**Networks under deep uncertainty.**

**Food security of countries**

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Food security plays one of the vital roles in our live. The World Food Summit in 1996 agreed upon the definition «Food security represent a situation where all the people, at all time, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs for healthy life».

The situation with food security can be influenced by factors such as changes in the value of production, export or import of products. The reasons for such changes can be different (drought, earthquake, flood, etc.). For example, according to information on the official UNICEF website, the flood in Pakistan in 2022 led to almost 10 million children are suffering from hunger. The problem of hunger in global terms cannot be solved without productivity increasing as well as without the development of science and technologies, new ways of preserving food products, with the advancement in the theory of logistic schemes, and the rational development of agricultural production [Serageldin, 1999; Rosegrant & Cline, 2003].

We use scenario analysis to model the consequences of events affecting exports/imports in the network and consider models of food networks to identify critical countries in case of export/import values change. The main aim is to find the most vulnerable countries when some countries are not able to export or import products for various reasons. For example, a country has reduced its exports because of drought, then we find countries which have a deficit of food consumption after import decrease from the first one.

Scenario analysis is considered as a process of modeling changes in product flows regardless of the reasons for this process.

Scenario analysis will also help to solve problems of country's economic policy. For example, the possible replacement of food shortages with supplies from other countries may be considered.

To identify vulnerable countries in networks of import/export grains, taking into account their production, the value of the consumption deficit per capita is used. The amount of consumption deficit is calculated as the difference between the minimum recommended value of carbohydrate consumption per person per year and real carbohydrate consumption per capita for the year. If the deficit is positive, then there is a shortage of carbohydrates.

We analyze the export/import and production data of basic crops (rice, wheat, maize, sorghum, barley, rye, millet, buckwheat, oats) for 2018, 2019, 2020 years. The consumption of grain crops taking into account physiological needs is analyzed. The countries most dependent on imports of grain products have been identified by classic [Newman, 2003] and new centrality indices [Aleskerov et al, 2017; Aleskerov & Yakuba, 2020]. Based on the data for 2020, scenarios of various situations have been constructed.

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