

**LEASECON 2020****International Conference «Land Economy and Rural Studies Essentials»****TYPIIFICATION OF LAND AND NATURE MANAGEMENT  
SYSTEMS IN TARSKY DISTRICT (OMSK REGION)**

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**Abstract**

Modern society can exist and function only in constant interaction with nature by implementing nature management. Natural resources as well as economic and social factors determine the opportunities contributing to the development of the region and its system of nature management. Natural resources are inseparable from land, in connection with which the process of nature management is directly accompanied by the process of land management. Thus, the systems of land and nature management are closely related to each other. Specifically, when one system changes the other one changes as well. Production development necessitates monitoring the state of land and nature management systems as well as determining the possible ways of their development. Within the framework of this study, municipal unit territory was typified according to the optimal indicators of land and nature management. Identification of typical areas of the Tarsky district of the Omsk region from the viewpoint of land and nature management will better reflect the general situation in the field of environmental management, predict their further development, and develop proposals for the rationalization and adaptation of the use of land and other natural resources on the basis of typical sites.

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## 1. Introduction

Typification enables to streamline understanding the structural, functional and territorial components of the natural environment and social reproduction, theoretically substantiate the system-forming connections and interactions of system elements, predict their further development and determine ways of their effective regulation (Veselova, 2015). Typical research is the most likely one for a given system. Thus, the identification of typical areas of the Tarsky District of the Omsk Region from the viewpoint of land use and nature management will better reflect the general situation in the field of land and nature management, predict their further development, and develop proposals for the rationalization and adaptation of the use of land and other natural resources on the basis of typical sites.

## 2. Problem Statement

The land reform of 1991 led to many shortcomings in the systems of land and natural resources use in Russia (Volkov, 2001). Undesirable phenomena including underutilization of agricultural land and leading to their overgrowth with trees and shrubs and their further transfer to non-agricultural land, violation of scientifically based use of arable land, development of land use and land tenure shortcomings, lack of clear fixed boundaries of business entities began to appear in the system of agricultural land use. All these phenomena had a detrimental effect on the rational and efficient use of land resources, led to a reduction in agricultural production and formed many land disputes (Medvedeva, 2009).

Problems concerning the use of natural resources in agricultural production have also emerged in the system of agricultural nature management. These problems are more pronounced in the increase in the area of agricultural land, which is subject to negative natural processes, the development of erosion and deflation, a decrease in the fertility of soil cover, etc. (Magomedov & Velibekova, 2015).

Thus, at present, the question of the need to improve the systems of agricultural land use and nature management through land management is sharply raised, which in turn creates a system for the effective use of land and other natural resources, and forms a stable economic performance of agricultural production. Typification of sites contributes to the development of strategic measures to rationalize land and nature management within the boundaries of the municipality.

## 3. Research Questions

The object of the research is the systems of agricultural land use and nature management within the administrative boundaries of the Tarsky municipal district of the Omsk region. The Tarsky municipal district is located in the north-east of the Omsk region of Russia. The administrative center of the district is Tara, being the second largest city in the Omsk region after Omsk (Petrov, 2017).

The district is characterized by a significant remoteness from Omsk being the administrative center of the Omsk region (302 km). Transport connection with it is possible by road or air transport (an airport is located on the territory of the Tarsky district), in summer water transport (a branch of the Irtysh river shipping company is located on the territory of the district) is used. The district is located at a considerable distance from the railway, specifically, 250 km.

The Tarsky District is one of the most promising districts of the Omsk Region with regards to the involvement of minerals in the economic turnover. The total area of land within the administrative boundaries of the Tarsky district as of January 1, 2018 was 1,556.087 thousand hectares. Agricultural land in the Tarsky district occupies 224.8 thousand hectares. Agricultural land is dominated by arable land and is equal to 70.0%, of which arable land accounts for 47.6%, fodder land for 37.3% (Petrov, 2017).

#### **4. Purpose of the Study**

Typification of land and nature management systems on the territory of the Tarsky municipal district aimed to develop strategic measures to rationalize land and nature management within the boundaries of the municipality.

#### **5. Research Methods**

The research methodology is based on the use of balance, cartographic, abstract-logical, economic-statistical, system analysis methods. Graphic material was processed with the software MapInfo Professional 15.0 and AutoCAD 2013.

#### **6. Findings**

The analysis of the existing systems of agricultural land and nature management within the boundaries of the Tarsky municipal district revealed the most preferable territorial part for agricultural production being the south of the district, mainly represented by the left bank of the Irtysh being the main water artery of the district (Petrov, 2019). However, for a more orderly presentation of the current picture, it is most rational to group the territory of the region according to the prevailing type of nature management. The materials of the analytical part of the study were used at the first stage to provide this grouping and the territorial binding of the selected groups (Petrov, 2017).

The economy of the Tarsky district is based on agriculture, forestry and woodworking industries. In this regard, the region is unique in its industrial complex and potential, where forestry is developing along with agricultural production (Sokolova & Zakharova, 2019). Thus, it becomes necessary to identify zones of dominant types of nature management in different areas.

Indicators of agricultural development and forest cover of the territory were identified to provide zoning, which determine the typical areas according to the actual types of prevailing nature management (Veselova, 2006). Rural settlements of the Tarsky Municipal District as well as parts of them were chosen as an evaluation unit for this zoning.

At the first stage, rural settlements of the district were grouped out according to the actual indicators of agricultural development and forest cover of the territory. Based on the grouping of the territory, it can be concluded that the Tarsky district as a whole is a typical representative of the northern natural-agricultural zone in terms of agricultural development (14.5%) and forest cover (85.0%). However, a more detailed analysis of the above indicators in the context of rural settlements and the banks of the river Irtysh led to a strong gradation contradicting the above statement at times. The right

bank of the river Irtysh is characterized by a very low agricultural development (7.2%) and a very high rate of forest cover (92.5%). In this connection the territory can be defined as a zone of specialized forestry nature management. The left bank of the Irtysh, on the other hand, is characterized by a relatively high rate of agricultural development (59.4%) and a small part of forest-covered areas (38.9%) for the northern natural-agricultural zone. Whereas the area of agricultural land on the left-bank part of the Tarsky district occupies a large part, this territory and rural settlements of the left-bank part of the river Irtysh can be characterized as a zone of specialized agricultural nature management (Petrov, 2017). Thus, two groups of environmental management systems can be distinguished within the boundaries of the region based on the above features of nature management. Specifically, on the right bank of the river Irtysh the environmental management system is a predominant forestry type, on the left bank there is an agricultural type of nature management.

However, if the valuation units (rural settlements) are analyzed, then a number of contradictions are formed in the identified zones. Specifically, in this zone of specialized forestry environmental management, there are settlements that stand out from the general conclusion that the settlements on the right bank of the river Irtysh have a very low level of agricultural land development and a high rate of forest cover. For example, Egorovskoe, Ermakovskoe, Nagorno-Ivanovskoe, Samsonovskoe and Ust-Tarskoe rural settlements have a relatively good level of development (30-40% of the territory) for rural settlements on the right bank and these settlements have a good forestry infrastructure as well. Based on this, the third type of nature management being a complex one can be distinguished on the territory of the district. It goes about the territory where the boundaries of agriculture and forestry can be developed in parallel. Thus, within the boundaries of the Tarsky municipal district, it is proposed to distinguish three zones with different types of nature management, namely, they are as follows:

- zone of specialized forestry nature management;
- zone of integrated nature management;
- zone of specialized agricultural nature management.

Within the boundaries of each zone of a certain type of nature management, the territory is developed in different ways, and the forest cover of the territory has a different character. For example, there is often no agricultural land in the dedicated zone of specialized forestry nature management and the landscapes are mainly represented by forests and swamps.

**Table 1.** Grouping settlements of the district according to actual indicators

Rural settlements	Zoning by type of nature use					
	specialized forestry nature management		integrated nature management		specialized agricultural nature management	
	agriculture, %	forestry, %	agriculture, %	forestry, %	agriculture, %	forestry, %
<i>1. Right bank of the river Irtysh</i>						
Ermakovskoe	-	-	30.1	68.9	-	-
Nagorno-Ivanovskoe	-	-	43.1	55.8	-	-
Samsonovskoe	-	-	26.7	73.3	80.6	19.4
Vasisskoe	1.2	98.8	-	-	-	-
Imshegalskoe	20.8	78.6	-	-	-	-
Litkovskoe	2.2	97.8	-	-	-	-

Egorovskoe	-	-	29.8	69.3	-	-
Martyushevskoe	-	-	26.0	73.0	-	-
Atirskoe	-	100.0	25.1	74.7	-	-
Pologrudovskoe	-	-	29.8	67.5	-	-
Ust-Tarskoe	-	-	27.3	72.7	97.7	2.3
Mezhdurechenskoe	14.3	83.6	-	-	-	-
Ekaterininskoe	5.4	90.9	-	-	100.0	-
<i>2. Left bank of the river Irtysh</i>						
Vstavskoe	-	-	-	-	71.4	27.4
Bolshe-Turalinskoe	-	-	-	-	62.4	36.6
Lozhnikovskoe	-	-	-	-	56.0	43.2
Souskanovskoe	-	-	-	-	44.7	54.4
Chernyaevskoe	-	-	-	-	69.6	28.9
Chekrushanskoe	-	-	-	-	69.8	25.3
Zalivinskoe	-	-	-	-	56.6	40.5
Orlovskoe	-	-	-	-	58.8	40.4
Tarskoe	-	-	-	-	72.0	9.1
Total by zone	2.3	97.7	19.5	80.5	61.9	38.1
Total for the district		<b>agriculture – 14.5</b>			<b>forestry – 85.0</b>	
Total for the northern zone		<b>agriculture – 19.3</b>			<b>forestry – 77.2</b>	

The main economic activity on the territory of this zone is production of redwood like pine and larch. In other words, the territory of this zone is the area of the main forest resource base of the district and region. As well, the designated forestry zone includes large reserves of potential cedar forests, only a few of which are left within the region.

Left bank of the Irtysh as well as a part of the right bank represented mainly by land along the Irtysh forms a zone of specialized agricultural nature management, characterized by a high agricultural development by the representatives of the northern regions (62%). Agricultural production dominant in the economy of the district settlements within the boundaries of the formed zone historically formed here.

In the central part of the district, a zone of integrated nature management has been formed, on whose territory forestry functions along with agriculture. This zone is characterized by a typical insignificant level of agricultural development for the region (17%) and a high level of forest cover (Table 1). The timber industry complex is well developed in the zone of integrated nature management. It includes harvesting, processing and sale of red and ordinary wood, secondary forest use. In addition to this, in the rural settlements of this zone, there is also the development of agricultural production, mainly represented by peasant (farmer) and personal subsidiary plots engaged in animal breeding as well as crop production as an additional activity.

The Tarsky district is unique in its industrial complex. Along with agricultural production, forestry is also developing here. Nine agricultural enterprises, 15 peasant (farm) households and more than 13 thousand personal subsidiary plots are engaged in manufacturing agricultural products in the Tarsky district (Yudina & Konovalov, 2019). The woodworking industry in the Tarsky district is represented by three leading organizations being a branch of ZAO “AVA Company”, “Atakskiy Lespromkhoz” and OOO “NPK “Sibirskiy Les”. In addition, specialized autonomous institutions “Tarsky forestry” and “Vasissky forestry” as well as about 100 small businesses are engaged in wood harvesting and processing in the region (Petrov, 2019).

The availability of agricultural land and organizations is not the main factor for the successful future development of agriculture (Shumakova et al., 2019). One of the key factors is the land suitability for agricultural purposes with regards to cultivation and processing of crops (Krupkin, 2007). To identify lands suitability for agricultural use, the method of agroecological typification of lands was applied (Samofalova et al., 2013). Land types are formed by combining elementary areas of similar cultivation conditions for a given culture or a group of crops with similar agroecological requirements, fertility, ball-bonitet, pronounced negative processes, etc. (Kiryushin, 2010). For the purpose of assessing and grouping lands, 312 elementary soil areas were allocated, which correspond to the boundaries of soil differences. In accordance with the principles of natural limitations on the lands suitability for growing certain crops and the nature of measures to overcome or adapt them, agroecological types of lands were ranked according to six categories of suitability (Kiryushin, 2011).

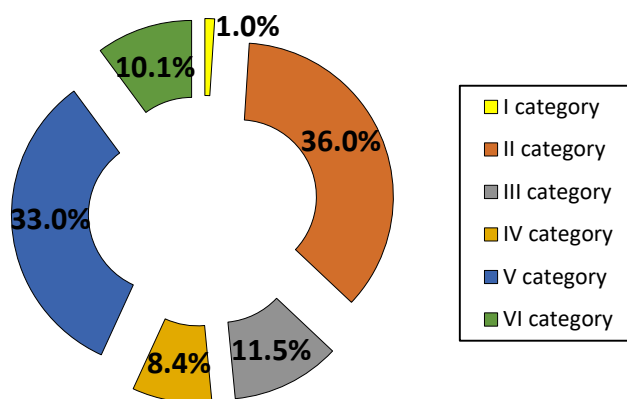
On the territory of the Tarsky district, within the boundaries of the identified zones of nature management types, the following types of agricultural land whose characteristics are presented in Table 2 were identified.

**Table 2.** Characteristics of agricultural land suitability for agricultural use

Category	Suitability group	Soil characteristics	Area, hectares	Specific gravity,%
<b>Zone of specialized forestry nature management</b>				
V	suitable for cultivating agricultural crops but only after complex hydrotechnical reclamation	boggy, meadow-boggy, meadow soils in a complex with meadow-boggy ones	245	0.1
VI	unsuitable for cultivating agricultural crops due to unavoidable limitations and small adaptability	podzolic soils	99	0.1
Total land by zone		344		0.2
<b>Zone of integrated nature management</b>				
II	suitable for cultivating agricultural crops with few restrictions	sod-podzolic, gray forest soils	18336	8.2
III	suitable for cultivating agricultural crops with restrictions hardly suitable for cultivating agricultural crops due to unavoidable restrictions	gray forest, gley and gleyed soils	25740	11.5
IV	restrictions on the conditions of soil-forming rocks, relief and other conditions	alluvial soddy, alluvial meadow-boggy soils	5638	2.5
V	suitable for cultivating agricultural crops only after complex hydrotechnical reclamation	boggy, meadow-boggy, meadow in a complex with meadow-boggy soils	9175	4.1

VI	unsuitable for cultivating agricultural crops due to unavoidable restrictions and little adaptation possibilities	podzolic soil	15862	7.1
Total land by zone		74751	33.4	
<b>Zone of specialized agricultural nature management</b>				
I	suitable cultivating agricultural crops on arable land for without significant restrictions	meadow chernozem soil	2295	1.0
II	suitable for cultivating agricultural crops with few restrictions	sod-podzolic, gray forest soils	62602	27.8
IV	hardly suitable for cultivating agricultural crops due to unavoidable restrictions on the conditions of soil-forming rocks, relief and other conditions	alluvial soddy, alluvial meadow-boggy soils	13160	5.9
V	suitable for cultivating agricultural crops only after complex hydrotechnical reclamation	boggy, meadow-boggy, meadow soils in a complex with meadow-boggy ones	64859	28.7
VI	unsuitable for cultivating agricultural crops due to unavoidable restrictions and little adaptation possibilities	podzolic soils, solod soil	6792	3.0
Total land by zone		149,706	66.4	
<b>Total agricultural land</b>		<b>224,801</b>	<b>100.0</b>	

Thus, soils on agricultural lands on the territory of the Tarsky district have poor agricultural production properties since soils of categories V (74.3 thousand hectares) and VI (22.8 thousand hectares) prevail (Figure 1).

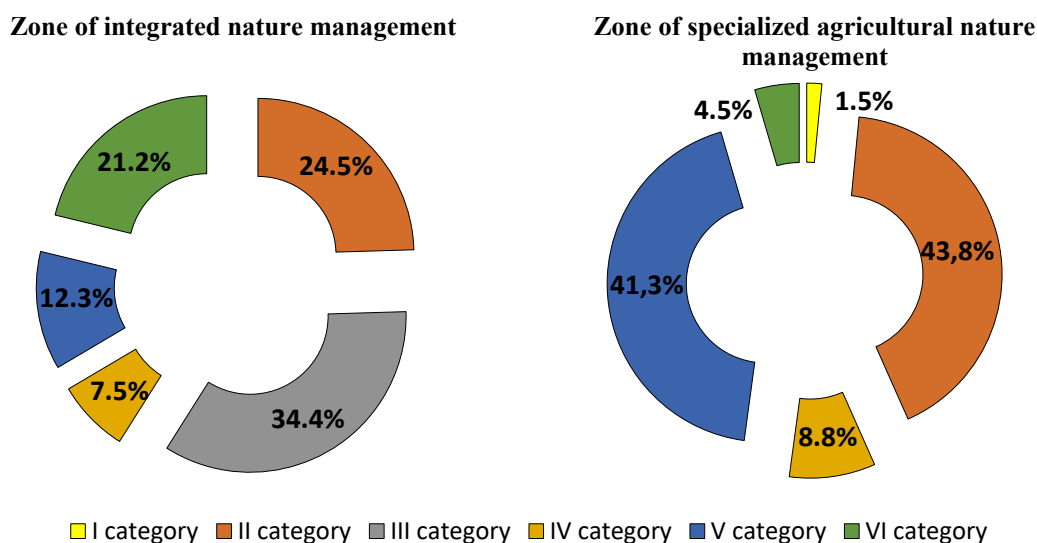


**Figure 1.** Part of agroecological types by land suitability categories

Soils of these categories are rarely used in agriculture, since they require very costly measures to increase fertility (Chernogorov et al., 2012). Most of the land in these suitability categories is used as forage lands. The main methods to use lands of category V rationally is to regulate the surface runoff, and it is more rational to transfer lands of the category VI to the lands of the forest fund in view of their low suitability and large remoteness.

Lands of suitability categories II and III also form a significant part accounting for 47.5% in total. For lands of these categories, it is rational to improve fertility and reduce negative factors by introducing organic and mineral fertilizers, deepening the arable layer, liming and improving the water regime. Lands of category I, which do not require significant measures to stabilize fertility with the exception of recommendations for optimizing the composition of nutrients and the selection of more resistant varieties of grain crops for these conditions, occupy a very small proportion (1%).

When considering the suitability of lands in the context of the designated zones of various nature management types, then the lands suitable for agricultural use dominate in the potential zone of specialized agricultural nature management and integrated nature management (45.3% and 58.9%, respectively). The data are shown in figure 2.



**Figure 2.** Part of agroecological types by land categories with regards to designated zones of nature management types

## 7. Conclusion

Agroecological typification shows that the lands within the boundaries of the Tarsky district as a whole and separately for the formed zones of nature management have the potential for the development of agricultural crop production.

Typical systems of land and nature management have been identified within the boundaries of the municipality. Territory zoning by types of nature management has been carried out. There are three zones within the boundaries of the Tarsky district:

- a zone of specialized forestry nature management (agricultural land development is 2.3%);
- zone of integrated nature management (agricultural land development is 19.5%);



- a zone of specialized agricultural nature management (agricultural land development is 61.9%).

The results of agroecological land typification according to suitability showed that soils on agricultural lands on the territory of the Tarsky district have comparatively favorable agricultural production properties since lands of suitability categories II and III prevail, making up 47.5% in total.

Thus, agricultural lands within the boundaries of the Tarsky district as a whole and separately according to the formed zones of nature management have the potential and prospects for the development and improvement of agricultural crop production.

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## References

- Chernogorov, A. L., Chekmarev, P. A., Vasenev, I. I., & Gogmachadze, G. D. (2012). *Agroecological land assessment and land use optimization*. Moscow, Publishing house of Moscow University.
- Kiryushin, V. I. (2010). *Agronomic soil science*. Moscow, KolosS.
- Kiryushin, V. I. (2011). *Soil classification and agroecological land typology*. Moscow, Lan.
- Krupkin, P. I. (2007). Land typification - the basis of adaptive landscape farming systems. *Bulletin of the Altai State Agrarian University*, 5(31), pp. 22-26.
- Magomedov, A. M., & Velibekova, L. A. (2015). Nature management is the basis of land use organization *Mountain agriculture*, 4, pp. 11-15.
- Medvedeva, O. E. (2009). *Problems of sustainable land use in Russia*. Moscow, Publishing House of the Institute for Sustainable Development.
- Petrov, M. A. (2017). Analysis of the existing system of agricultural land use in the Tara municipal district of the Omsk region *Electronic scientific and methodological journal of the Omsk State Agrarian University*, 2(9), pp. 18.
- Petrov, M. A. (2019). Formation of adaptive land use in the zone of integrated nature management of the Tara region for the purposes of sustainable development of rural areas *Modern scientific knowledge in the context of systemic changes*, pp. 134-140.
- Samofalova, I. A., Mudrykh, N. M., Kamenskikh, N. Yu., & Lobanova, Yu. A. (2013). Agroecological typification of lands as a basis for improving crop rotation and fertilization systems *Vestnik Altai State Agrarian University* 5(103), pp. 45-50.
- Shumakova, O. V., Kryukova, O. N., Kosenchuk, O. V., & Mozzherina, T. G. (2019). The Influence of a Resource and Competence Centre on the Multifunctional Development of Agriculture *The Fifth Technological Order: Prospects for the Development and Modernization of the Russian Agro-Industrial Sector (TFTS 2019): Advances in Social Science, Education and Humanities Research: Vol. 393*.
- Sokolova, E. V., & Zakharova, T. I. (2019). Factors of Formation and Development of Human Capital in Rural Areas *The Fifth Technological Order: Prospects for the Development and Modernization of the Russian Agro-Industrial Sector (TFTS 2019): Advances in Social Science, Education and Humanities Research: Vol. 393*.
- Veselova, M. N. (2006). The influence of changes in the parameters of nature management on the state of land use in the Omsk region. *Omsk Scientific Bulletin*, 2(35), pp. 198-202.
- Veselova, M. N. (2015). Identification of typical systems of land and nature management of the Omsk region and the ways of their development *Omsk Scientific Bulletin* 2(144), pp. 157-160.

- Volkov, S. N. (2001). *Land management. Volume 1. Theoretical foundations of land management*. Moscow, Kolos.
- Yudina, E. V., & Konovalov, S. A. (2019). Development Issues and Prospects of Milk Processing Enterprises *The Fifth Technological Order: Prospects for the Development and Modernization of the Russian Agro-Industrial Sector (TFTS 2019): Advances in Social Science, Education and Humanities Research: Vol. 393*.