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Conference on Land Economy and Rural Studies Essentials**METHODOLOGY FOR ASSESSING THE CREATIVE  
AGRICULTURAL ECONOMY**

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Moscow, Russia, worldeconomy@rgau-msha.ru**Abstract**

The article deals with the fact that, from the point of view of the economy, a new concept is introduced in agriculture, such as a creative agricultural economy. The creative agricultural economy is based on human capital. This concept is formulated in the study of the world economy, in which there is the emergence and transformation of new products and services in the field of agriculture. A methodology for evaluating the creative agricultural economy has been developed and proposed. It is a system of three indicators. On the basis of which three indices are calculated: the health index, the knowledge index and the morality index. Then the index of the creative agricultural economy is calculated using the arithmetic mean. At the same time, for each index, indicators are taken that undergo the procedure of normalizing indicators. This method is being tested on twenty leading countries in terms of competitiveness and Russia. The leading countries of this direction are identified. The authors have identified the countries that have a great potential in innovation, but do not occupy a leading position in the creative agricultural economy. The reasons for this fact are indicated. This direction is quite relevant today, when everything is changing rapidly in the global world: new taste preferences, new goals for growing plants, new opportunities for modern technologies are changing the traditional way people think about agriculture.

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## 1. Introduction

Recently, both scientists and politicians have discussed the issue of creativity even more intensively. The events that take place in the world pose some new tasks to modern society that are not possible to solve in the traditional way. If initially creativity was associated with a kind of business engine, now various economic, social and other problems are solved with the help of creativity.

Agricultural creativity is the ability to create a new target object in the field of agriculture and related areas, which has no analogue.

The creative agricultural economy is built on three equal pillars: knowledge, creativity, and humanity. Knowledge includes the level of education, upbringing, and personal health. Creativity includes a set of personal qualities and personality traits to find new things, make decisions, and act outside the box. This is best shown by A. T. Shumilin, who writes that creative personalities are usually characterized by divergent thinking. They tend to form new combinations of elements that most people know and use in a certain way, or to formulate connections between two elements that at first glance have nothing in common. An act of creativity can be performed only when a person is completely absorbed in the corresponding type of activity. The author highlights such features of a creative personality as “willingness to take risks, impulsiveness, impetuosity, independence of opinions and assessments, commitment to success, perseverance, purposefulness, exactingness”. He also points out the “ability to operate with vaguely defined concepts, courage of mind and spirit, courage of imagination, ability to hold by one’s opinion, self-confidence, search for inconsistencies and contradictions, individual formulation of new problems and solutions” (as cited in Abydenova & Ryzhov, 2007). This understanding is close to the concept of creative capacity that we have adopted.

Creative potential is defined in this study as a system of motivational, intellectual, emotional, volitional, spiritual and moral qualities of a person that enables the creation of the opportunity to find new things, make decisions and act outside the box.

Humanity is an essential element. This concept includes honesty, justice, loyalty, hard work, patriotism and the whole set of qualities characteristic of human dignity. The third pillar is considered in its philosophical, psychological, political, ethical, and social aspects. In the creative agricultural economy, creative activity acts as a driving factor in the evolution of the world agricultural sphere. It is important to note that creativity is the creation of the new, purely of the new, which does not forget, does not destroy the old, but remembers it, preserves it in itself as a moment of its own history, as its premise. Bulgakov (2008) also wrote that science is an attribute of a person, his tool, which he creates for certain tasks. The third pillar of the creative agrarian economy says that tasks should not contradict humanity.

There are enough high-priority problems in the agricultural sector to be solved at different stages of the state agrarian policy. However, agriculture, both in individual countries and in the aggregate on a global scale, has reached the point where it is necessary to form a fundamentally new structure of the agricultural economy. This will help the creative agricultural economy, focused on modern promising technical and technological solutions adapted to foreign economic challenges and climate change, to ensure the development and improvement of the quality of human potential.

## 2. Problem Statement

Currently, many scientists note the fact that the world has entered a new period of its development, the era of knowledge and the domination of intellect. The human capital with its intellectual and creative implications is becoming the main resource of the modern innovative, high-tech economy (Melnikov, 2012). The creative agrarian economy is a new phenomenon in economics. In practice, we will not find an exact definition of this phenomenon in any economic dictionary or economic vocabulary. Moreover, we are unlikely to find a broader concept such as "creative economy" in the same sources. Many scholars, namely economists, sociologists, political scientists, philosophers, and others study "creativity".

Creativity, or the ability to be creative, is often portrayed as something that defies definition, description, or replication. Although in reality, creativity is not such an incomprehensible phenomenon. Original innovations - products, services, and theories - did not come about by magic. These are the fruits of creativity, and creativity is the result of using old ideas in new ways, in new places and in new combinations (Sutton, 2013).

Scientists from around the world are studying the creative agrarian economy, but there is still no generally accepted methodology for assessing this phenomenon in modern science. In order to determine the level of development of a country according to a given indicator, it is necessary to develop such a technique. In this article, we offer one of the options for such a technique.

## 3. Research Questions

Any new economic phenomenon requires a detailed approach not only to identification, but also to a methodological description and formulation of a methodology for its assessment. The lack of a generally accepted approach significantly complicates a reliable assessment of the existing potential of the creative agrarian economy of a particular country. The economic system will depend on how correct the chosen path will be at the initial stage and, ultimately, what geo-economics or geopolitical position the state will take in the world.

Due to the fact that there is still no absolutely precise definition of the creative economy and more creative agrarian economy, accordingly, there are still no separate statistical data on these items in statistics. But there are statistics on other related positions that can be attributed to the result of creativity and accounting for its fruits. At the same time, we note that agriculture itself in the traditional understanding of this sector of the national economy does not limit itself to strict limits, but is closely interconnected with other sectors of the world economy. And agriculture not only complements, but equally interacts with them. Proceeding from this fact, one should consider the closest available options for world and domestic experience in assessing the level of a creative and innovative economy.

The main and goal-setting task is to build the most correct path with timely, competent regulation and search for tools to influence the result and quality of human capital, from an individual to a company, a farm, an agricultural holding and, ultimately, of the national economy.

The first thing to pay attention to is innovation potential. It contains the key standards for the development of a creative agricultural economy.

In this direction, we consider the methodology proposed by the OECD. It is presented in more detail in the documents; these documents have their own names and years of adoption. Most often, the method of assessment in them is to build a composite index. The data on the basis of which this or that index is compiled provide statistical data that classify certain indicators in a country or between countries. As a result, using this technique, we can obtain a comparative characteristic of the studied indicator.

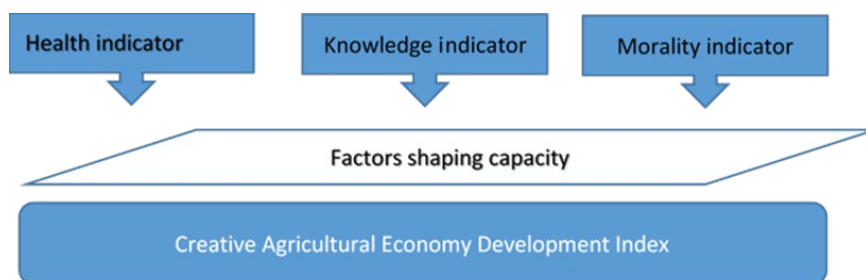
The main advantages include the simplicity of construction; the disadvantages include a number of questions, the specifics of the answers to which are not unambiguously clear. It is not entirely clear how objective the selection of indicators is; this requires a clear understanding of what is being investigated, and even in this case, disagreements may arise when choosing a classification.

Another variant of the methodology, the most common one, is the European Innovation Scoreboard (EIS), which has been in force since 2001 and has been implementing the EU's Lisbon Strategy.

First, the European innovation index was calculated, which is a matrix of private indicators of innovative activity of countries ( $I_{ij}$ ) of dimension  $m \times n$ . Here  $I_{ij}$  is the value of a private indicator of the  $i$ -type for the  $j$ -th territorial entity;  $m$  is the number of types of indicators;  $n$  is the number of territorial entities  $S$  ( $1 < i < m$ ,  $1 < j < n$ ). "This tool is complemented by a database on European innovation policy measures, where groups and classes of measures were distributed by countries and placed in a specially built matrix, made in the form of a spreadsheet with hyperlinks to the profiles of these measures". "In 2008, the European innovation scoreboard was significantly improved", various large-scale innovative projects began to be created and implemented, for example, such as PRO INNO EUROPE. Currently, this technique is also being improved and supplemented. The positive side is the credibility and worldwide recognition of this technique.

The Government of Japan proposed an assessment of the scientific and technical potential of the country, consisting of 8 units, characterizing the possibilities at the level of investments and results. This technique has a slightly different approach, mainly the maximum value of 100 is taken as a basis; then the share of one or another indicator is calculated. In this case, the interconnection of the aggregates is practically not taken into account at all. Nevertheless, based on this approach, many others emerge, being developed by today's experts.

The methodology is based on the calculation of the "Index of Development of the Creative Agricultural Economy". A visual scheme for assessing indicators of the development of a creative agricultural economy is shown in Figure 01.



**Figure 1.** General scheme of indicators for the development of a creative agricultural economy

This index consists of indicators reflecting, on the one hand, the potential of the creative agricultural economy, and on the other hand, the relationship contributing to the development of the creative potential of human capital. The top-order indicators according to Figure 01 follow from the definition itself, so let us break them down in order.

The health indicator is the “pillar” of health.

The knowledge indicator is the “pillar” of knowledge. The human capital of a creative agricultural economy should be able to generate new ideas based on scientific knowledge and bring them to the level of innovation.

The morality indicator is a “pillar” that demonstrates the vector of economic development based on indicators of the corresponding rank. When calculating this indicator, the available data in world statistics were taken. In contrast to the above two concepts of “knowledge” and “health”, the morality of the individual, cluster and society has not been developed by statistical bodies.

The methodology for assessing the creative agricultural economy is built up from consistent actions. The initial stage involves the collection and systematization of the initial data. The main sources of information are the official data of international and statistical organizations.

The next step involves a rationing procedure:

$$x_i = \frac{x_i - \bar{x}}{S}, \text{ where } i=1, 2, \dots, n,$$

The obtained data satisfy the condition  $\bar{x} = 0$  and  $S_x^2 = 1$ . It happens like this:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i = \frac{1}{n} \sum_{i=1}^n \frac{x_i - \bar{x}}{S} = \frac{1}{S} * \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x}) = \frac{1}{S} * \frac{1}{n} \left( \sum_{i=1}^n x_i - \frac{1}{n} \sum_{i=1}^n \bar{x} \right) = 0,$$

$$S_x^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{n} \sum_{i=1}^n \left( \frac{x_i - \bar{x}}{S} \right)^2 = \frac{1}{S^2} * \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 = 1.$$

In some cases, there is a need for data unification. In this case, it is necessary to use the principles of calculating the variables of the second type, which are calculated by the following formula:

$$x_i = \frac{x_{\max} - x_i}{x_{\max} - x_{\min}},$$

**Table 1.** Methodology for calculating the three basic indicators included in the index of the creative agricultural economy

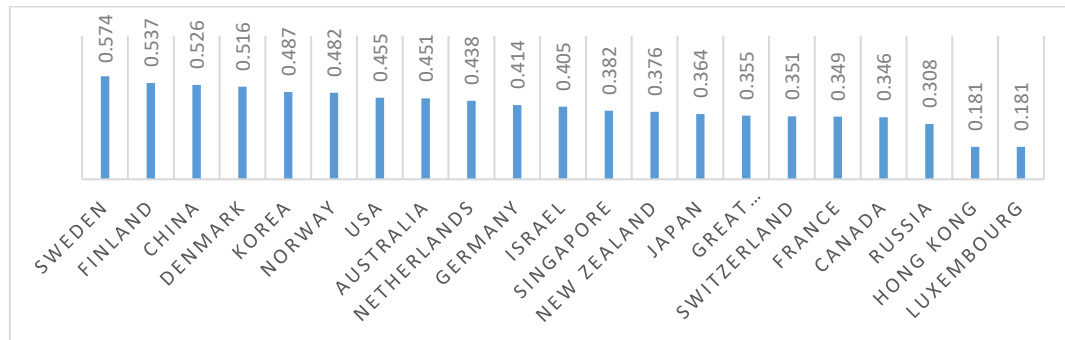
Name	Designation	Calculation formula
Health indicator	$I_h$	$I_h = \frac{I_{h1} + \dots + I_{hn}}{n}$
Knowledge indicator	$I_{kn}$	$I_{kn} = \frac{I_{kn1} + \dots + I_{knn}}{n}$
Morality indicator	$I_m$	$I_m = \frac{I_{m1} + \dots + I_{mn}}{n}$

The calculation of the composite index of the creative agricultural economy is the final stage of the implementation of the methodology. The creative agricultural economy index  $I_{CAE}$  is calculated as the arithmetic mean of all the indicators listed in Table 01. The calculation formula is as follows:

$$I_{CAE} = \frac{I_h + I_{kn} + I_m}{3}.$$

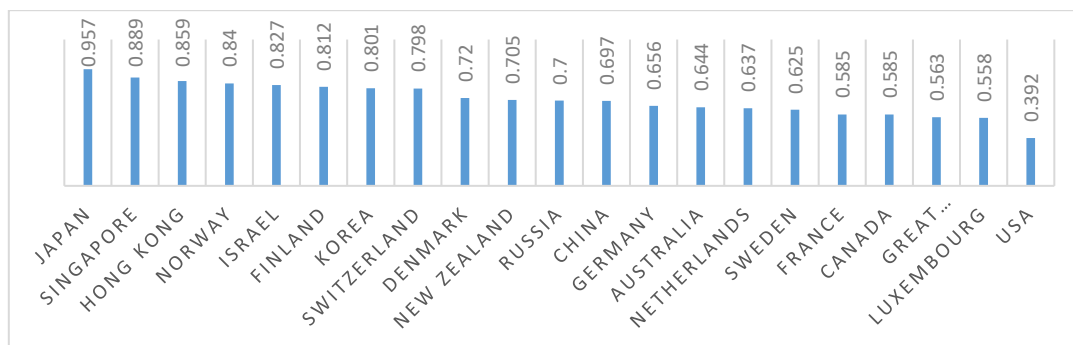
For a more accurate substantiation of the relationship,  $I_{CAE}$  is first calculated, and then the blocks theoretically influencing its development are found out. The calculations used statistical data from well-known international organizations and institutions.

Figure 02 shows the distribution of countries depending on the  $I_{kn}$  value. An important value in the knowledge index is the indicator-enrollment in higher schools, as a percentage of all children who are eligible for this.



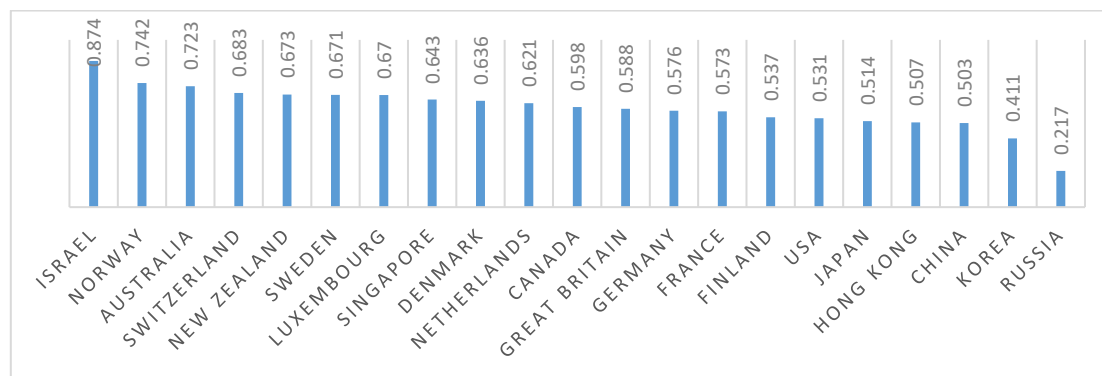
**Figure 2.** Countries depending on the value of the knowledge index

Figure 03 shows the distribution of countries depending on the value of  $I_m$ . According to this indicator, Russia occupies a decent position; the country is in the middle of the studied countries. Japan is not only the leader in moral positions, but also the safest country (since most crime indicators are included in the index), which can favorably affect agricultural tourism.



**Figure 3.** Countries depending on the value of the morality index

Figure 04 shows the distribution of the studied countries, depending on the value of the  $I_h$ . The indicator of Russia occupies the very last line in this list. One of the most significant indicators, such as life expectancy, is that Russia is several times behind the developed countries of the world. Therefore, in absolute terms, we have 72 years in Russia and 82 in Israel, although it is worth noting that the improvement of this indicator in Russia is faster than that in Israel.



**Figure 4.** Countries depending on the health index value

## 4. Purpose of the Study

The main purpose of this work is to develop a methodology for assessing the creative agrarian economy in the countries of the world. For this, the existing techniques are analysed in similar areas, their advantages and disadvantages are identified. Based on this, it is proposed to first approve the concept of a creative agrarian economy and then the formula for calculating its assessment. This work is necessary to assess the sustainable development of the economies of the countries of the world.

## 5. Research Methods

The work uses general scientific methods, statistical methods and mathematical methods, matching and comparison methods. More methods that are specific include the arithmetic mean method; the correlation method is a special case of statistical relationship.

Data standardization (normalization) is a necessary initial stage of data transformation when using many multivariate statistical methods.

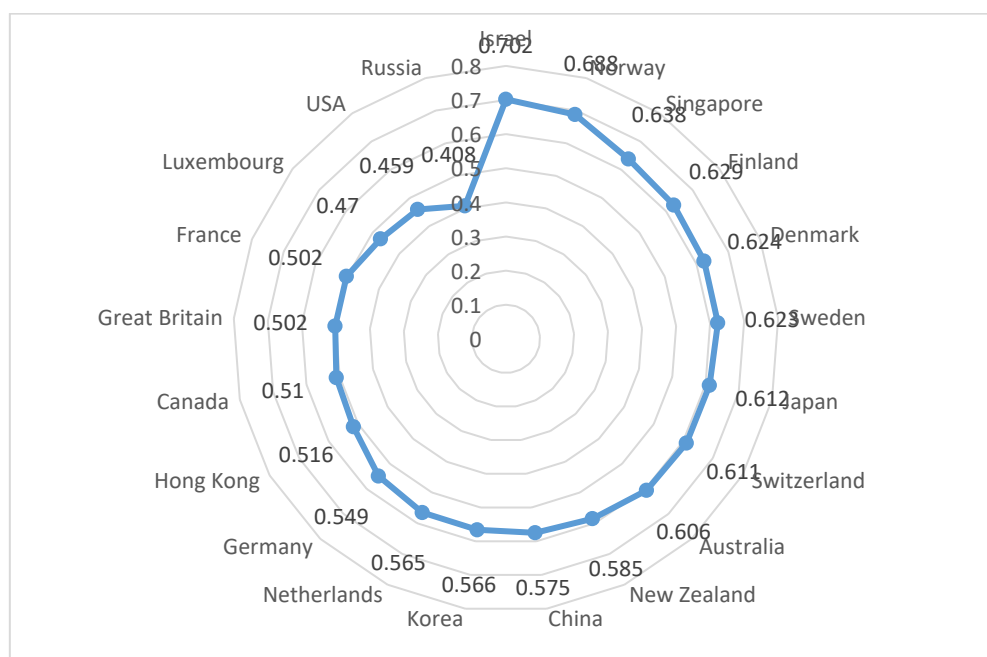
## 6. Findings

Based on the above information, the index of the creative agricultural economy was calculated. Clearly, I\_CAE is shown in Figure 05.

Israel has the highest level of development of the creative agricultural economy – 0.702, followed by Norway – 0.688, followed by Singapore – 0.638. In Russia, the level of ICAE by 2019 reached 0.408. Some scientists confirm Israel's achievements; they believe that it is all about a non-standard and creative approach to farming (Kramarenko, 2019). Israel has also developed a fairly effective system of incentives for agricultural producers who use innovative approaches in their activities. The share of state compensation for new technologies reaches up to a third of all expenses (Naidanova et al., 2020). US with 0.459 ranks last among the leading countries according to the competitive rating; most of this is due to low I\_m indicators.

The United States has long been a leader in the introduction of new methods. The rest of the world has felt respect for this country. The fertilization of the soil with industrial nitrogen, the chemical

protection of plants, the breeding of plants and animals of higher productivity, and the introduction of modern agricultural equipment are all the results of the first great scientific and technological revolution. The first textbooks on world agriculture wrote, “the mechanization of agricultural production is one of the main factors in the growth of labour productivity and productivity” (Kuvshinov et al., 1970, p. 56). This was enough for other countries of the world to adopt this experience. However, as time passed, it became obvious that many methods have negatively affected other components of our lives.



**Figure 5.** The final index of the development of the creative agricultural economy in 2019

## 7. Conclusion

Because of the work, we received a methodology for assessing the creative agricultural economy in the countries of the world. It has been tested in 20 leading countries of the world on a competitive basis and in Russia. The results showed that the leaders are those countries that take into account not only profits and short-term benefits, but also further, that is, future benefits for the country, for society. This is very important for the agricultural sector, as most of the processes associated with this industry are closely interrelated. High-quality food, food security, humane treatment of plants and animals, all this forms the sustainable development of the world economy and the environment. All this is the basis for further economic prosperity of both a single country of the world and the entire world economy.

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