.4	1091.9	1176.3	171.5	76.6	269.9
Winter triticale	80.7	241.7	210.2	92.5	31.5	129.5	6.8
Winter rye	311.4	140.6	129.9	336.7	10.7	-181.5	-18.9
Winter barley	2.7	17.3	10.4	4.5	7.0	7.7	-2.0
Spring wheat	222.3	166.8	126.8	292.9	40.0	-95.5	-2.9
Spring barley	856.9	842.5	699.6	1031.4	142.9	-157.3	-72.0
Spring triticale	50.2	21.7	18.5	58.8	3.2	-31.7	-3.0
Oats	82.9	117.7	98.7	98.8	19.0	15.8	-42.8
Buckwheat	14.7	13.0	19.6	9.8	-6.6	4.9	-39.4
Mixed cereals	19.8	31.6	27.4	22.9	4.2	7.6	-13.4
Other spring crops	0.8	3.1	6.0	0.4	-2.9	5.2	2.0
Peas	49.7	22.0	22.7	48.1	-0.7	-27.0	-8.2
Beans	2.7	5.3	4.4	3.2	0.9	1.7	-1.7
Vetches	16.8	2.0	2.4	14.3	-0.4	-14.4	-1.4
Lupine	1.6	2.8	2.2	2.1	0.6	0.6	-4.8
Other dried pulses	2.2	25.4	21.5	2.6	3.9	19.3	-12.6
Total	2730.7	2916.9	2492.0	3272.3	424.9	-238.7	55.8

• Due to the areas of separate crop plants and the change of their structure:

76.5 + 129.5 – 181.5 +7.7 – 95.5 – 157.3 – 31.7 + 15.8 + 4.9 + 7.6 + 5.2 – 27.0 + 1.7 – 14.4 + 0.6 + 19.3 = –238.7 thousand t.

We may draw a conclusion that in 2004, if compared to 2000, the changes of size and structure of areas under crops reduced the total harvest even by 238700 t.

• Only due to the impact of the structure of the area:

269.8 + 6.8 – 18.9 – 2.0 – 2.9 – 72.0 – 3.0 – 42.8 – 39.4 – 13.4 + 2.0 – 8.2 – 1.7 – 1.4 – 4.8 – 12.6 = 55.8 thousand t.

Thus, although the structure of areas in 2004 was more rational, this did not compensate a negative decrease of areas of some grain crops (winter rye, summer wheat).

Base indexes alone do not always allow us to evaluate the extent of changes of the index analyzed. If we calculate only base indexes (base is year 2000), then we have to draw a conclusion that in all following years except for 2004, the total harvest of grain crops decreased, in relation to the base. However, from the chain indexes we may see that since 2002 the total harvest of grain crops has increased each year.

Table 3. **Indexes of the harvest of grain crops grown in Lithuania**

Grain crops	Indexes %						
	Base-year weights				Given-year weights		
	2001	2002	2003	2004	2002	2003	2004
Winter wheat	88.3	100.9	100.8	124.4	114.3	99.9	123.5
Winter triticale	132.7	141.8	224.9	299.5	106.8	158.7	133.2
Winter rye	74.2	54.7	47.2	45.2	73.6	86.4	95.6
Winter barley	274.1	766.7	1285.2	640.7	279.7	167.6	49.9
Spring wheat	80.9	86.9	81.4	75.0	107.3	93.7	92.2
Spring barley	89.7	99.2	101.0	98.3	110.6	101.7	97.4
Spring triticale	73.1	61.6	65.1	43.2	84.2	105.8	66.4
Oats	101.7	117.6	138.2	142.0	115.7	117.5	102.7
Buckwheat	86.4	72.1	100.0	88.4	83.5	138.7	88.4
Mixed cereals	100.0	93.4	144.4	159.6	93.4	154.6	110.5
Other spring cereals	137.5	1037.5	1087.5	387.5	754.5	104.8	35.6
Peas	60.4	74.4	43.5	44.3	123.3	58.4	101.9
Beans	151.9	148.1	166.7	196.3	97.6	112.5	117.8
Vetches	85.1	91.1	25.0	11.9	107.0	27.5	47.6
Lupine	93.8	106.3	175.0	175.0	113.3	164.7	100.0
Other dried pulses	104.5	222.7	700.0	1154.5	213.0	314.3	164.9
Total	87.8	95.3	98.2	106.8	108.5	103.0	108.8

Therefore, undoubtedly, in our case the reasons for the change of total crop harvest are the increase or decrease of separate grain crops which make up the total harvest of all grain crops

As we may see, one of the components of the aggregate index is the quantity which is indexed (the one whose change is reflected by this index). And another, fixed component is called weight. In quantitative indexes it fulfils the role of commensurable quantity. While calculating aggregate indexes various weights may be used.

Aggregate form for calculating indexes was introduced by German statisticians Laspeyres and Paasche [4, 8].

The Laspeyres' index:

$$I_p = \frac{\sum_{i=1}^{n} q_{i0} p_{ik}}{\sum_{i=1}^{n} q_{i0} p_{i0}}, \tag{14}$$

where $k = 1, 2, \dots, m$.

Paasche index:

$$I_p = \frac{\sum_{i=1}^{n} q_{ik} p_{ik}}{\sum_{i=1}^{n} q_{ik} p_{i0}}. \tag{15}$$

The results of calculating indexes having the same initial information are different according to formulas introduced by Laspeyres and Paasche. This may be illustrated by such an example (information in Table 2).

The impact of change of various grain crops yield on the total crop harvest according to Laspeyres' formula:

$$I_d = \frac{\sum_{i=1}^{n} N_{i0} d_{i4}}{\sum_{i=1}^{n} N_{i0} d_{i0}} = \frac{3272.3}{2730.7} = 1.198. \tag{16}$$

According to Paasche's formula:

$$I_d = \frac{\sum_{i=1}^{n} N_{i4} d_{i4}}{\sum_{i=1}^{n} N_{i4} d_{i0}} = \frac{2916.9}{2492.0} = 1.171. \tag{17}$$

The results achieved are rather similar: according to Laspeyres' formula the impact of yield on the total grain crop harvest is positive and due to this factor the result index – the total harvest of grain crops – increased by 19.8%, according to Paasche's formula – 17.1%, if we compare indexes of 2004 to indexes of 2000 data. The meanings of aggregate indexes of yield calculated by Laspeyres' and Paasche's formulas coincide only in one case – if the amounts of commensurable are the same.

Since the Laspeyres' index uses base period quantities as weights, they can easily become out of date (disadvantage) while the current quantities that the Pasche's index uses as weight are always up-to-date (advantage).

The choice of weights is only a conditional principle of indexation. Some statisticians claim that in order to retain a general principle of the choice of weights, we would need to take the weights of the base period for both quantitative and qualitative indexes (variant of Laspeyres' index). However, in such a case, the multiplication of quantitative and qualitative indexes wouldn't give the volume index, i.e. there would be no multiplicative model.

According to Professor Martisius [6, 7], from the point of view of statistical methodology, the calculation used by Laspeyres is more convenient in that once you determine the weight coefficients, they may be used for all quantities of exponents no mater when they are indexed. This allows to reduce the demand of statistical information, needed for the calculation of indexes.

However, in order to retain the condition of interrelation of indexes, it is suggested [4, 5, 9, 11 and others] to take the weights of the period under review when aggregate indexes are formed.

In order to "free" a researcher from the necessity to choose between the two forms of indexes, a covariation index was introduced:

$$I_{\text{cov}} = \frac{I_p^P}{I_p^L} = \frac{\sum_{i=1}^{n} \frac{q_{ik} p_{ik}}{q_{ik} p_{i0}}}{\sum_{i=1}^{n} \frac{q_{i0} p_{ik}}{q_{i0} p_{i0}}}. \quad (18)$$

In our case

$$I_{\text{cov}} = \frac{I_d^P}{I_d^L} = \frac{\sum_{i=1}^{n} \frac{N_{i4} d_{i4}}{N_{i4} d_{i0}}}{\sum_{i=1}^{n} \frac{N_{i0} d_{i4}}{N_{i0} d_{i0}}} = \frac{1.171}{1.198} = 0.977. \quad (19)$$

However, the content of the covariation index remains obscure and its economic interpretation is complicated.

Fisher introduced an "ideal" form of index, which encompasses Laspeyres' and Paasche's indexes:

$$I_p^F = \sqrt{I_p^L \cdot I_p^P} = \sqrt{\frac{\sum_{i=1}^{n} q_{i0} p_{ik}}{\sum_{i=1}^{n} q_{i0} p_{i0}} \cdot \frac{\sum_{i=1}^{n} q_{ik} p_{ik}}{\sum_{i=1}^{n} q_{ik} p_{i0}}}. \quad (20)$$

In our case

$$\boldsymbol{I_d^F} = \sqrt{\boldsymbol{I_d^L} \cdot \boldsymbol{I_d^P}} = \sqrt{\frac{\sum_{i=1}^{n} \boldsymbol{N_{i0} d_{i4}}}{\sum_{i=1}^{n} \boldsymbol{N_{i0} d_{i0}}} \cdot \frac{\sum_{i=1}^{n} \boldsymbol{N_{i4} d_{i4}}}{\sum_{i=1}^{n} \boldsymbol{N_{i4} d_{i0}}}} = \sqrt{1.198 \cdot 1.171} = 1.184. \quad (21)$$

If Fisher's "ideal" index form is applied, due to the change of yield, 18.4% an increase of harvest is received. Because this index is calculated according to the formula of geometrical mean, using Paasche's and Laspeyres' indexes, have both advantages and disadvantages of the mentioned mean.

Therefore, we emphasize once again that factor index analysis may only give good results in case one goes deep into the matter of economic content of the index analyzed.

The main problem of the factor index analysis of indexes – how to join harmoniously two forms of analysis: relative and absolute indexes, by exactly calculating the impact of each factor on the increase or decrease of total sum. This causes most discussions [6, 11].

Even very simple calculations show that a relative analysis of the same indexes differs from an absolute analysis. For instance:

$$\boldsymbol{i_d} = \frac{4.12}{3.61} = 1.141, \quad \boldsymbol{i_N} = \frac{75.9}{66.5} = 1.141,$$

$\Delta_{\boldsymbol{d}} = 4.12 - 3.61 = 0.51$, i.e. id = iN = 1.141, but $\Delta_{\boldsymbol{N}} = 75.9 - 66.5 = 9.4$, thus $\Delta_{\boldsymbol{d}} \neq \Delta_{\boldsymbol{N}}$.

In factor analysis of indexes the problems of its profundity and comprehensiveness are also important.

When calculating group indexes, we may use various weights. When choosing them, one has to consider the following:

- researcher's attitude (according to him);
- simplicity of calculation;
- accessibility of information, necessary for calculation;
- the fact that it is impossible to prove the advantage of weight systems of some methods over the system of another weight method.

CONCLUSIONS

1. Statistical indexes may be applied to determine the amount of total grain crop harvest and the impact of factors influencing it. Their advantages: easy to calculate, allow to determine the magnitude of both absolute and relative impact; may be used in the analysis of total crop harvest of separate grain crops and total grain crops; having the data of several years, we may calculate base and chain indexes.

2. When the index method is applied the most important problem is the choice of index weight. There is no unanimous opinion considering this issue. The best thing to be made when choosing weights is to consider the economic origin of the index analyzed.

3. Aggregate indexes may be applied to analyze not only the total crop harvest of all grain crops, but also in a greater detail – according to their classification: winter and spring crops, crops and leguminous crops for grains, crops according to their sort, etc.

4. This method may be applied to analyze the changes and the magnitude of factors which influence these changes of total harvest (volume of production) of other plants which are of the same sort homogeneous – field vegetables, perennial garden plants and

mushrooms; total harvest of forage plants could be analyzed by applying the index method, using the coefficients of forage nutritious ness.

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INDEKSŲ METODO TAIKYMAS ANALIZUOJANT ŽEMĖS ŪKIO AUGALŲ BENDROJO DERLIAUS KITIMĄ

S a n t r a u k a
Straipsnyje remiantis moksline literatūra ir Lietuvos statistikos departamento 2000–2004 m. oficialia informacija indeksų metodu išanalizuotas grūdų bendrasis derlius, jo kitimas ir nustatytas lemiančių veiksnių poveikio dydis.

Statistiniai indeksai – vienas universaliausių statistinės analizės metodų. Jis atsirado dėl praktinių žmonių poreikių: vykstant prekiniams piniginiams mainams būtinai reikėjo apskaičiuoti prekių kainas ir įvertinti jų kitimą. Todėl pradžioje buvo apskaičiuoti individualūs kainų indeksai.

Šiuolaikinė indeksų teorija leidžia indeksus plačiai taikyti versle, prekyboje ir valdžios sektoriuje. Pasitelkus indeksus galima nustatyti įvairių ekonominių reiškinių absoliutųjį ir santykinį kitimą ir apskaičiuoti kiekvieno iš juos lemiančių veiksnių poveikio dydį.

Nagrinėjant žemės ūkio augalų derliaus kitimą gali būti skaičiuojami individualūs ir agregatiniai indeksai. Individualūs tinka vieno augalo derliaus analizei, o agregatiniai naudotini vienarūšių (giminingų) augalų grupėje.

Indeksai leidžia apskaičiuoti ne tik santykinį, bet ir absoliutųjį bendrojo derliaus kitimą ir nustatyti šį kitimą lėmusių veiksnių poveikio dydį absoliučiais ir santykiniais rodikliais. Tam praverčia fiksuotos sudėties pasėlių plotų ir derlingumo indeksai.

Turint kelerių metų duomenis gali būti skaičiuojami baziniai ir grandininiai indeksai – taigi analizė gali būti labai išsami.

Indeksų privalumas – jie lengvai suprantami ir apskaičiuojami.

Indeksų metodas gali būti taikomas nagrinėjant ne tik grūdų, bet ir kitų vienarūšių augalų (pvz., daržovių, pašarinių augalų) bendrojo derliaus kitimą ir jį lemiančius veiksnius. Taikant šį metodą pašarinių augalų bendrojo derliaus analizei būtina vartoti pašarų maistingumo koeficientus.

Raktažodžiai: indeksai, faktorių analizė, absoliutus ir santykinis kitimas, bendrasis derlius

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ПРИМЕНЕНИЕ ИНДЕКСНОГО МЕТОДА В АНАЛИЗЕ ДИНАМИКИ ВАЛОВОГО СБОРА СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

Р е з ю м е
В статье на основе научной литературы и официальной информации Литовского департамента статистики за 2000–2005 гг. проведен индексный анализ валового сбора зерна, его динамики и определено влияние факторов.

Статистические индексы являются одним из наиболее универсальных методов статистического анализа. Появлению этого способствовало практическая деятельность: при товаро-денежных отношениях необходимо было вычислить цены на товары и оценить их изменения. Поэтому вначале были рассчитаны лишь индивидуальные индексы цен.

Современная индексная теория позволяет широкое применение этого метода в сфере бизнеса, услуг, а также в государственном секторе. С помощью индексов можно определить абсолютное и относительное изменение различных экономических явлений и установить влияние каждого из факторов.

При исследовании валового сбора сельскохозяйственных культур можно использовать индивидуальные и агрегатные индексы. Индивидуальные используются в анализе одной сельскохозяйственной культуры, а агрегатные – в группе однородных культур.

Индексы позволяют не только рассчитать относительное и абсолютное изменение валового сбора зерна, но и определить влияние разных факторов и размер этого влияния в относительных и абсолютных величинах. Этому способствуют индексы фиксированного состава. При наличии данных нескольких лет можно провести исчерпывающий анализ с помощью базисных и цепных индексов.

Преимущество индексов: они легко воспринимаются и рассчитываются.

Индексный метод можно применять в анализе не только валового сбора зерна, но и других однородных культур (овощей, кормовых). При анализе валового сбора кормовых культур индексным методом необходимо использовать коэффициенты питательности кормов.

Ключевые слова: индексы, факторный анализ, обсолютное и относительное изменение, валовой сбор