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ИНСТИТУТ ЭКОНОМИКИ И УПРАВЛЕНИЯ АПК

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APPLICATION OF AGRICULTURAL DATA IN ECONOMICAL ANALYSIS OF DIFFERENT COUNTRIES OF THE WORLD

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***Annotation**: Statistical and Machine Learning methods were applied to agricultural indicators to find meaningful connections to some economical indicators.*

***Keywords**: data science, machine learning, statistics, economics, data analysis, agriculture, global data, world bank.*

Almost every country in the world depends in different amounts on its own agriculture – it is important for providing its people with food, and its economy with export profits. In our work we wanted to analyze how can open agricultural data influence economical data, and examine possibility of predictions based on this data. For our research we used data from World Bank Organisation, which provides more than fourteen and a half thousand documents on different indicators of participant countries since 1960.[1]
We used 20 indicators of more than two hundred countries for the last 60 years. This includes:

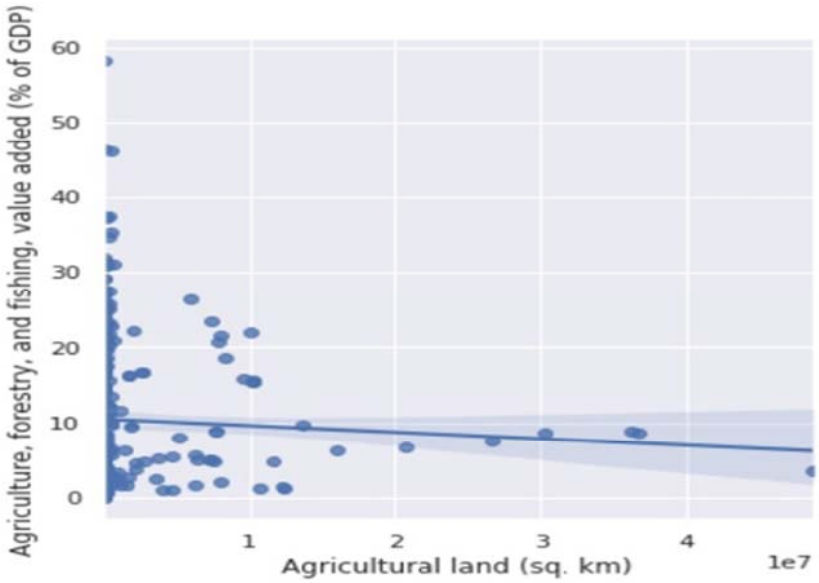
- Arable land (% of land area);

- Land area (sq. km);
- Agricultural land (% of land area);
- Agricultural land (sq. km);
- Employment in agriculture (% of total employment);
- Agriculture, forestry, and fishing, value added (% of GDP);
- Fertilizer consumption (kilograms per hectare of arable land);
- Arable land (hectares per person);
- Cereal yield (kg per hectare);
- Rural population;
- Rural population (% of total population);
- GDP (constant 2010 US$);
- GDP growth (annual %);
- Access to electricity, rural (% of rural population);
- Imports of goods and services (current US$);
- GDP per capita (constant 2010 US$);
- Imports of goods and services (% of GDP);
- Exports of goods and services (% of GDP);
- Exports of goods and services (current US$);
- Agricultural raw materials exports (% of merchandise exports).

Our first step was to analyze correlations in given dataset, so we can find any helpful patterns. Unfortunately, we found out that most agricultural indicators correlate weakly with financial ones. We used graphical analysis for further details. For this, we plotted out all combinations of data and picked out the most interesting ones for further analysis.

First one is a plot of arable land percentage to fraction of agriculture, forestry and fish production in GDP. The trend in this dataset is insignificant, its coefficient of determination is 0.04.

Next trend – agricultural land to same fraction of GDP – is insignificant as well. The only interesting finding is that big countries, such as Russia, US, Canada, China and others tend to have about 5-10% of their GDP as GVA from agriculture. This plot is shown below.



Graph 1. **Agricultural land to Argicultural GVA**

Same observation is further proven by further analysis, where we plotted arable land percentage against total land area of countries. Beforementioned countries tend to have about 15% of its overall land used for agriculture. Overall arable land percentage tend to fall as countries grow, and big countries cant use all their land and cant rely only on agricultural sector.

One of the most significant indicators was urbanization data. It is no surprise that countries with low urbanization rates tend to have low GDP per capita, proven by linear regression with rsquared of 0.32 and exponential regression with rsquared of 0.55. However, developing countries with big rural populace percentage tend to have bigger GDP growth, but this trend is not profound.

Apart from direct analyzis, we tried out machine learning methods to further analyze our data and explore the possibility of prediction based on our data. For this, we used different lags: one, three, five and all 60 years. Our target indicators were GDP per capita and Agricultural export. Both did not yield any reliable results. Predictions were no more than 10% true. One of the interesting observations from this though was that algorithm gave employment in agriculture high weight while predicting agricultural export.

In conclusion, our goal was only partially achieved. We analyzed different indicators and produced some observations, but it was not enough for fully fledged predictions. There were no simple and significant correlations based on our data, and predictions are impossible because most of the dispersion could not be explained by our models. But this does not mean that there are no connection and it is likely that applied methodology was not suitable for such reseach. We believe that further research is needed.

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АНАЛИЗ ДИНАМИКИ ЭКСПОРТА МЯСА И ЗЕРНА В УСЛОВИЯХ ВНЕШНИХ ОГРАНИЧЕНИЙ

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***Аннотация**: В статье рассмотрен анализ динамики экспорта мяса и зерна из Российской Федерации в условиях внешних ограничений. Изучены особенности существующих внешних ограничений, выявлены изменения состава стран-импортеров российской сельскохозяйственной продукции. Для анализа были рассчитаны показатели динамических рядов, индекс Рябцева с целью оценки структурных сдвигов в странах-импортерах, использованы графический и табличный методы.*

***Ключевые слова:** анализ динамики, экспорт, страны-импортеры, внешние ограничения.*

На сегодняшний день увеличение объёмов экспорта является для РФ одним из важнейших источников увеличения темпов роста национальной экономики. За период с 2014 по 2020 гг. на экспорт зерна и мяса из Российской Федерации не раз оказывали влияние внешние ограничения. В соответствии с Таможенным Кодексом ЕАЭС под внешними ограничениями понимается «комплекс мер, применяемых в отношении товаров, перемещаемых через таможенную границу, включающий меры нетарифного регулирования, меры, вводимые исходя из национальных интересов, особые виды запретов и ограничений внешней торговли товарами, меры экспортного контроля, в том числе в отношении продукции военного назначения, меры технического регулирования, а также санитарно-эпидемиологические, ветеринарные, карантинные, фитосанитарные и радиационные требования» [5].