

Economic efficiency of on-farm land management in agricultural organizations

Nuriddin R. Auesbekov^a, Yergali S. Akhmetov^b, Kuanysh B. Abdeshev^b, and Gaukhar M. Rakhimzhanova^c

^a Department of Land Resources and Cadastre, Kazakh National Agrarian Research University, 050010, 8 Abay Str., Almaty, Republic of Kazakhstan.

^b Department of Land Management and Cadastre, M.Kh. Dulaty Taraz Regional University, 080000, 7 Suleymenov Str., Taraz, Republic of Kazakhstan.

^c Department of Management and Organization Agrobusiness named after Kh.D. Churin, Kazakh National Agrarian Research University, 050010, 8 Abay Str., Almaty, Republic of Kazakhstan.

nuriddinauesbekov@outlook.com; yergali_akhmetov@proton.me; abdeshev_k@hotmail.com; rakhimzhanovagaukhar8@gmail.com

Received October 2023, accepted February 2024, available online May 2024

ABSTRACT

Good land management provides protection against land degradation for long-term and effective use. A survey was conducted among students in Kazakhstan for an internal assessment of the education quality. It was found that for ensuring competent land management, state financial support and external investment have to meet the needs for working capital and improve the quality of the material and technical base and staff; the quality education of new experts and their motivation have to be ensured; innovations introduction in the agricultural sector and long-term planning with centralized control have prospects for increasing economic efficiency.

Keywords: Agricultural sector of Kazakhstan; talent pool; innovations in agriculture; land use; economic sustainability.

1 Introduction

Any state's economic policy approach should prioritize addressing the issue of food security since how well this problem is resolved has an impact on societal stability on all levels – political, social, and ethnic. Global food security is now seriously threatened by the global financial crisis, which is also having an impact on the agricultural industry and the economy. As a result, new mechanisms must be developed and existing ones must be revised in order to guarantee food security at both the international and national levels.

In Central Asia, there is a wide range of agricultural output. Since 1991, Central Asia's crop diversity has risen, but several nations have also partially maintained the specialization they developed while under Soviet rule. Conservatism can also be traced in the methods of farming and land control, in the personnel training. Currently, the problem of insufficient specialists' motivation is urgent – low salary expectations, some stigmatization of the images of agricultural workers. In connection with the increasing requirements for the volume and quality of the industry's products, a comprehensive radical change in the organization of farming is necessary, which will optimize costs and increase economic efficiency (Critchley and Radstake, 2017). The main aspect, which will be disclosed in this work, concerns land management. So, relying on the definition from the Federal Law "On land management", "on-farm land management is carried out in order to organize the rational use of agricultural lands and their protection". Additionally, this law has jurisdiction over "measures development to improve agricultural land, develop new land, restore and conserve land, reclaim disturbed land, protect land from erosion, mudflows, waterlogging, secondary salinization, desiccation, compaction, pollution by industrial waste and consumption, radioactive and chemical substances, contamination, and other negative influences" (Land Code..., 2021). World studies (Mikheeva, 2018) prove that only with the careful use of pasture land is it possible to achieve maximum productivity, coupled with the preservation of biodiversity. In addition, maintaining the good condition of the land is more economically beneficial than facing the consequences of destruction.

This work will identify the main key points of internal land management that have an impact on the economic efficiency of agricultural organizations. Each of the aspects will undergo a deep analysis for the current state in the world, and in the Republic of Kazakhstan in particular, which will make it possible to identify problem areas and outline possible vectors of development. The result of this work is of great practical importance for the agricultural sector in the Republic of Kazakhstan, since this sector is the leading one (Mikheeva, 2018) and its economic efficiency correlates with the economic state of the republic. A number of the world's research has addressed critical issues in land use, the likely consequences of inaction and possible solutions. This work sets itself the goal of a consistent and comprehensive analysis of the economic efficiency of on-farm land management in the agricultural territories of the Republic of Kazakhstan.

Achieving this goal is possible through an analytical study of theoretical publications on the sounded topic with the initial highlighting of the main criteria of economic efficiency in agriculture for a reasoned and high-quality assessment, conducting a survey among a sample of potential industry specialists (students of specialized educational institutions) with subsequent statistical data processing. In addition, it is necessary to study the existing regulations (Law of the Russian..., 2001; Abbas and Singh, 2014; Land Code..., 2021) in this industry, highlight the significant aspects and pay attention to problem areas with the prospect of proposals for the development of legislation and control.

2 Materials and Methods

To analyze the issues highlighted, the authors of the study proposed the following plan: disclosure of the concept and content of economic efficiency in the context of agriculture, study and analysis of publications on the internal land management of the industry. To draw up an objective and complete picture of the current state of the industry in the Republic of Kazakhstan, as well as to form possible proposals and highlight promising areas of activity for these tasks, methods of observation, systematization and generalization, analytics and information structuring were selected.

One of the aspects identified in the research objectives is the survey of students of specialized educational institutions. The objects of the general population were: RSAU Moscow Agricultural Academy named after K.A. Timiryazev, Moscow (Department of Ecology and Nature Management, Animal Science and Biology), KATU named after S. Seifullin, Astana (Department of Land Management and Geodesy; Ecology, Forest Resources), KNU named after Al-Farabi (Department of Land Management, Department of Biodiversity and Bioresources). This sample is justified by the factor of the research topic, as well as the possibility of comparing the results of the survey between the central region of Russia and the Republic of Kazakhstan.

For the survey, 4 questions were selected with the possibility of a detailed answer:

1. What do you like about the learning process?
2. What do you dislike about the learning process?
3. What was the reason for your choice of the direction of study?
4. Do you see your future in your profession? Yes / no, why?

The study was based on primary data; therefore, a questionnaire method of data collection was used to collect the data. In total, 200 questionnaires were filled out using the Google form service, which allows for a short period of time without personal presence and at a convenient time for the respondents to collect representative material for the study (Abbas and Singh, 2014), the responses of the students were evaluated, and descriptive statistics were used to analyze the data using the statistical program SPSS. To guarantee a fair representation of the overall study population, the sampling technique used stratified random sampling, in which students from across the entire university were chosen at random. The future of the environment is in the hands of students, particularly those attending colleges and universities, who can successfully manage the land to achieve environmental sustainability and prosperity in the agricultural sector. A similar study involved students at Lovely Vocational University (Zuev, 2017). The results of the study showed that although students participated in a small number of environmental activities, they had a high level of environmental knowledge and a favorable attitude toward the environment. Consequently, our study revealed an important vacuum that needs to be filled in this area of research.

Collecting and analyzing knowledge and feedback from students about their learning experience allows educational institutions to constantly develop their educational and teaching capabilities, to improve the quality of educational services for students. One of the methodological tools for doing good work in this area is to evaluate each improvement cycle using the Shewhart-Deming cycle. The Deming Cycle is a framework for continuous quality improvement that includes the logical steps of plan, execute, check, and act (Figure 1) (Dudin and Frolova, 2015).

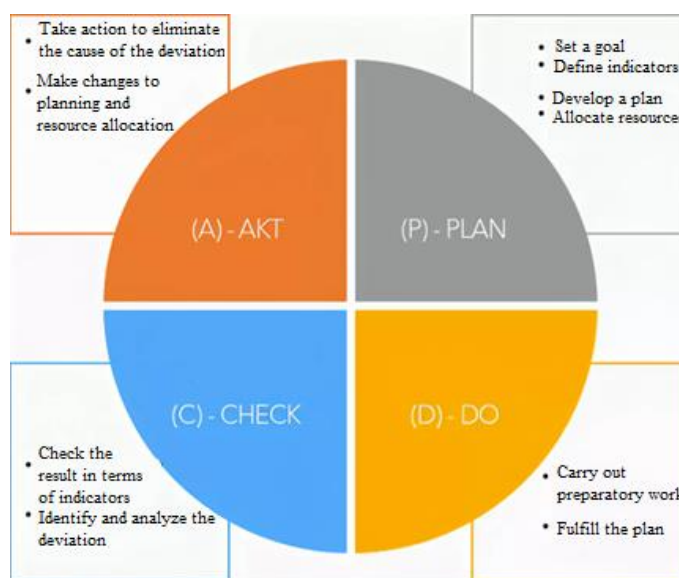


Figure 1. Deming cycle content.

Whole quality management techniques can be used to further encourage the sustainable growth of global agribusiness. The Deming cycle idea should also serve as the foundation for quality management for agricultural businesses (Agriculture experiences..., 2021); this strategy directs all business operations toward the application of the whole quality management system's eight guiding principles.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. A study was approved by National Ethics Commission of the Ministry of Health of the Republic of Kazakhstan, No. 1899-A. Informed consent was obtained from all individuals included in this study.

3 Results and Discussion

3.1 Land management in Kazakhstan

As mentioned in the introduction, the agriculture sector in Central Asia has the potential to generate profits for millions of people. However, this sector still has some difficulties that do not allow it to reach the maximum indicators of economic efficiency. The territory of Kazakhstan is located simultaneously in Central Asia and in Eastern Europe, washed by the Caspian and Aral seas. The continental climate causes cold winters with little snow and hot dry summers. About half of the country's territory is occupied by deserts and semi-deserts. In the western part there are mountain ranges. As for water resources, there is a shortage due to geographic location. It should be noted, that the agriculture of Kazakhstan ranks second in the world in the production of grain crops with an indicator of 967 kilograms per capita (leading positions belong to Canada, where this figure is 1168 kg). At the same time, it is the only post-Soviet republic that exports bread. Nevertheless, the productivity and efficiency of such an industry as animal husbandry in Kazakhstan is quite low – according to this indicator, the state ranks 142nd in the world (Sholk, 2016). Maintaining the position of plant growing, increasing the economic efficiency of the livestock industry (as the major one in the republic) largely depends on a well-implemented policy of internal land management. It is noted that it is necessary to focus on improving the quality of land, and not on increasing the area of land used. Nevertheless, the productivity and efficiency of such an industry as animal husbandry in Kazakhstan is quite low – according to this indicator, the state ranks 142nd in the world (Sholk, 2016). Based on the Land Code of the Republic of Kazakhstan, it is possible to identify the main tasks of land management, which are subject to consideration and analysis in this chapter. So, land management includes and provides (Seilkhanov, 2021):

1. Development of projects for land resources use, improvement and protection.
2. Drawing up projects for existing land uses education and streamlining.
3. Drawing up projects of land and economic structure of settlements.
4. Defining the borders of naturally protected areas that have unique restrictions on their use and protection, as well as other land parcels.
5. Reclamation of disturbed lands and development of new lands, including land inventory to identify violations in use.
6. Conducting topographic and geodetic, cartographic, soil, geobotanical, and other survey and exploration tasks, and then compiling maps and atlases with a specific theme.

Agriculture continues to be a crucial pillar of economic growth, accounting for 15% of all employment, despite a dramatic fall in its contribution to GDP (Gross Domestic Product) (only 4.18 percent in 2018). The infrastructure for mobile communications using cellular phones is very advanced in Kazakhstan. It is intended to use alternative technologies, such as optical fiber, to cover more than 4.000 settlements between 2021 and 2025.

3.2 Agricultural policy specifics in Kazakhstan

2017 saw the adoption of the 2017–2021 State Program for the Development of the Agro-Industrial Complex in the Republic of Kazakhstan. This multisectoral policy document aims to ensure that the agro-industrial sector produces products that are competitive in response to market demand through the following aspects of land management: the participation of small and medium-sized farms in agricultural cooperation; effective use of state financial support; efficient use of water resources; creation of conditions for efficient land resource use; provision of scientific and technical personnel, information, and market data.

Conducting a brief retrospective of the development of agricultural land, we note that since the 1950s virgin lands and areas, which were characterized by low humidity and a tendency to erosion, were actively developed in Kazakhstan and adjacent republics, which led to a record grain harvest. At the same time, a sharp decline in pasture areas became a negative consequence. In order to prevent a crisis in animal husbandry, specialized collective farms are obliged to increase the number of livestock. In the 60s and 80s, the cooperative property was completely transformed into state property, which made it possible to strengthen control over the movement of money, which led to the fact that many agrarians preferred to leave the village. The government decided to attract specialists from other republics, as well as to urgently use military personnel.

At the moment, almost all agricultural land is privately owned, which does not allow for effective operation due to the problems of control over each separate territory and the lack of personnel. The state faces a multi-stage task: the creation of large agricultural holdings with the organization of a large number of jobs, the motivation of specialized specialists to work in remote regions, as well as preventing the outflow of the population. The regional governors in 2021 were tasked with saturating the market and employment in rural areas (Shibaeva et al., 2019). All this will require significant financial investments with the prospect of payback in the long term. Other regions also face problems in agriculture related to lack of planning and lack of government support. An exhaustive evaluation of the efficacy of state regulatory policy in agriculture is methodologically supported by the structuring of objectives, approaches to economic

state regulation, as well as the organizational and economic mechanisms of regulatory policy (Tazabekov and Tulegenova, 2016).

I would like to refer to the current activities and design prospects for the management of existing land uses, as well as design in the field of land management of settlements. After the collapse of the Soviet Union, the development of new arable lands in the republic was suspended, the existing remote lands were abandoned. Decentralization of responsibility for the management and control of the pasture resources distribution from republican and territorial state bodies to local authorities has significant consequences. Rural communities and private peasant farms do not have a significant livestock population, as well as the resources to ensure long-distance movement of livestock, which leads to grazing near settlements. All this becomes the reasons for the pollution of the territory, total land degradation and low economic efficiency of activities. For the plant growing industry, the situation is similar. Legal protection of pasture areas is under the jurisdiction of the Law on Pastures (Order of the Minister of Agriculture..., 2020).

The majority of the people of the republic believes that foreigners should not be allowed to own land in Kazakhstan. Young businesspeople urge leasing to foreigners to draw in investment, in contrast to elder officials who either oppose leasing to foreigners or prefer renting under strict conditions. Several government representatives worry that foreign investors, particularly Chinese ones, may deplete Kazakhstan's land resources while adding nothing to society. Such fears, in the opinion of the authors of the article, do exist, but they can be avoided by signing lease agreements with detailed description of points about responsibility and the need to respect the property of the republic. The main provisions and wording can be transferred from the existing normative acts of the republic, and for controversial issues additional legal formalities and consultations are required. Also, since 2020, voluntary insurance has been introduced in the agricultural sector, which can also become an aspect for land protection and financial support. On the other hand, with a general vector of import substitution, the formation of a competitive economy requires the implementation of a number of protectionist measures: restricting access to the national market for imported products and stimulating national exports. In order to regulate the import market, it is possible to establish tariff quotas, create conditions for the development of import-substituting production in Kazakhstan and the formation of healthy price competition (Seilkhanov, 2021).

3.3 Enhancing agricultural sustainability and resource management

It is not the first year that Kazakhstani farmers have been reporting a catastrophic shortage of working capital, and this is happening despite the fact that the state annually allocates significant funds to support the agricultural sector. To obtain financing, sufficient liquid collateral is required, which not every peasant farm, let alone individual farmers, can provide. Even with the availability of equipment, experienced specialists and a sales market, due to a lack of funds, farms have to simplify the production technology, and this leads to the fact that for many years Kazakhstanis maintain the same yield indicators as before. In 2021, the Government made the necessary decisions on the provision of funds and material and technical support to ensure spring field work – in addition to an increase in budget loans, this year there is an increase in the volume of funds from 24.5 billion tenge to 45.3 billion tenge for ensuring forward purchases of agricultural products (Tankiyeva, 2016). In addition, the Prime Minister of Kazakhstan Mamin stated the need to develop roadmaps for the implementation of investment projects (Shibaeva et al., 2019). One way or another, there are reasoned aspects of mutual interest, both for representatives of the republic and for external persons, in order to carry out business investment relations (Islamov et al., 2021). For Kazakhstan and adjacent regions with a similar climate, the tendency towards desertification of territories and xerophytization of the vegetation cover is relevant. The development of agrotechnical operations aimed at restoring, maintaining, increasing, and protecting the fertility of sandy desert soils, as well as the use of forecasting techniques to stop the process of soil degradation, are some additional steps that must generally be taken in order to improve the condition of desert pastures. They, in turn, provide a scientific foundation for the effective and sensible use of land at businesses that specialize in agricultural or livestock production on desert pastures.

In a recent field study in Uzbekistan (Morozov and Subbotin, 2014), it was discovered that the ecological and biological suitability, purity, and fertility traits of plant seeds affected the appropriate agrotechnical measures, such as maintaining the best sowing dates for desert forage crops and taking seed consumption rates into account. The growth and development of plants is influenced by many different factors; the quality of the future adult plant depends not only on the quality of the seed, but also on exogenous factors. The use of quality seed material leads to higher yields per unit of land area and lower production costs per unit of production. Therefore, it is important to evaluate them in detail. The certification system for seed and planting material was introduced in the Russian Federation in 1993. The head of the Certification System is the Central Seed Certification Body (COSC), the responsibilities of which were assigned to the State Seed Inspection under the Ministry of Agriculture, which is currently reorganized into the Federal State Institution "Rosselkhoztsentr". Their responsibilities include determination of the seeds sowing qualities (Hofman, 2018; Kazakhstan - Agricultural Sector 2021). This seemingly insignificant aspect is one of many examples of how a wide variety of factors form the overall picture of successful agriculture with high economic efficiency. The aforementioned element poses a lot of difficulties since restrictions prevent easy trade between Central Asia and its neighbors. Poorly constructed

trade routes, insufficient customs enforcement, and challenges in meeting phytosanitary requirements that goods must meet in order to enter, say, the European Union, are all factors impeding trade (EU). The fact that many smallholder farmers in Central Asia select their own seeds is another issue. As a result, the output of goods is extremely diverse and occasionally of low quality, which can make exporting large amounts of goods difficult (Kaldybai and Kulakhm, 2018). Obtaining and certification of seed, planning the use of pasture lands, legal support and regulation of controversial issues – all this and much more requires the participation of individual dedicated experts. At this point, the study approaches the issue of agricultural organization staff formation and motivation.

3.4 Human resources challenges in Kazakhstani agriculture

When comparing statistical data on the main agricultural indicators for the Republic of Kazakhstan between 2008 and 2018, a significant decrease in the share of employed persons in the field of agriculture can be seen. So, if in 2008 30.16% of the total number of employed people were busy in the agricultural sector, then by 2018 this figure decreased by 50% and began to amount to 15.1%. On the one hand, these are positive changes associated with an increase in the efficiency of labor resources use and the introduction of technological solutions. On the other hand, according to industry experts, this trend has a negative background – unstructured reforms and a lack of funding and other motivation, coupled with low control, led to a personnel crisis and a certain stigmatization of the image of an agricultural employee. The main problems of the region's industry in the field of personnel include the low level of education of young specialists and their unwillingness to work “on the land in the region”; most livestock specialists and agricultural technicians are people of retirement age, whom agricultural holdings do not want to let go, since there are no successors for them. In addition, there is a strong shortage of scientific personnel – soil analysis, organization of crop rotation to prevent land degradation, other agrotechnical measures fall on the shoulders of non-professionals, which leads to low efficiency of the operations (Kaldybai and Kulakhm, 2018). Improper management of pastures and other agricultural lands leads to their degradation, necessitating their restoration. The economic efficiency of professional land management or, in extreme cases, the implementation of preventive and protective agrotechnical measures, is much higher than the complete restoration of degraded land.

Students of specialized educational institutions are potential future leaders and industry experts. Therefore, there is a need for an in-depth study of the current situation of the process and learning outcome in order to identify problem points and form a vector for improving the quality of education. That will have a delayed but significant impact on the sector economics. Experts with good theoretical training and understanding of topical problems in the field of animal science, ecology, land management, agrotechnical sciences and other related specialties, with proper motivation, will be able to radically change the situation in the economy of the industry. Due to the closure of numerous Soviet-era agricultural colleges in outlying areas, the caliber of agricultural education has also decreased. Now, Kazakhstan lacks the institutional framework needed to educate all agricultural employees in the country. Also, it is exceedingly challenging for most farmers to travel to large cities for schooling because they are at the bottom of the socioeconomic range and operate tiny family farms rather than massive industrial holdings (Land Code..., 2021).

3.5 Prospects in agricultural education

The survey made it possible to identify the main bottlenecks in terms of education. So, 63% of the respondents in their questionnaires noted a conservative approach to the presentation of material, the use of outdated methodological literature and teaching aids. Moreover, the average age of the teaching staff of most educational institutions is over 45 years old, which (despite their significant achievements, experience and regalia) does not contribute to the modern presentation of material and implies difficulties in communication with students. Returning to the issue of conservatism and traditionalism, 55% of respondents indicated such an aspect as “theoretical” preparation and solution of typical Soviet problems without real cases of our time.” Students need more independence together with an understanding of the current problems of the industry. 48% of students noted, that they are not sure of their future in the industry, do not feel support from the university management, do not understand the practical applicability of knowledge and do not know where to go for practice/internship. 23% of the questionnaires noted the scarcity of the material and technical base, other aspects were rather subjective in nature (the duration and complexity of the sessions, inconvenient schedule, unnecessary subjects, etc.).

Also, enough representative material was obtained on the general image of the student and the positive aspects noted by the students about how their studies are going. 70% of students have a pronounced interest in nature, ecology, love for animals, and the desire to engage in volunteer activities. All this, as well as the low passing score for these specialties, became the reasons for choosing the direction of study. Subjective reasons (convenient location, choice of a random destination, admission with friends) were not subject to analytics. For 61% of students, they are interested in specialized subjects, the possibilities of laboratory and field work. 38% mentioned campus infrastructure as positive. 17% said about the possibilities of doing science, the prospects for publications.

3.6 Global education and agricultural efficiency

Among the differences in analytics between students of Kazakhstan universities and educational institutions in Moscow, there is a more frequent problem of the long distance between the place of study and its material and technical base. Differences in future salary expectations are also noted. Internship and international student exchange programs are a great way to both gain new professional and cultural experiences. The growth of virtual teams, as well as the internationalization and globalization of education, are all related to this (one of the areas of activity of engineering psychology). Globalization and internationalization are considered the main processes leading the reform, in our case, in the field of education. Our everyday life in the era of information technologies development and all means of communication is inevitably subordinated to the process of globalization.

Internationalization is based on mutual communication and exchange between individual peoples. Globalization and internationalization are two interrelated processes that are transforming universities into new forms. First of all, globalization creates a close relationship between states and even their interdependence from each other. The economies of different countries are so closely related to each other that sometimes a decline in the economic performance of one country entails a weakening of the others (Zaira et al., 2020). Unlike globalization, the internationalization of universities is not a new issue. Higher education has always been filled with the idea of internationalism. The idea of intercultural cooperation in the field of art, science and education dates back to the 17th century. Internationalization enriches the knowledge base of participating universities, expands the scope of scientific research and deepens the curriculum. The presence of students and scholars from different countries broadens the cultural horizons of students and teachers from their own countries. The education of foreign students also influences the development of their countries and contributes to global economic and political stability.

In practice, what problems arise for any educational institution wishing to develop international cooperation so that it brings tangible results? Lack of funding, lack of information, differences in organization and curriculum certainly deserve mention, but the first one of the major challenges on the way towards internationalization and globalization of higher education is the language barrier. Many European countries are declaring their desire for internationalization by introducing English courses to invite or attract foreign teaching staff or students. The rapid development of computer telecommunication technologies currently has a strong impact on the educational process. The Internet increases the motivation of foreign language learners, has a positive impact on the entire learning process, makes authentic materials available, enhances. Problems of linguistic and academic adaptation of foreign students who experience learning difficulties due to insufficient knowledge of the language, as well as lack of adaptation and long-term integration into the host society as a result of poor assimilation of cultural practices of the host community. And if educational institutions are trying to organize accessible, barrier-free education, then teachers name the main problems that hinder the effective implementation of joint learning – the lack of desire among foreign students to get acquainted with the culture of the host country and participate in university sports and cultural events.

3.7 Gender equity in agri-business growth

Among the already formed specialists, there are other difficulties. Gender inequality among agricultural specialists (and business in general) has its consequences both for the Republic of Kazakhstan and on a global scale. The development of women's economic activity is also influenced by the ethnocultural peculiarity of Kazakhstani culture; women are allocated housekeeping chores, which limits their prospects for business development. According to estimates from the Global Entrepreneurship Monitor, women's entrepreneurship is experiencing a surge in Kazakhstan. At the same time, the first wave of female entrepreneurship emerged as a result of the fall of the Soviet Union and Kazakhstan's declaration of independence, when the populace was confronted with several political and socioeconomic issues. Women entered small company and the development of subsidiary plots due to unemployment and the need to support their families (Alshanskaya, 2020). However, from 2008 to 2018, there was a 50% decline in the proportion of women employed in agriculture. In addition to reasons related to gender segregation and low wages in the industry, this correlates with an increase in radical religious sentiments and ethnographic characteristics of the region. Figure 2 shows how low proportion of women leaders is active in agriculture (second row from the bottom) (Tsvetkova et al., 2020).

The International Monetary Fund estimates that gender disparity costs the world economy between 10% of GDP in affluent nations and 30% of GDP in South Asia, the Middle East, and North Africa. Also, studies demonstrate that expanding women's engagement in business has a positive impact on a nation's prosperity and economic development. In a similar line, economic well-being in Europe and Central Asia rises by roughly 1% as the proportion of women in business grows. The primary source of employment in rural areas, agriculture, shows a preference for male labor. Additionally, since women spend a lot of time caring for children, the elderly, and housework, their economic options are much more constrained in rural areas and in areas with poor infrastructure (Alimaev et al., 2020). Thus, social

reforms are needed, a gradual change in the vector of the republic's attitude towards women in top management, which is as important as digital innovations in the field of agriculture.

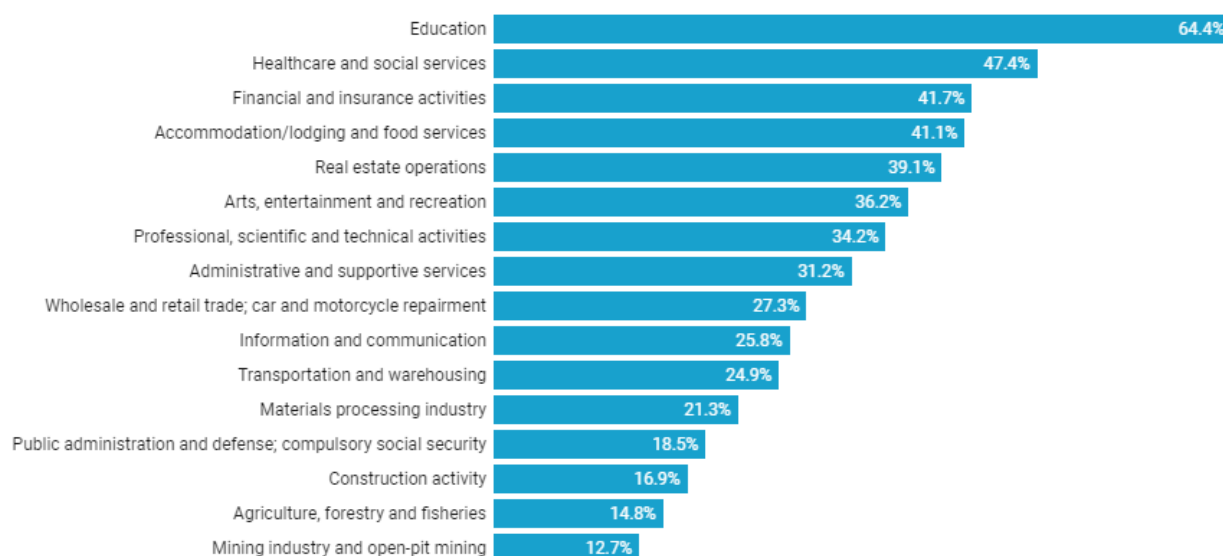


Figure 2. Number of female executives as a percentage of legal entities

3.8 Digitalization in agriculture and sustainable land management

The way that people, businesses, and governments operate is being transformed quickly by digital technology. By lowering the cost of information and control, they have an impact on every player in the food system and have a big positive impact on agriculture. Information and communication technologies (ICTs) are important development drivers in our increasingly digital environment and can help countries empower themselves to accomplish all of the Sustainable Development Goals. 3.6 billion individuals are reportedly still totally locked off from the online world. Social and economic sustainability can be built on a foundation of digital technologies. There has never been a more urgent crisis in the world, and the recent worldwide awareness of the significance of digital infrastructure and its services creates numerous previously unimaginable prospects for genuine and quick improvement. The effects of a well-focused policy and regulatory framework can be seen in the growth of digitalization in Europe and the CIS.

In Europe, a 10% rise in digitization has led to a 1.4% increase in gross domestic product (GDP) per person (GDP). A 10% increase in fixed broadband penetration in the CIS region will lead to a 0.63 percent rise in GDP per person (Alshanskaya, 2020). Although while Europe is at the forefront of digital agriculture, many regions of the continent continue to underinvest in this field. Access to timely, precise information that is suited to particular locations and conditions is essential to helping farmers increase agricultural efficiency as agriculture becomes more knowledge-intensive. E-agriculture is concerned with the conception, creation, and implementation of cutting-edge ICT applications in the agricultural industry. The requirement to create strategies for national e-agricultural, often known as digital agriculture, has long been acknowledged by many stakeholders. A national plan for the use of ICTs in the agriculture sector has not yet been adopted or put into action in the majority of countries. E-agriculture initiatives will aid in the rationalization of human and financial resources, thoroughly handle the ICT difficulties facing the agricultural industry, create new sources of income, and enhance the quality of life for people living in remote areas. It is suggested that FAO co-host an international platform for digital agriculture in response to the call of the 2020 Global Forum on Food and Agriculture (GFFA). This platform will make it easier to put into practice policy recommendations, best practices, and voluntary guidelines that can increase the benefits of using digital technologies in agriculture while addressing potential economic, social, and ethical implications and challenges.

Any human actions in the field of land development and use must be thought out and analyzed in advance. According to its description, the Sustainable Land Management (SLM) Agricultural Production Assessment Program is a knowledge-based method that aids in integrating land, water, biodiversity, and environmental management to meet changing human needs while ensuring the long-term productive potential of these resources. The usage of a "TEES test" is presumed in this technique. The technical efficiency, economic return, environmental friendliness, and social acceptability (TEES) test is a pre-filter for evaluating the viability of interventions or innovations in the field of sustainable land management (Quillérou et al., 2016).

3.9 Costs and technology in land restoration

In 2016, research calculated the annual cost of soil degradation in the area as a result of changes in ground cover and land use between 2001 and 2009. The deterioration of pasture accounts for the majority of the costs (\$4.6 billion US), followed by desertification (\$0.8 billion US), deforestation (\$0.3 billion US), and arable land abandonment (\$0.1 billion US). The study demonstrates the potential for making financially sound investments in more environmentally friendly land management, with the cost of taking action often being five times less than the cost of inaction. Unfortunately, among the five studied republics, Kazakhstan loses 3.5-6.1 times more funds for land restoration in comparison with the rest of the republics (Figure 3) (Tsvetikova et al., 2020).

Country	Annual cost of land degradation between 2001 and 2009, due to land use/cover change, in billion USD	Annual cost of land degradation per capita, in USD	GDP in 2009, in billion USD	Cost of land degradation as a share of GDP
Kazakhstan	3.06	1.782	115	3%
Kyrgyzstan	0.55	822	5	11%
Tajikistan	0.50	609	5	10%
Turkmenistan	0.87	1.083	20	4%
Uzbekistan	0.83	237	33	3%
Total	5.85	769	178	3%

Figure 3. Expenditures of the republics of Central Asia for degraded agricultural lands restoration, billion dollars

The process of land management in general is required for locating real estate objects in space and registering subsequent rights to them. Several kinds of equipment started to emerge to streamline the research process. Electronic versions of the original theodolites, tachometers, and levels have taken their place, and new space technologies are being used to locate and characterize real estate items. The goal of geodetic technology development is often to combine multiple instrumental functions into a single device. Hence, experts may swiftly gain an understanding of a certain real estate object's physical position as well as its categorical affiliation and the type of permitted use, when it comes to land plots; or about typology, when it comes to the characteristics of buildings or structures.

One of the tasks of internal land management in agriculture is to carry out scientific field work with the subsequent compilation of maps and atlases. For the first time for Kazakhstan, specialized digital cartographic materials have been created, reflecting in real time the indicators of the breed zoning of animals, forage resources, watering of land, and weather conditions. All these monitoring and digital management tools make the life and work of specialists and private farmers much easier. Access to the service is free (when purchasing a subscription) for both organizations and individuals. The prospects for the development of such tools include automatic planning, the formation of the necessary reporting, the ability to track and predict the use of agricultural land.

4 Conclusions

The primary economic sector in Central Asia is agriculture. Because of this, the sustainable use of agricultural land is crucial for ecosystem preservation, human well-being, social fairness, and economic prosperity. The importance of technology and investment for the future growth of the nation's agriculture sector is widely acknowledged. A wide range of applications and great opportunities for improving economic efficiency can be found in the introduction of innovations in the agriculture sector. Hence, the use of computer technology and high-tech tools with Internet support can greatly lower expenses, make analytics and control operational, and increase accessibility in the field of internal land management.

As discussed in the main part of the work, the issue of financing should be put at the head when considering the cardinal measures to support agriculture. In addition, it is necessary to think over how to properly direct banks to finance the real sector, making this direction more attractive to them. Long-term planning of the upcoming work and sufficient funding will provide the sector with the necessary material and technical base, as well as motivate and attract scientific and expert industry personnel. High-quality training of qualified personnel in the field of land management, ecology and

agriculture, organization of practice and internship programs for students during the period of study, as well as assistance in employment with the provision of motivation – financial, career, etc., will allow future experts to understand the problems of the industry and develop in scientific and practical activities without fear or unwillingness to plunge into a real professional environment. Competent social policy and financial support of the adult population will become an opportunity for the state to reduce the outflow of personnel from rural areas. Further research on specific land management issues will be conducted in more depth, and a methodical approach to solving such issues will be used, reflecting the findings and classification of land development difficulties.

References

- Abbas, M.Y., Singh, R. (2014). A survey of environmental awareness, attitude, and participation amongst university students: A case study. *International Journal of Science and Research*, **3** (5): 1755-1760.
- Agriculture experiences the most powerful staff shortage. (2021). <https://atameken.kz/en/news/25192-v-severnom-kazahstane-samyj-sil-nyj-kadrovj-golod-oshushaet-sel-skoe-hozyajstvo>
- Alimaev, I.I., Kushenov, K.I., Meldebekova, N.A., Zhakipova, K.B., Shanbaev, K.B. (2020). *Recommendations for the use of pastures in beef cattle breeding*. Almaty, Nauka.
- Alshanskaya, A. (2020). How much, where and how do women earn in Kazakhstan? <https://cabar.asia/en/how-much-where-and-how-do-women-earn-in-kazakhstan>.
- Critchley, W., Radstake, F. (2017). *Sustainable land management in Asia introducing the landscape approach*. Philippines, Asian Development Bank.
- Dudin, M., Frolova, E. (2015). The deming cycle (PDCA): Concept as an efficient tool for continuous quality improvement in the agribusiness. *Asian Social Science*, **11** (1): 239-246.
- Hofman, I. (2018). Agriculture in Central Asia: Unlocking the potential. <https://voicesoncentralasia.org/agriculture-in-central-asia-unlocking-the-potential-interview-with-irna-hofman/>
- Islamov, S., Namozov, N., Saidova, M., Kodirova, D. (2021). Elimination of desert pastures degradation through creation of perennial crop areas in Uzbekistan. *E3S Web of Conferences*, **244**: 1-6.
- Kaldybai, K.K., Kulakhm, S.R. (2018). The impact of globalization on Kazakhstan's agriculture. *Young Scientist*, **5.1** (191.1): 44-45.
- Kazakhstan - Agricultural Sector. (2021). <https://www.privacyshield.gov/article?id=Kazakhstan-Agricultural-Sector>
- Land Code of the Republic of Kazakhstan. (2021). https://online.zakon.kz/Document/?doc_id=30958904
- Law of the Russian Federation N 78-FZ "On Land Management". (2001). http://www.consultant.ru/document/cons_doc_LAW_32132/
- Mikheeva, N. (2018). Kazakhstan: There are many pastures, little sense. <https://kazakh-zerno.net/144384-kazakhstan-pastbishch-mnogo-tolku-malo/>
- Morozov, E.V., Subbotin, A.G. (2014). *Seed production and seed certification*. Saratov, FGBOU VPO "Saratov GAU".
- Order of the Minister of Agriculture of the Republic of Kazakhstan No 7 "On approval of the Rules for the rational use of agricultural land and amendments and additions to some orders of the Minister of Agriculture of the Republic of Kazakhstan". (2020). <https://adilet.zan.kz/rus/docs/V2000019893>
- Quillérou, E., Thomas, R.J., Guchgeldiyev, O., Ettling, S., Etter, H., Stewart, N. (2016). Broadening options for improved economic sustainability in Central Asia: A synthesis of national studies. https://www.eld-initiative.org/fileadmin/pdf/ELD_CA_regional_report.pdf
- Seil Khanov, A. (2021). Kazakh PM instructs to prepare roadmaps for investment projects' implementation. https://www.inform.kz/en/kazakh-pm-instructs-to-prepare-roadmaps-for-investment-projects-implementation_a3759374
- Shibaeva, N., Baban, T., Prokhorova, V., Karlova, O., Girzheva, O., Krutko, M. (2019). Methodological bases of estimating the efficiency of organizational and economic mechanism of regulatory policy in agriculture. *Global Journal of Environmental Science and Management*, **5** (SI): 160-171.
- Sholk, D. (2016). Kazakhstan's land reforms: A major debate on the contentious issue of land reforms is underway in Kazakhstan. <https://thediplomat.com/2016/06/kazakhstans-land-reforms/>

- Tankiyeva, A. (2016). Myth and reality of investment attractiveness of agriculture in Kazakhstan. *Central Asian Economic Review*, **6**: 149-155.
- Tazabekov, A., Tulegenova, M. (2016). Agricultural industry of republic of Kazakhstan and food security. *Journal Bulletin of KEU: Economy, Philosophy, Pedagogics, Jurisprudence*, **1** (40): 128-132.
- Tsvetikova, T., Bokov, Y., Kochetkov, E., Reshetnikova, I. (2020). Land management activities in the context of the development of modern business activity. *Academy of Entrepreneurship Journal*, **26** (1): 1-5.
- Zaira, T., Satpayeva, A.A., Kireyeva, G.K., Yermekbayeva, D. (2020). Gender equality and women business of framework 5ms in Kazakhstan: Analysis and basic directions. *Journal of Asian Finance Economics and Business*, **7** (3): 253-264.
- Zuev, E. (2017). Learning to use the Deming Cycle in work. <https://blog.zolle.ru/2017/08/25/cikl-deminga/>