



Regional Development of Agro Complex in Republic of Macedonia

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Abstract: An important policy challenge of every social community is the development of each region. Republic of Macedonia has adopted the Law on Balanced Regional Development which includes Strategy for balanced regional development. This is especially important strategic goal because of the large differences that occur between regions especially between the capital and other parts of the country. In Macedonia there are eight planned or statistical regions: Vardar, East, Southwest, Southeast, Pelagonia, Polog, Northeast and Skopje region. A survey of regional development of agro complex in Macedonia, is done by using the methodology of Ivanichev's distance. As a result, according the values of I - distances are getting rank - list of regions for the development of agro complex. In labor, as important indicators for each region separately are taken: population in the Republic Macedonia, working population, used agricultural land, agricultural area, gross - value added, gross - domestic product and investment of fixed assets. The result is the basis for taking further steps such as economic, technical, technological measures, tools, strategies for improving the situation of agro complex in those regions where it will be required.

Keywords: Agro Complex, Region, I – Distance, Discrimination Analysis, Indicators, Rank.

I. GOAL AND METHOD OF RESEARCH

The aim of the research in this paper is to get a preview of the level of development of all regions in agro complex separately in Macedonia. For this purpose are used indicators for each region such as: population in the country, working population, total used agricultural land, agricultural area, gross value added, gross domestic product and investment of fixed assets. They will be used in the methodology of research, ie to determine the value of Ivanichev's I-distance, and will get the list of regions in R. Macedonia according the development in agro complex in each of them.

Law of Balanced Regional Development prescribes the establishment of plan regions in the country, as functional territorial units for the purpose of development planning and implementation of measures and instruments to encourage the development. Plan regions coincide with the statistical regions determined by the Nomenclature of Territorial Units for Statistics NUTS - 3, in order to provide a statistical basis for planning the development of the regions. According to the legal framework, plan regions represent the basic unit for planning the development of the Strategy for Regional Development. To enable the research to have the best success and to see a precise picture of the regional development of agro

complex in Macedonia, the territory of the Republic of Macedonia is divided into eight regional districts or regions with their municipalities:

- Vardar Region
- East Region
- Southwest Region
- Southeast Region
- Pelagonia Region
- Polog Region
- Northeast Region
- Skopje Region

Under the Law on Local Self-Government functions centers for development of each region separately, that made plans and programs for development of the regions in Macedonia, in full compliance with the Spatial Plan of the Republic of Macedonia, strategic development documents at the national level and development documents for integration of Macedonia in the European Union.

In the research work is used method Ivanichev's distance I - distance, while the statistical parameters are calculated for each indicator as follows: arithmetic mean, standard deviation, variance and correlation coefficient.

Agro complex in Macedonia analyzed using a statistical method is a statistical complexes (K), which is composed of such subsystems (S1) and (S2) which actually represents statistical structures. When you want to explore the development of agro complex by regions in Macedonia actually you perform the classification or ranking of regions according to their level of development. Thus, the methodology of Ivanichev's distance or so called I - distance, which theoretical conception is in the methods of discrimination analysis. Discrimination analysis is used for:

- For determination of the order - the rank of the observed phenomena, in this case the regions in Macedonia;
- ranking of the observed phenomena is performed on the basis of values of Ivanichev's distance (I-distance).

In the ranking a number of statistical structures as eight regions in Macedonia which are subsystems of a statistical complexes as agro complex and if on each of them is measured a series of statistical signs, definition of the problem for their ranking in terms of an measurable factor, sets up a whole range of problems. It's quite difficult to determine a complete index which on absolute way will determine the place of statistical structures in the ranking - the list, according to the size of the investigated profile of

the statistical complexes. The problem often arises from the fact that the selected indicators of development are given by statistical data in different units (MKD, tons, etc.), the problem of duplication of information, the problem of different significance of selected statistical indicators etc. If we take two statistical structures (Sr) and (Sm) of which indicator (X1) has a value (Xri) and (Xmi). If you compare these values will be found that there is a difference between them. The sum of these differences defines total discriminatory effect which will separate the two statistical structures, based on the observed statistical mark (X1). By changing the statistical marks comes to a change in the discrimination effect, so that their choosing and increase of the number of marks increases discrimination effect as well which is approaching to its limit known as total discriminatory effect.

II. CALCULATION OF INDICATORS FOR DEVELOPMENT OF AGRO COMPLEX IN MACEDONIA

As indicators that will be used to determine the regional development of the agro complex in the Republic of Macedonia are taken the data from the State Statistical Office of Macedonia:

- population in the Republic of Macedonia by region
- working population
- total used arable land
- agricultural area
- gross value added in millions denars, for the Department of Agriculture, hunting, forestry and fishing.
- gross domestic product, in millions denars
- investment of fixed assets in millions denars, for the Department of Agriculture, hunting, forestry and fishing

In order to perform the calculation of the I - distance it's required knowledge of the basic statistical parameters of the individual statistical signs such as arithmetic environment, standard deviation, variance and coefficient of correlation

But for the solutions thus obtained, it is necessary application of statistical formulations offered by the modern Microsoft Excel package from Microsoft Office, without which there are difficulties in obtaining the necessary decisions given their scope of statistical source material.

Rank - list obtained by the prasmetuvanje I - distance so collected individual discrimination effects for each region, thus providing a total effect discrimination.

As a basis for comparison is taken:

- ❖ fictional group of regions with the lowest values:

$$x_i^- = \min(x_{i1}; x_{i2}; x_{i3}; x_{i4}; x_{i5}; x_{i6}; x_{i7})$$

- ❖ fictional group of regions with the highest values:

$$x_i^+ = \max(x_{i1}; x_{i2}; x_{i3}; x_{i4}; x_{i5}; x_{i6}; x_{i7})$$

III. OBTAINED RESULTS

To determine the range of regions in Macedonia is necessary to perform the calculation of Ivanichev's I - distance, so that each region gets total discriminatory effect, and with the summary of individual discrimination effects from the first to the seventh mark or indicator.

The calculation of I - distance by the smallest values would be:

$$D = \sum_{i=1}^n \frac{|x_{ik} - x_i^-|}{\sigma_1} \prod_{j=1}^{i-1} (1 - r_{ij}) \text{ or in developed form:}$$

Table 1. Values of I - distance according fictional group of regions with the lowest values.

	Regions in Macedonia	I - distance
D ₁	Vardar Region	1,898370282
D ₂	East Region	1,647342457
D ₃	Southwest Region	0,818758927
D ₄	Southeast Region	2,467286968
D ₅	Pelagonia Region	7,379490304
D ₆	Polog Region	2,602316952
D ₇	Northeast Region	1,096741356
D ₈	Skopje Region	3,828057365

Graphic 1. Graphic display of the values of the I-distance according fictional group of regions with the lowest values

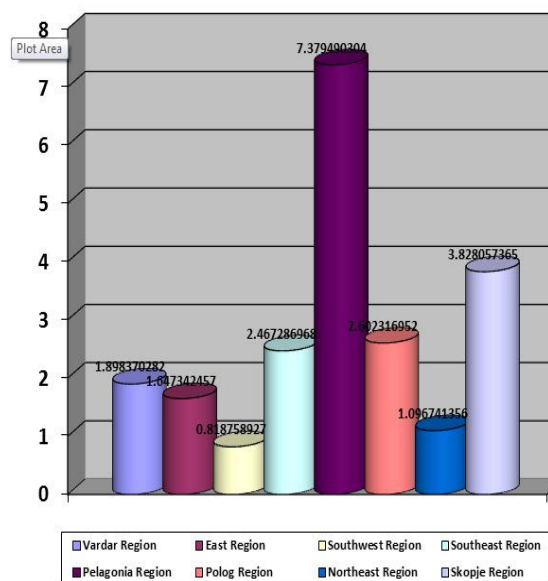


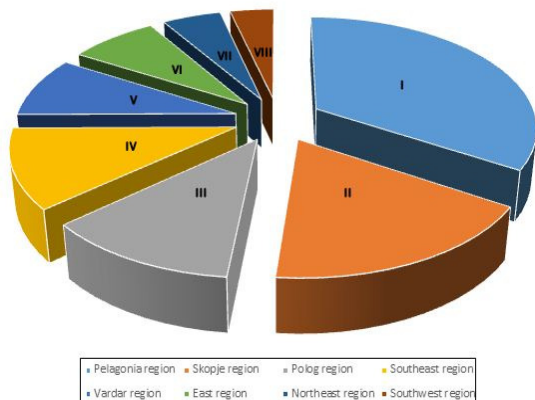
Table 2. Calculated standard deviation, variance and correlation coefficient

Ordinal number	Regions in Macedonia	Total population	Working population	Gross Domestic product in millions denars	Investments in basic assets in millions denars	Agricultural area (ha)	Gross value added in millions denars	Total used arable land (ha)
1	Vardar region	153.837,00	122.138,00	29.862,00	582,00	108.167,00	4.038,00	36.196,32
2	East region	179.846,00	152.504,00	30.683,00	218,00	113.625,00	3.867,00	64.057,86
3	Southwest region	221.899,00	176.191,00	31.136,00	8,00	103.601,00	2.434,00	20.579,37
4	Southeast region	172.693,00	141.859,00	32.717,00	196,00	90.973,00	10.847,00	40.566,17
5	Pelagonia region	234.320,00	195.363,00	51.502,00	1.781,00	268.500,00	9.026,00	73.826,24
6	Polog region	314.194,00	234.365,00	29.473,00	78,00	169.526,00	4.375,00	28.205,37
7	Northeast region	174.876,00	137.773,00	18.299,00	10,00	145.286,00	2.650,00	46.362,75
8	Skopje region	601.057,00	473.148,00	187.063,00	250,00	64.711,00	2.925,00	24.431,94
	Arithmetical mean	256.590,25	204.167,63	51.341,88	390,38	133.048,63	5.020,25	41.778,25
	Standard deviation	138.671,7609	107.127,9242	52.002,0026	552,9728604	59.299,40084	2.945,442316	17.718,66763
	Variance	19.229.857.279	11.476.392.133	2.704.208.274	305.778,9844	3.516.418.940	8.675.630,438	313.951.182,6
	Coefficient of correlation		0,998002152	0,940277681	-0,070298219	-0,256233645	-0,264454858	-0,414342434
				0,955719282	-0,038371598	-0,251766305	-0,242248414	-0,374493748
					0,049391164	-0,329996734	-0,165372257	-0,283974406
						0,762116473	0,524533589	0,675258596
							0,365748067	0,650602975
								0,455468217

Table 3. The order - rank the regions in Macedonia established by declining values of I - distance

	Regions in Macedonia	I - distance	Rank
D ₅	Pelagonia region	7,379490304	I
D ₈	Skopje region	3,828057365	II
D ₆	Polog region	2,602316952	III
D ₄	Southeast region	2,467286968	IV
D ₁	Vardar region	1,898370282	V
D ₂	East region	1,647342457	VI
D ₇	Northeast region	1,096741356	VII
D ₃	Southwest region	0,818758927	VIII

Graphic 2. Graphic display of the rank order of the regions in the Republic of Macedonia



From the application of the methodology of Ivanichev's distance, values are obtained of the I - distances, ie calculated overall discriminatory effect for each individual region that obtains rank - lists - by ascending or descending values of I - distance, in which rank - lists the order of the regions in Macedonia in the first rank - list is with declining values, but it's the inverse with rank - the list which is created by increasing values.

According to the obtained results Pelagonia region occupies the first place in the ranking - list of declining values and with increasing values in which region are getting that there the Agricultural Complex is most developed in Macedonia. Second place takes the Skopje region, after that is Polog, Southeast, Vardar, East, Northeast, and last Southwest region.

IV. CONCLUSION

From the obtained results for regional development of the agro complex in the Republic of Macedonia, could see that with the use of the methodology I - distance, ie with performed discrimination analysis of the eight plan regions in R. Macedonia the ranking is done by decreasing values and is analogous to the rank obtained with increasing values in the following order:

- Pelagonia region
- Skopje region
- Polog region
- Southeast region

- Vardar region
- East region
- Northeast region
- Southwest region

With immediate analysis of the obtained rank – lists, the conclusion is that there is a large discrepancy in the level of development of agro complex especially among first-ranked Pelagonia and last ranked, that is Southwest region. The analysis shows that other regions in between have smaller fluctuations in the development of agro complex.

The regions that are on the top ranking - list Pelagonia and Skopje region are associated with the logic because the first is our biggest plane with most agricultural area, while the other is the center of the state or the capital Skopje which is the main crossroads in which pass the most important roads in the country, and also abounds with developed industry.

Thus obtained order or rank - lists of regions in R. Macedonia by the development of agro complex, is based on statistical information from a limited number of indicators for development of agro complex, which can be said that has not been provided a detailed information on the achieved development of agro complex in the country. Otherwise ideally, if we take all possible indicators for development of agro complex would have received theoretical exactly ideal rank - lists for development in agro complex in the regions.

From here could be observed the possibilities for further researches, and other detailed guidelines. But above obtained rank - lists through discrimination analysis can say that weigh toward optimality. It could serve as a good basis on which to create strategy goals, ie would be guided development policy of the country for the development of agro complex in order for balanced regional development of agro complex in the Republic Macedonia.

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