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Article

Fostering sustainable innovative development of agriculture: The example of taxation reform in Kazakhstan

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Abstract: The aim of this paper is to develop a methodology for determining the size of the unified land tax in agriculture based on the results of the economic assessment of agricultural land to form the foundation of a new effective system of macroeconomic instruments for state regulation of the innovative development of the agro-industrial complex of the Republic of Kazakhstan. There were used gatherings of facts and summaries, induction and deduction, analysis and synthesis, historical and logical, normative, comparison, index and modeling methods in the research. The article provides an overview of various scholarly perspectives on the challenges and strategies for improving the tax system. The base rates of the unified land tax per hectare of arable land have been calculated to establish equal conditions for all land users. This unified land tax rate is expected to encourage the efficient utilization of land resources and enable the optimization of production structure. The article addresses avenues for improving water management relations in agriculture, aimed at fostering a shared interest and creating incentives for adopting innovative technologies in both agriculture and the water management sector. An essential condition for achieving the effective functioning of Kazakhstan's agro-industrial complex is its transformation to an innovative development model. This necessitates the development and application of a new system of macroeconomic tools for its implementation, aimed at creating a favorable environment for entrepreneurial development.

Keywords: macroeconomic instruments; taxes, money; loan, subsidies; innovation; integration; land rent; water relations; efficiency

1. Introduction

The agricultural sector in the Republic of Kazakhstan is currently characterized by a low level of resource utilization. To date, more than 80 million hectares of agricultural land remain underutilized, labor productivity in agriculture is low, and the proportion of self-employed individuals within the sector remains substantial. In addition, the majority of agricultural enterprises continue to use outdated equipment and technologies. The agricultural sector remains unattractive for investment. Kazakhstan continues to be dependent on food imports, with an upward trend in import

volumes. The origins of these adverse trends can be traced to the country's macroeconomic policy, underscoring the clear need for its comprehensive reform.

Macroeconomic instruments for state regulation of economic development include the tax system, monetary policy, insurance, and government support in the form of subsidies and investments. The tax system, beyond its fiscal role, should also perform regulatory, redistributive, and incentivizing functions.

The equalization of initial conditions for market entities situated on lands of differing quality and location should be facilitated through the implementation of a land tax that captures differential rent. This long-term, stable tax is expected to incentivize market participants to utilize land resources more efficiently particularly in the context of land degradation.

It should serve as a foundation for developing a new system of macroeconomic instruments for state regulation of innovative agricultural development. From this standpoint, the article evaluates the current taxation system in agriculture and proposes strategies for its improvement.

2. Literature review

The high efficiency of agricultural operations in developed countries has been attained through the implementation of a coherent economic policy aimed at fostering accelerated innovative development, with a significant emphasis on the use of digital technologies (McConnell, 1995; Samuelson, 2000; Yespolov; 2017) The integration of innovative technologies has been carried out systematically through the execution of various government programs targeting key areas of economic development (Filatov, 2014; Madiyev, 2018; Nechayev, 2022).

Considered factors include the prolonged payback period for investments in the sector, a substantial reliance on natural and climatic conditions for production outcomes, and a sluggish response to fluctuations in market conditions. These characteristics influence both the competitiveness of agricultural products and the investment appeal of the sector.

The cornerstone of sustainable innovative development in agriculture is an effective macroeconomic policy designed to create a conducive environment for business development and enhance investment activity. This strategy has led to consistent production growth, a reduction in unemployment, and an increase in income and living standards among the rural population. The effectiveness of these investments is evidenced by the growth of gross national product, which has exceeded the rate of investment growth (Heady, 2010; Madiyev, 2018).

The World Bank report "Agriculture for Development" asserts that, in the context of poverty alleviation, growth in gross domestic product (GDP) attributable to agriculture is regarded as twice as effective as increases in production volume from other sectors of the economy. The selection of support methods for the sector was determined by factors such as the geopolitical context, the competitiveness of produced goods, and the presence and level of development of cooperation and integration. A notable increase in the utilization of financial instruments to facilitate integration processes across various sectors has been observed (Randal and Wang, 2018).

The commitments of developing countries to reduce direct subsidies to the agricultural sector, in accordance with the conditions of their accession to the World Trade Organization, along with the need to adhere to a unified approach to coordinated agricultural policy, compel governments to seek indirect methods of supporting the sector through effective tax mechanisms and other strategies (Krylatykh, 2004).

The organization of rational land use has become crucial for the sustainable development of agricultural production (Dubovitsky, 2021).

The land rent is a well-established mechanism for achieving effective land resource utilization, recognized in global practice. There are identified four classical types of land rent in economic theory: absolute rent, monopoly rent, and two forms of differential rent.

Many issues in the theory of land rent continue to be contentious. Substantial differences exist in the conceptualization of land rent between classical and neoclassical theories. Proponents of classical theory assert that labor constitutes the source of rent, with its formation attributed to monopoly control over land as both a means of production and an object of ownership, while natural and economic disparities serve as the underlying conditions (Buzdalov, 1997; Gaisin, 1998).

Proponents of neoclassical theory base their arguments on the theory of three factors. According to neoclassical economists, the source of land rent is the land itself rather than labor. Rent is formed as a result of demand for agricultural products, given that the demand for land is derived and its supply is inelastic.

Further research on the theory of land rent is based on the recognition of their continuity, which underlies the development of a two-factor pricing theory that integrates both the cost of production and marginal utility theories (Marshall, 1993).

The subsequent stage in the development of this theory corresponds to the growing complexity of economic relationships among market participants, highlighting the need for government regulation of the economy. Consequently, the role of the state has increased in regulating not only the overall economy but also in managing land relations and overseeing land resource management. In developed countries, land relations and mechanisms for managing land resources have been refined over several centuries, addressing issues related to the enhancement of land valuation, taxation, and land cadaster management.

The foundations of the modern land cadaster were established in the 20th century, with the French land cadaster recognized as the most sophisticated. Despite variations in management practices, it is designed to deliver precise and comprehensive data on the potential productivity of land resources for taxation purposes, as well as for planning agricultural development and forecasting land use (Trynsky, 1966).

In the United States, a unified methodology for the economic assessment of land is not employed. However, the most commonly used method is the assessment of land based on the net income derived from agricultural production. Land with the highest income is assigned a score of 100, against which the productivity of other lands is compared. In several countries, including Belgium, Spain, Canada, the United States, and Germany, land tax is not classified as a separate tax. The object of taxation is real estate capital, which includes the value of land. The low effectiveness of macroeconomic instruments, including the taxation system, is clearly reflected in the performance of agribusiness and the utilization of resource potential. Consequently,

there is a clear need for a comprehensive examination of taxation practices in other countries.

It has been shown that providing tax incentives for agricultural entities is a widely used management tool in both developed and developing economies. However, the scale of this assistance is considerably smaller compared to the subsidies granted to agricultural producers. This difference arises from the difficulties in identifying specific beneficiaries of additional tax administration, as well as the absence of methodologies for evaluating the additional revenues generated from tax incentives and other measures (Bird, 1974). The works of American and European scholars on tax reforms and tax planning in the agricultural sector are noteworthy (Sharma, 2012; Vogel, 2012; Williamson, 2013). These studies highlight that ongoing changes and increasing threats in the global economy and agricultural sector necessitate further exploration of the theoretical and methodological issues related to enhancing financial support tools.

One of the significant shortcomings of the current tax system is that it does not promote progressive structural changes in the agricultural sector that could enhance its competitiveness. The tax system should stimulate the development and deepening of integration processes, as well as the effective utilization of resource potential. It is essential to undertake further reflection and to develop innovative, effective financial instruments that are aligned with contemporary global economic trends.

In global practice, the agricultural sector is regarded as a unique area warranting various tax incentives. Such incentives are applied almost universally alongside targeted subsidies and other budgetary mechanisms for state support of the agricultural sector (Veen et al., 2007). In agriculture, preferential indirect taxation is typically applied.

There are varying approaches to setting value-added tax (VAT) rates for farmers. The range of rates depends on the type of product and its socio-economic significance. Specifically, reduced rates are applied to agricultural and food products. For example, in Germany and France, agricultural enterprises are fully exempt from VAT (Agrotypos report, 2014). In several EU countries (such as Spain and Portugal) and former Eastern Bloc countries (such as Poland, Romania, and Hungary), a special preferential tax regime is applied to agricultural income. Additionally, some countries provide further tax benefits for small farms and young farmers. In Canada, investment costs aimed at improving land quality can be deducted from a farmer's taxable income. Among other tools for regulating agricultural taxation is the option to modify the tax period. In France, farmers with a certain income level may set a production cycle that does not align with the calendar year. In the United States, farmers can opt to pay taxes on average income once every three years. In Canada, taxes are based on the average income over a five-year period to protect farmers from the impacts of sudden income fluctuations.

Many countries' laws employ additional methods for providing land tax benefits:

1) full exemption from taxation for agricultural land in the United Kingdom and China; for reclamation cooperatives in Italy; and in the Czech Republic for plots up to 10 hectares provided if they are cultivated by the owner;
2) in addition, there is a reduction of the tax rate. In Italy, agricultural cooperatives located in mountainous regions benefit from a 50% reduction in land tax rates.

Moreover, in the Czech Republic, significant tax exemptions can be granted to agricultural plots where yields are substantially below the norm. Furthermore, the Australian government has implemented a special tax on farmers to fund scientific projects in the grain industry. The primary organization representing the grain sector, Grains Producers Australia (GPA), sets the tax rate annually. This tax, however, does not exceed 0.5% of the gross value of the grain produced by farmers (Vogel, 2012).

The practice of tax regulation in agriculture in developed countries demonstrates similarities in their tax policies. In these countries, the full range of direct and indirect taxes is utilized, with agricultural producers paying both federal and local taxes (Veen et.al, 2007). While federal taxes in the agricultural sector are standardized, local taxes can vary significantly, depending on the region's objectives, specific geographical and climatic conditions, and the national mentality.

Research findings confirm that, in developed countries, the tax system fulfills all its inherent functions and is aimed at enhancing the efficiency of the agricultural sector's operations.

3. Methods

The research methodology was based on established principles of economic science and macroeconomic goals, such as sustainable economic growth, stabilization of the national currency, and balance of payments equilibrium, achieved through optimal and effective use of resources. The studies adhered to the necessary conditions for reaching these macroeconomic objectives, emphasizing the government's important role in guiding the socio-economic development of the country and improving the welfare and living standards of the population. In generalizing theoretical provisions on the problem under consideration, traditional methods were used: collection of facts and generalizations, induction and deduction, analysis and synthesis, historical and logical, in solving practical problems statistical methods: normative, comparison, index, in the economic assessment of land used in agriculture - mathematical modeling methods.

Traditional methods were employed to summarize the theoretical aspects of the problem, including data collection and generalization, induction and deduction, as well as analysis and synthesis, alongside historical and logical approaches. Additionally, statistical methods were utilized to address practical tasks, encompassing normative analysis, comparative analysis, and index methods. Moreover, in the economic assessment of agricultural land, data from government statistical agencies were utilized. This analysis involved determining standardized values for sown areas, yields, and gross agricultural production, both at the national level and by region.

Results and Discussions: The Republic of Kazakhstan ranks ninth in the world by land area and possesses the potential to become a major exporter of agricultural products and food on the global stage. To realize this potential, it is essential to transform the agro-industrial complex into an innovative development model, with the government playing a pivotal role in this process.

In this context, it must perform the following functions:

(1) identifying priority areas for the development of the agro-industrial complex (AIC);
(2) allocating the necessary investment volumes for this purpose;
(3) establishing mechanisms to stimulate investment activity;
(4) creating a favorable environment for the development of entrepreneurship based on innovation and integration processes in related sectors.

The priority areas for the development of the agro-industrial complex (AIC) should be determined in consideration of the existing conditions within the sector.

The analysis revealed a significant decline in the resource potential of agriculture. Specifically, compared to the indicators of 1991, the number of tractors decreased from 243,000 to 147,000 units by 2022, while the number of grain harvesters fell from 176,900 to 38,100 units. Additionally, the workforce also diminished, with the number of hired workers declining from 2,720,300 to 2,369,800 individuals. Moreover, the underdevelopment of social and production infrastructure in rural areas has led to a migration outflow of the population, which will undoubtedly complicate the implementation of agricultural policy in the future.

During the research, the reasons for the reduction in utilized agricultural land were examined. The analysis of the dynamics of the land fund by categories of land users from 1991 to 2022 revealed that the area of agricultural land decreased from 218,375.8 to 115,966.2 thousand hectares, representing a reduction of 44.9%. The area of land designated for settlements expanded significantly, from 3747.2 thousand hectares to 24,592.8 thousand hectares (a 6.6-fold increase). This expansion of settlement areas occurred at the expense of arable land and pastures (see **Table 1**). These changes in land use structure took place in the absence of scientifically justified standards to regulate land relations. Moreover, this situation has persisted to the present day.

Table 1. Dynamics of the land fund by categories of land from 1991 to 2022, thousand hectares.

#	Categories of Land	1991	2021	2022	Change by 1991, %	
					2021	2022
1	Agricultural land	218375.8	113961.4	115966.2	52.2	55.1
2	Lands of settlements	3747.2	24,288.7	24592.8	648.2	656.3
	including:					
	cities and towns	2053.5	4190.9	4106.2	204.1	199.6
	rural settlements	1693.7	20097.8	20486.6	1186.6	1209.6
3	Land for Industry, Transportation, Communications, and Other Purposes	18,796.8	2239.1	2273.0	11.9	12.1
4	Land for Specially Protected Natural Areas	775.1	7810.7	7811.3	1007.7	1007.8
5	Forest fund lands	10179.2	22,435.3	22,963.5	220.4	225.6
6	Water fund lands	819.9	4206.5	4209.4	572.1	573.4
7	Reserve lands	18952.3	87989.1	85114.6	464.3	449.1
	Total land	271646.3	262930.8	262930.8	96.8	96.8
	Land used by other states	993.7	9561.1	9561.1	962.2	962.2
	Territory of the Republic	272490.2	272491.0	272491.0	100	100

Note: Compiled from source : Consolidated analytical report, 2020–2022.

As of 1 November 2022, the agricultural sector of the republic utilized 26,452.0 thousand hectares of arable land, representing 23.4% of the total. Specifically, this includes irrigated land at 1625.3 thousand hectares, perennial crops at 60.7 thousand hectares (2.1%), and pastures at 82,418.5 thousand hectares (72.9%). Additionally, the area of fallow land remains significant at 1,824.5 thousand hectares, accounting for 2.1% of the total agricultural land.

In the pre-reform period (1991), agricultural crops were cultivated across an area of 34,935.5 thousand hectares in the republic. However, during the initial phase of market transformations, the agricultural sector experienced a substantial decline, leading to a reduction in the cultivated area to 15,285.3 thousand hectares by 1999. Beginning in 2000, the area under cultivation gradually expanded, ultimately reaching 22,980.7 thousand hectares by 2022 (see **Table 2**).

Table 2. Composition and structure of agricultural land by categories as of 1 November 2022, thousand hectares.

#	Land categories	Total Farmland	Arable land					
			total	incl. irrigated	Perennial plantations	deposit	Hayfields	Pastures
	1	2	3	4	5	6	7	8
1	Agricultural land	113 096.9	26452.0	1625.3	60.7	1824.5	2341.2	82418.5
	Structure. %	100	23.4	1.44	0.05	0.72	2.1	72.8
2	Lands of settlements	22 036.5	378.4	132.7	68.1	194.8	218.7	21176.5
	Structure. %	100	1.7	0.6	0.3	0.9	1.0	96.1
3	Lands of industry. transport. communications. defense and other non-agricultural purposes	3530.5	2.5	0.3	0.7	1.4	127.53	398.4
	Structure. %	100	0.07	-	-	0.4	3.6	11.3
4	Forest fund lands	6833.2	93.8	7.0	0.5	9.9	231.6	6497.4
	Structure. %	100	1.4	0.1	0.01	0.14	3.4	95.1
5	Reserve lands	67 297.6	29.7	12.9	16.6	1424.0	1933.0	63884.3
	Structure. %	100	0.04	0.0	0.01	2.1	2.9	94.9
	Land used by other states	5397.8	-	-	-	-	220.0	5177.8
	Structure. %	100	-	-	-	-	0.4	95.9
	Territory of the Republic	219 099.8	26 971.4	1778.9	146.9	3471.7	5104.3	183 405.5
	Structure. %	100	12.3	0.8	0.07	1.6	2.3	84.0

Note: compiled from the source: Consolidated analytical report, 2020–2022.

The lands of settlements include 378.4 thousand hectares of arable land, of which 132.7 thousand hectares are irrigated, 68.1 thousand hectares of perennial plantations, 218.7 thousand hectares of hayfields, 21,176.5 thousand hectares of pastures.

These changes in the use of arable land were accompanied by a breakdown of the established system of agricultural management and disruptions in the adopted crop rotation schemes. Consequently, monoculture practices became prevalent, leading to the degradation of the topsoil and a reduction in its humus content. The results of soil

surveys confirm the ongoing trend of declining humus levels in the plow layer. Therefore, it is essential to prioritize the development of agriculture and to establish mechanisms that stimulate investment and ensure the effective and comprehensive utilization of land resources.

In this context, the land tax serves as a crucial instrument that should replace all forms of taxation. Moreover, it should be based on the results of the economic assessment of the profitability of land parcels.

Within the agricultural sector, taxpayers are classified into legal entities and individuals. Legal entities include agricultural producers such as joint-stock companies (JSCs), limited liability partnerships (LLPs), agricultural cooperatives, and organizations involved in the processing of agricultural products. These entities are subject to value-added tax (12%), corporate income tax (10%), land tax, and social tax (20%). In contrast, individuals—including peasant (farmer) households and individual entrepreneurs who are not registered as value-added tax payers—are subject to taxation under a special tax regime.

According to this regime, a special procedure for budget settlements is established based on the payment of a unified land tax. In this case, the taxable object is the income derived from the sale of agricultural products and their processed goods. The unified land tax rate is set at 0.5% of the income. Taxpayers under the unified land tax system are exempt from the following types of taxes and budget payments: individual income tax, land tax, vehicle tax, property tax for assets used in primary activities, and social tax.

Agricultural lands are categorized into two zones. The first group includes lands from the steppe and dry-steppe zones of flat territories with ordinary and southern black soils, dark chestnut and chestnut soils, as well as foothill territories with dark gray (gray-brown), chestnut (brown), and foothill black soils. The second zone comprises lands from semi-desert, desert, and foothill-desert areas featuring light chestnut, brown, gray-brown, light gray, and ordinary gray soils, as well as mountainous areas characterized by mountain steppes, mountain meadow steppes, and alpine and subalpine soils.

Basic land tax rates, measured in tenge per hectare, have been established for these lands, as detailed in Instruction No. 34 on the calculation and payment of land tax. This instruction was approved by the Order of the Ministry of Finance of the Republic of Kazakhstan on 27 June 1995 (**Table 3**).

Table 3. Basic rates of land tax per 1 hectare depending on the quality of soils on lands.

No.	Bonitet score	Base tax rate, KZT
steppe and dry steppe zones of plain territories		
1	1–10	0.25–1.25
2	11–20	1.50–2.50
3	21–30	2.75–5.00
4	31–40	7.50–12.50
5	41–50	15.00–20.00
6	51–60	22.50–27.50

Table 3. (*Continued*).

No.	Bonitet score	Base tax rate, KZT
steppe and dry steppe zones of plain territories		
7	61–70	30.00–42.50
8	71–80	45.00–57.50
9	81–90	60.00–75.00
10	91–100	77.50–100.00
semi-desert, desert and foothill-desert territories		
11	1–10	0.25–0.50
12	11–20	0.75–2.50
13	21–30	2.75–5.00
14	31–40	5.25–7.50
15	41–50	7.75–10.00
16	51–60	10.25–12.50
17	61–70	12.75–15.00
18	71–80	15.25–17.50
19	81–90	17.75–20.00
20	91–100	20.50–25.00

The basic land tax rates for one hectare in the steppe and dry-steppe zones range from 0.25 to 100 tenge, depending on the established bonity score, while in the semi-desert, desert, and foothill-desert zones, the rates range from 0.25 to 25 tenge. However, these rates do not correlate with the land productivity in the specified zones. The calculations for the land tax rate have been borrowed from the Russian Federation, and their application in the regulation of land relations in Kazakhstan has not achieved the intended goals in managing land resources.

Table 4. Tax revenues from agriculture for 2018–2022 in billion tenge.

Years	Total Taxes	Of these:												
		Legal entities						Individuals						
		Quantity, units	Amount of taxes	incl.				Quantity, units	Amount of taxes					
				MTP	PIT	social	Other			MTP	PIT	social	EZN	Other
2018	51.7	3332	41.9	7.6	8.5	3.2	22.6	176,535	9.8	0	1.0	0.2	1.0	7.6
2019	59.3	4673	49.4	8.3	8.7	4.0	28.5	108,140	9.9	0	1.0	0.2	1.0	7.7
2020	67.2	4901	56.5	10.1	9.8	4.1	32.5	177,387	10.7	0	1.1	0.2	0.4	9.0
2021	80.3	5184	68.9	12.3	12.3	5.1	38.9	179,103	11.4	0	1.1	0.2	0.1	10.0
2022	104.6	5549	88.2	17.2	16.7	6.2	48.2	190,016	16.4	0	1.5	0.2	0.2	14.5
Structure of taxes by categories of taxpayers														
2018	100	X	81	14.9	16.4	6.0	43.6	X	19	0	1.9	0.4	1.9	14.7
2019	100	X	83.3	14.0	14.7	6.7	47.9	X	16.7	0	1.7	0.3	1.7	13.0
2020	100	X	84.1	15.0	14.5	6.2	48.4	X	15.9	0	1.6	0.3	0.6	13.4
2021	100	X	85.8	15.3	15.7	6.1	48.4	X	14.2	0	1.4	0.4	0.1	12.3
2022	100	X	84.4	16.4	16.0	5.9	46.1	X	15.6	0	1.4	0.2	0.1	13.9

Note: calculated from the data of the State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan

Furthermore, an analysis of tax revenues from agricultural taxpayers revealed that, from 2018 to 2022, the total tax revenue increased from 51.7 billion to 104.6 billion tenge, which represents an increase of more than twofold (**Table 4**).

A significant portion of these taxes is attributed to legal entities. Specifically, the tax revenue from legal entities increased from 41.9 billion tenge to 88.2 billion tenge during this period, representing a growth of 2.1 times. Additionally, their share in the overall tax structure for categories of taxpayers rose from 81% in 2018 to 84.4% in 2022. In contrast, the tax revenue paid by individuals increased from 9.8 billion to 16.4 billion tenge over the analyzed period; however, their share of the total tax revenue decreased from 19% to 15.6% (**Table 4**).

It is important to note that the tax structure across categories of economic entities does not adequately reflect the area of utilized agricultural lands. In 2022, legal entities occupied 40,945.1 thousand hectares (35.7%) of agricultural land while contributing 84.4% of the total tax revenue. In contrast, individual taxpayers, who utilized 72,792.1 thousand hectares (63.5%) of agricultural land, accounted for only 15.6% of the total tax revenue.

This discrepancy is attributed to the country's policy of preferential taxation aimed at supporting small businesses. As a result, small enterprises are exempt from corporate income tax. Specifically, the amounts income tax for individuals collected were 1.5 billion tenge, while social and unified land taxes amounted to 200 million tenge, and other types of taxes totaled 14.5 billion tenge. The tax revenue per hectare of land utilized by individuals was only 22.5 tenge in 2022. Despite this low rate, both land utilization efficiency and the production activities of individuals remain at a low level.

The analysis conducted demonstrates that the current tax system is inadequate and does not fulfill its intended regulatory functions. Specifically, the value-added tax hampers entrepreneurial activities. Furthermore, the unified land tax, which is predicated on the extraction of differential income, levels the playing field for market participants situated on lands with varying fertility and locations. This tax's stability fosters incentives for effective land use while also encouraging the preservation and enhancement of soil fertility. In addition to its fiscal responsibilities, it performs other essential functions, including regulatory and stimulatory roles.

Therefore, establishing the rates of the unified land tax based on land cadaster outcomes, in accordance with methodologies recognized in global practice, would represent an optimal approach to developing an effective taxation system.

Given that tasks such as the establishment of a database for land plots and their respective stakeholders, comprehensive soil material assessments, and geobotanical surveys for land passporting purposes have not been completed in the country, the land cadaster does not align with the standards recognized in developed countries.

Moreover, transitioning to a regulatory framework for land relations that utilizes net income is consistent with global practices. This approach lays the economic foundation for the rational use of land resources and can serve as a basis for implementing a mechanism of state regulation of pricing. Such regulation aims to ensure equitable exchange, protect the interests of agricultural producers, and justify the use of other macroeconomic instruments.

The development of this methodology should be based on the following principles:

1) ensuring the equalization of initial conditions for market participants operating on lands with varying natural fertility and locations;
2) establishing an economic mechanism that incentivizes the rational use of land and the preservation of its fertility;
3) overcoming the seasonality associated with the use of labor, machinery, and other resources;
4) facilitating the effective functioning of market participants, among other considerations.

The optimal structure of sown areas of agricultural crops, which provides maximum profit, taking into account the market demand for agricultural products, will make it possible to determine the amount of net income per unit of land by natural economic zones, administrative territories (by regions and districts). It can be used as the basis for taxation.

According to the most common opinion, the calculation of differential rent is carried out according to the formula:

$$DR = (Z - PP) \times Y \quad (1)$$

where *DR* is differential rent;

Z is the average selling price, tenge/hundredweight;

PP is the price of production, defined as the product of the standard cost of 1 centner of production by the profitability index.

Y = yield of agricultural crops, c/ha

This makes it possible to set the rates of the unified land tax.

Table 5. Determination of the value of land rent of sown areas in the Republic of Kazakhstan (in the context of crops, taking into account 40% of the rate of return for the last 5 years).

Name of crops	Standardized sowing area, thousand hectares	Standardized yield, centners/ha	Total standardized volume of commercial products, thousand tons	Production costs + profit (standard cost of products), centners/tenge	Selling price, centners/tenge	Rental income from 1 centner of standardized yield, centners/tenge	Rental income from 1 ha, thousand tenge	Total amount of land rent, million tenge
Wheat	12165.74	13.25	161238.64	6762.93	7086.37	245.77	3.26	39,628.15
Corn (maize)	170.58	43.55	7428.76	3507.60	4672.44	1164.84	50.73	8653.33
Barley	2541.95	12.94	32884.36	5949.61	6463.64	362.19	4.69	11910.24
Rye	29.90	9.92	296.68	5367.39	5542.65	175.26	1.74	52.00
Oat	226.12	17.37	3926.70	3971.40	4314.07	342.67	5.95	1345.55
Dried leguminous vegetables	260.07	12.35	3211.49	7239.86	10217.81	901.59	11.13	2895.44
Rice, unhulled	98.50	50.15	4939.45	1919.24	3740.74	1950	97.79	9632.01
Potato	196.66	193.04	37,963.18	8435.71	8683.02	306.99	59.26	11654.45

Table 5. (*Continued*).

Name of crops	Standardized sowing area, thousand hectares	Standardized yield, centners/ha	Total standardized volume of commercial products, thousand tons	Production costs + profit (standard cost of products), centners/tenge	Selling price, centners/tenge	Rental income from 1 centner of standardized yield, centners/tenge	Rental income from 1 ha, thousand tenge	Total amount of land rent, million tenge
Sunflower seeds	897.50	11.04	9910.03	10988.24	12,058.17	964.46	1065	9557.87
Tobacco	0.36	33.60	12.10	4255.85	2680.07	−1575.78	−52.95	−19.06
Cotton	125.22	26.62	3333.36	1586.13	2014.76	428.63	11.41	1428.76
Sugar beet	222.46	206.16	45862.35	582.77	624.60	41.83	8.62	1918.35
Open field vegetables	160.22	240.97	38608.90	14482.67	14987.06	504.38	121.54	19473.72
Melon crops	361.92	229.54	83075.12	6354.51	6332.51	−22.00	−5.05	−1827.35
Fodder crops	7423.98	10.88	80794.14	1776.56	1875.07	98.51	1.07	7959.04
Total in the Republic of Kazakhstan	24881.18						4.99	124262.49

Note: calculated by the authors

This methodology for calculating the unified land tax rates allows for the establishment of tax rates based on this formula. Using this approach, the authors have determined the unified land tax rates per hectare of arable land, both for the republic as a whole and in the context of individual regions. The average unified land tax rate per hectare of arable land across the republic amounts to 4990 tenge. However, this rate varies by agricultural crop, ranging from 1.07 thousand tenge for fodder crops to 121.5 thousand tenge for crops cultivated on irrigated land. The statistical data served as the primary source for calculating the rental income figures. According to our calculations, the total tax revenue from the use of arable land in the republic is projected to reach 124,262.49 million tenge (**Table 5**). In these calculations, considerations included the low efficiency of production within the sector and the necessity for substantial investments in the development of agriculture and the entire agro-industrial complex.

In the southern region of the republic, the proportion of irrigated arable land is notably high. Consequently, the rates of the unified land tax per hectare of arable land in this region range from 24,800 tenge to 43,100 tenge. In the northern region, the rates were significantly lower, ranging from 2620 tenge to 6440 tenge. In the western region, where natural conditions are unfavorable for sustainable agricultural development (specifically in Atyrau and Mangistau regions), the land tax rates were found to be at the lowest level. Using this methodology, land tax rates can be calculated by district within each region.

This methodology allows for the calculation of land tax rates at the district level within each region. When determining land tax rates for specific land users, it is essential to adjust the district rates to reflect the factors that impact net income.

Specifically, the amount of rental income derived from agricultural land utilization is significantly influenced by the distance to markets for agricultural products, as well as the geographical location of social, economic, and financial infrastructure.

Various factors specific to particular territories and land parcels also have a significant impact. This creates a need to determine the magnitude of their impact on the amount of net (rental) income. The proposed model for calculating the tax rate per hectare of land is as follows:

$$SN_i = (U_{ti} - U_i) \cdot R_{di} \cdot (k_1 \cdot k_2 \cdot \ldots \cdot k_n), \quad i = 1,2,\ldots,p \qquad (2)$$

where

SN_i—tax rate for the *i*-th crop

U_{ti}—yield of the *i*-th crop in the reporting year (taxable), in centners per hectare;

U_i—normalized yield of the *i*-th crop, in centners per hectare;

P—number of crop types

$k_1 \cdot k_2 \cdot \ldots \cdot k_n$ the product of adjustment coefficients (indices or coefficients) that account for the qualitative condition of the land plot, its location, water supply, surface slope, distance from service centers, and other relevant factors.

According to the land balance as of 1 November 2022, the area of irrigated land in the republic is 2.3 million hectares, of which 1.9 million hectares (82.2%) are agricultural lands, 205.1 thousand hectares (10%) are in the lands of settlements, 187.8 thousand hectares (8.2%) are in reserve lands (**Table 6**).

Table 6. Dynamics of the area of irrigated land by category for 1991–2022, thousand hectares.

№	Name of land categories	1991	2021	2022	Change by 1991, %	
					2021	2022
1	Agricultural land	2308.4	1826.0	1890.4	79.1	79.2
2	Lands of settlements	53.9	205.1	205.1	380.5	380.5
3	Lands of industry, transport, communications, for the needs of other purposes	7.2	2.6	2.6	36.1	36.1
4	Lands of specially protected natural areas	0.2	0.6	0.6	300	300
5	Forest fund lands	8.4	7.7	15.5	91.6	184.5
6	Water fund lands	1.0	0.6	0.7	60.0	70.0
7	Reserve lands	0.4	229.3	187.8	573.0	469.5
	Total land	2379.5	2271.9	2302.7	95.5	96.8

Note: compiled from the source: Consolidated analytical report, 2020–2022.

During the reporting year, the area of irrigated agricultural land increased by 64.4 thousand hectares, the forest fund land increased by 7.8 thousand hectares, and the water fund land increased by 0.1 thousand hectares due to the implementation of meliorative measures and the conversion of non-irrigated land into irrigated land.

A significant challenge in irrigated agriculture is the lack of water measurement devices and regulating distribution structures on irrigation canals. As a result, there is an uneven use of irrigation water depending on the location of irrigated plots in relation to the main canal. Farmers whose fields are located in close proximity to the main canal receive an excess of water, whereas those farther away face challenges in accessing irrigation water.

Moreover, the charge for water use is not based on the volume of water used for irrigation but is instead calculated based on a tariff per hectare of irrigated land. This situation leads to the inefficient use of water and unproductive discharges. Additionally, the absence of a reliable collector-drainage network results in the rising of groundwater levels, causing soil salinization and waterlogging. It is estimated that between 30% and 60% of irrigation water is irretrievably lost, replenishing the groundwater. Alongside these issues, there is significant wear and failure of irrigation and drainage systems, which negatively impacts the meliorative condition of the land.

The assessment of the state of land and water resources in the agriculture sector of the republic has highlighted the urgent need for radical changes in the regulation of land and water relations. This regulation should focus on mitigating negative processes within these systems, incorporating incentives for the effective use of land and water resources, promoting the adoption of innovative technologies, and ensuring compliance with environmental standards. It is essential to recognize that land and water are inseparable factors in the unified process of production, and their respective contributions to the outcomes of this process must be clearly defined. These resources are utilized in irrigated agriculture and on irrigated pastures, where production yields are higher compared to dryland farming and non-irrigated pastures. Consequently, the land tax, which is based on the extraction of differential income, reflects the outcomes associated with the use of both land and water. It is, therefore, feasible to determine the contribution of each resource to the unified land tax.

Land is a gift of nature that does not require labor for its acquisition, whereas the utilization of water resources in irrigated agriculture and the watering of pastures entails significant expenses. Consequently, the cost of water incorporated into the land tax should be determined based on the investments made in the construction and operation of water management infrastructure. Market participants who utilize water for both the irrigation of agricultural crops and the watering of pastures should be subject to a unified land tax.

The payment for utilized water resources should be made through a deduction from the land tax, with the amounts determined based on the expenses incurred by water management entities. This approach fosters a shared interest among both land users and water management stakeholders.

Water management entities will be motivated to expand the area of irrigated lands and waterlogged pastures by organizing and implementing water-saving innovative technologies. This initiative is also in the interest of land users.

4. Conclusions and policy implications

The results of the study led to the following conclusions:

1) Achieving high efficiency in the functioning of agriculture and the entire agro-industrial complex necessitates their transformation into an innovative development model. This requires a new macroeconomic policy that creates an enabling environment for both business development and encourages the efficient use of limited resources;
2) There should be established a new system of macroeconomic instruments for state regulation of the innovative development of the agro-industrial complex. This system must ensure the creation of a favorable external environment for entrepreneurship, stimulate the effective utilization of resource potential, and enhance investment activity.
3) The assessment of the effectiveness of land and water resource utilization in agriculture has highlighted the urgent need for radical changes in land and water relations. These relations must incorporate mechanisms that stimulate the efficient use of land and water resources in agriculture, promote the adoption of innovative technologies, and ensure compliance with economic requirements.
4) The existing tax system in agriculture and its related sectors is flawed. It fails to fulfill its inherent regulatory, distributive, and incentivizing functions.
5) A transition to a unified land tax in agriculture has been proposed. This tax, based on the extraction of differentiated income, will ensure a level playing field for market participants utilizing lands of varying quality and location. The unified land tax will incentivize agricultural producers to utilize land resources efficiently, leveraging a wide range of innovative technologies. Moreover, it will serve as a foundation for the development of macroeconomic regulatory instruments aimed at achieving sustainable innovative development in the agricultural sector of the Republic of Kazakhstan.
6) In irrigated agriculture and watered pastures, land and water are integral components of a unified production process, necessitating the determination of the contribution of each to overall productivity. The land tax, which is based on the extraction of differentiated income, encompasses the outcomes associated with the use of both land and water, making it crucial to delineate the share of each resource. Payment for water usage should be included within the framework of the land tax and subsequently allocated to the water management entities. This strategy will provide these entities with incentives to increase the area of irrigated land and watered pastures by adopting water-saving innovative technologies, a goal that aligns with the interests of land users.

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