The Assessment of the Feasibility of Using Degraded Lands as a Resource in the Production of Environmentally Friendly Food for Vulnerable Populations

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Abstract. The article presents the assessment of the feasibility of using degraded lands as a resource in the production of environmentally friendly food. The problem of degradation-exposed lands is addressed; the macro and micro social factors impacting the decision-making process in soil protection are identified; a comprehensive model for natural factor recovery in production by introducing organic agriculture technology for manufacturing environmentally friendly products. Research methods used in the article: balance sheet method for agriculture, food production and consumption; written and oral survey. We polled leadership, directors, farmers, businessmen, agrotechnologists, managers, production managers, field foremen, farm and agriculture machinery operator. The survey had questions on the real-life business life and measures taken; respondents’ opinion on the feasibility of using certain methods and technologies, respondents’ awareness of the problem and economic motivation as a result of using methods and technologies, and the social elements of the survey. The survey demonstrated the real situation in the area of land use, knowledge and respondents understanding the technologies they use and how they should be used. The social aspect of the survey helped to measure the competencies that are necessary to solve problems associated with the employed technological methods for protecting the soil system.
So, there is a need for lands where environmentally friendly production can be established with low processing intensity without pesticides and with a limited amount of fertilizers. Such an approach has become feasible from the economy point of view for Russia and other countries after they have become members of the WTO.

1. Introduction

The solution to the problem of providing environmentally friendly food for the population on the global level is being searched for under conditions of more and more degraded lands. According to FAO, "... about 33% of global soil resources have degraded due to erosion, condensation, salination, organic matter and nutrients leaching, acidification, pollution and other processes associated with unsustainable land use..." [1].

The Russian Academy of agricultural sciences has developed a report on the basis of official data sources saying that by early 2008 in Russia from 30 to 40 million hectares of agricultural lands had been taken out of the turnover and was not used [2].

Land use by manufacturers depends on the agricultural and climate factors, working conditions, land resource condition at the manufacturing location. The listed factors and conditions result in rational and irrational business use of agricultural lands. Irrational business use of agricultural lands,
natural disasters lead to lower ball-bonitet of lands (fertility), disturbed water and physical qualities, and growing bulk density. Global needs in food, animal foodstuff and fuel continue to grow fast, while the agricultural land basis that is essential for production is reducing in many parts of the world, which is caused by rapid land degradation[3].

Environment protection agricultural technologies is an alternative when it comes to land degradation[4]. Poverty, food, fight against the destruction of natural non-renewable resources, economic development and inequality are among the priorities for the international community. Continued population and consumption growth will mean that the global demand growth for food will be increasing as well for at least another 40 years[2]. The issue of providing food for the population is considered both on the global level, and from the point of view of food security in individual countries[5, 6].

In the Omsk oblast in the last 8 years the area of agricultural lands reduced with growing areas of fallow land from 2.0% to 2.7% by 2017. In the north forest-steppe zone, the area of agricultural lands reduced by 16.9%, by 12% in the northern zone, by 10% in the southern forest-steppe zone, by 1.6% in the steppe zone, which shows that lands are used for other types of agricultural activities. We should point out that in the last years the area of natural foraging lands (hayfield and pastures) has grown considerably with more than 35% [7], which is associated with land degradation.

The current negative trend in the agricultural land use led to irrational land management, diminished soil fertility and smaller cultivated land surface. This is why we face a multifaceted task: from one hand, it is essential to find additional land resources to provide the population with food, on the other hand, it is necessary to create incentives for land users to work in conservation farming to introduce derelict lands back into use and scale up agricultural production.

State makes steps to improve the situation in agriculture. For example, in the Russian Federation until 2014 there had been a federal targeted programme on protection and fertility restoration of agricultural land [8], with a view to maintain and manage agricultural lands and landscapes, to create conditions for scaling up high quality agricultural production on arable lands with restored and improved fertility, etc.

From 2014 to 2020 in Russia there has been a federal targeted programme "Arable land development in Russia in 2014-2020" aimed at improving productivity and sustainability of agricultural production and land fertility through comprehensive development under the conditions of climate change and extreme weather events; higher production capacity of arable land and efficient use of natural resources[9].

These programmes work in certain regions and to a certain degree. In case of the mass degraded land restoration this results in a number of problems, as in Russia there is no centralised programme for mass degraded land reclamation for agricultural use.

Research of behavioural reactions associated with technology and sustainable management of arable lands, and response mechanisms to state support is especially relevant. There is a scientific and practical problem of identifying facts that impact the substance of solutions and individual actions of businesses as regards to agricultural use of degraded lands. It is key to find the correlation between solutions and economic interests of agriculture manufacturers.

2. Materials and methods
The authors present the results of the scientific research with a view to assess the feasibility of using degraded land as a resource for producing environmentally friendly products for vulnerable populations.

The main goals of the research:
1) find lands that are susceptible to degradation;
2) identify macro and micro social factors that impact decision-making process associated with soil protection technologies;
3) propose a comprehensive model for restoration of natural factors of production through introducing organic agriculture for manufacturing environmentally friendly products.
Agricultural organizations and farming businesses in the Omsk oblast became the objects of agricultural assessment. Assessment subjects were the leadership, directors, farmers, businessmen, agrotechnologists, managers, production managers, field foremen, farm and agriculture machinery operators from agricultural organizations and farming businesses.

Research methods: balance sheet method for agriculture, food production and consumption; written and oral survey.

3. Results and discussion

The survey were developed so that every question corresponded to the position of the respondent. The number of respondents was 804 people. The questionnaire was divided into two thematically linked sections: the real-life business life and measures taken; respondents' opinion on the feasibility of using certain methods and technologies, respondents' awareness of the problem and economic motivation as a result of using methods and technologies, and the social elements of the survey.

When the initial results were described, the aim of the first section was to register certain quantitative indicators for business land use (area, type of land, uncultivated lands and the reasons for not farming it, fallow lands, etc.) and the legal status of lands (property, duration and type of land lease) and measures taken (moisture accumulation, fertilisers).

The total area of agricultural land provided by 268 surveyed businesses is about 1.9 million hectares with 30 thousand hectares of uncultivated land. However, according to the respondents, in the Omsk oblast, major areas of agricultural lands are prone to flooding, water logging, desertification and gradually become unsuitable for cultivation and as foraging sites (low ball-bonitet), as was stated by 20 businesses from 4 climate zones of the region. As a result of the negative processes that affect large areas and cultivation of poor lands, the overall fertility continues to deteriorate despite considerable state efforts aimed at maintaining and improving the fertility (liming, gypsum treatment, irrigation, drainage and organic and mineral fertilisers, etc.).

Non-usage of arable lands is associated with the surface of agricultural lands that cannot be used due to economic reasons (small size) and remoteness from communities and production distribution points (outland). The results of the survey and field experiments in the Omsk oblast showed that 51 agricultural produces pointed out the issues of small sizes and outlands. Land scarcity was mentioned by some businesses in the north forest and steppe areas of the Nizhneomsk region, where there are no rented land plots located in close proximity to one another, which is comfortable for the tenants. Forestation and bush formation of arable lands was pointed out by 35 farms in all climate zones of the Omsk oblast.

Besides natural negative processes, respondents indicated different legal status of arable lands (private property, joint property, leasing, etc.). Major agricultural organizations use lands that belong to the following businesses: in Pavlogradsky region there are Niva, JSC with 43493 ha, and Stepnoe, JSC with 20468 ha; in Rusko-Polyansky there are Tselinnoe, OJSC; Khelobodarovskoe, JSC, with 19333 ha each; in Isilkulsky there are Novorozhdestvenskoe, CJSC with 18365 ha, and Solnetsevo, JSC with 11316 ha; in Mariyanovsky there are PKZ Omsky, OJSC with 15425 ha; in Mosckalensky there are KamKur Agro, OJSC with 15477 ha and some of these companies use lands on the conditions of long-term leasing, from 5 to 10 years.

Companies that use lands under the conditions of short-term leasing (up to 1 year) with part of it being degraded are the "hostages" of arable land withdrawal, as the land user is not interested in investing in such lands (for example, the return on the invested financial and material resources in land chemicalization and development is about 5-8 years).

The second section of the survey is aimed at identifying the level of awareness of the respondents of the feasibility of using environmentally friendly methods and technologies and has shown that agricultural businesses (leadership, directors) point out good expertise in soil protection technologies, land cultivation methods, crop rotation system, fertilisers, plant protection, but they also say that training is not unwelcome; heads of farming businesses say that they have "some knowledge" of the
aforementioned issues. Agrotechnologists in the majority of the polled businesses go to various seminars organized by scientists from the Omsk state agrarian university and representatives from the Ministry of agriculture and food of the Omsk oblast and collect information that is necessary in the field.

The respondents' assessment of the awareness and economic motivation of the soil protection system in agriculture demonstrates the concerns of the respondents associated with soil erosion, in particular during some years. Almost all respondents have said that the soil protection technology and state support in the form of additional financial subsidies are clearly efficient.

The social aspect of the second section of the questionnaire gives some insights into the personality of the respondent (age, education, degree, position, etc.). The respondents have necessary competences that are key to the solution of questions related to the employed technological methods under soil protection system.

Respondents have a general understanding of soil protection technologies, realize the soil erosion threat for the crop yield, and see soil protection as a positive economic factor. However, not all of the respondents can use these technologies, as manufacturers with low income only care about short-term survival. This is why businesses can and will solve their socially meaningful long-term problems only when their work will generate enough income. The more the profit, the more a company is ready to take protective measure against degradation[10].

The decision making process in soil protection is influenced by a number of macro and micro social factors. Macro-social factors are not included into the sphere of land use, and the micro-social ones relate only to the efforts of businesses. The first group includes insufficient development of social, engineering and transport infrastructure, demographic trends, lack of decent labour conditions, state policies, etc. The second group impacts the decision making associated with technologies, skills and knowledge, the relation between a land user and technologies.

The accumulated survey data on the use of all the elements of soil protection technology indicate the lack of knowledge of the workers in the field, in particular heads of farming businesses, foremen and agriculture machinery operators. This is why we propose a comprehensive model for restoration of natural factors of production through introducing organic agriculture for manufacturing environmentally friendly products.

The purpose of the model is the restoration of agricultural lands that have been destroyed as a result of unsustainable management of land resources, including: derelict lands should be used for the production of environmentally friendly products; internal food support for vulnerable populations; state policies and targeted programmes for eliminating the differences in the income between executives in farming businesses that cultivate poor lands and agents that do intensive farming.

Fundamental processes aimed at the creation of a system for providing vulnerable populations with environmentally friendly products and use of derelict lands must be launched under the development strategy for the Omsk oblast. The national food security doctrine identifies populations (pregnant and nursing mothers, children, school children, social welfare institution clients, etc.) that must be provided with healthy food by the state. There is a justified need to produce environmentally friendly food for meeting the needs of the public. So, there is a need for lands where environmentally friendly production can be established with low processing intensity without pesticides and with a limited amount of fertilizers.

4. Conclusions
1. As a result of unsustainable management of land resources, a multifaceted issue has emerged: from one hand, it is essential to find additional land resources to provide the population with food, on the other hand, it is necessary to create incentives for land users to work in conservation farming to introduce derelict lands back into use and scale up agricultural production.

2. The article analyses behavioural responses of agricultural businesses to sustainable use of arable land and employing technologies, and studies the response mechanisms to state support.
3. The recommended efforts are aimed at improving the practice of soil protection, sustainable use of land resources and addressing the social needs of the population, and use of derelict lands as a resource for producing environmentally friendly food for vulnerable populations.

5. Recommendations

1. There is a need for further research of informal institutions, incentive mechanisms for agricultural manufacturers to use environmentally friendly technologies and lands that are not suitable for intensive farming.

2. Support of national agricultural manufacturing and processing businesses must be given as part of a "green basket" while eliminating state support limitations under the WTO, and as a result manufacturing and processing businesses will see demand for their products and will meet the internal demand in the region.

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