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The Kazakhstan dairy enterprises' problem analysis and innovative potential of an agricultural enterprise

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Abstract. In this study, the current situation in the agricultural sector of Kazakhstan and specifically the diary sphere is analized. Innovations and technologies for the dairy industry are also being researched, and the possibility of their utilization in Kazakhstan is proposed, along with ways to further agricultural development. This study shows the largest dairy enterprises of the Republic of Kazakhstan, their production capacities, and methods of milk production. It presents innovative methods that improve the process of milk production as well as its quality and quantity. This study reveals the problems of lack of acreage, absence of a clear subsidizing policy and state programs on supporting current and new industries, shortage of qualified personnel, and dependence on regulatory at both the national and transnational levels, etc. in the Republic of Kazakhstan in recent years. All these factors do not allow us to achieve adequately the required production rates, and with them comes the introduction of the latest technological methods in the production of dairy products. At the same time, there was an increase by 57.4% in the number of operating agricultural enterprises over the last 5 years, and the share of agriculture in the country's GDP by 0.8-1%. The study shows the further ways of the innovative development of milk production, as well as the problems that these productions face and the ways to solve them.

1. Introduction

The total area of the Republic of Kazakhstan ranks as second in the CIS, as well as among the EurAsEU member countries. In terms of pasture area, the Republic of Kazakhstan ranks fifth in the world and first in terms of the ratio of pasture area to the number of farm animals. There are 42.2 million hectares pastures, which one can use all year round. Most of them are located in the south and west of Kazakhstan in the valleys of the Ile, Syrdarya and Zhaiyk rivers, as well as in wet sandy massifs areas of the desert zone. In the republic, there is practically no well-established system of distant-pasture animal husbandry for the effective use of pastures. The development of such system will improve the situation with a less expensive fodder base for farms and will give impetus to the growth of livestock and the productivity of farm animals [1].

Modern technology is developing at a tremendous pace in all spheres of human life. The food

industry subjected to technological changes poorly and belatedly, in comparison with areas directly dependent on innovations and technologies development, such as telecommunications, construction, engineering, logistics, etc.

However, the population growth, the quantitative consumption level, the food products quality, their range and availability in the modern world require revision and modernization of their production approaches (Fig. 1). However, despite all this, the contribution of agriculture to the economy is only 5.4% in 2021, which is slightly higher than in previous years [2-4].

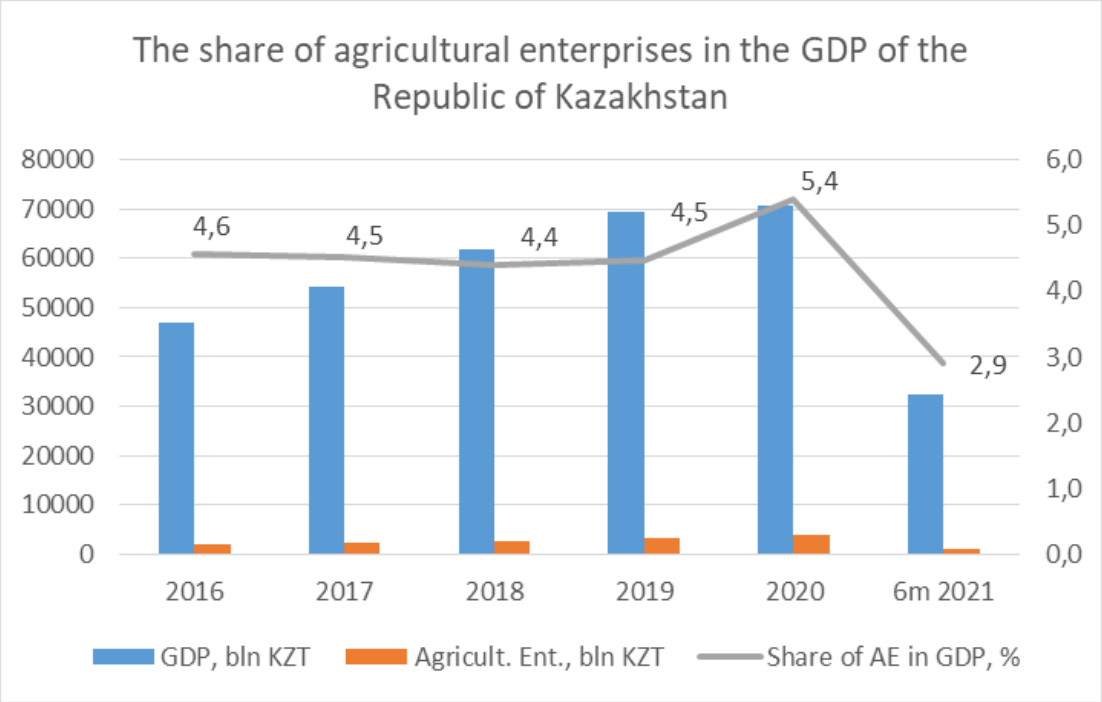

Fig. 1. The share of agricultural enterprises in the GDP of the Republic of Kazakhstan Source: [5].

The purpose of this study is to examine the current level of development of dairy industry enterprises in the Republic of Kazakhstan, the problems and ways to solve them, the level of innovation and the further vector of its development.

2. Methodology

This study analized the works of local and world economists published in periodicals, posted on websites, and on the Internet. Besides, the publications of the United Nations Economic Commission for Europe, the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, the Eurasian Economic Commission, as well as a number of other authoritative resources served as a source of data for the study. In the process of conducting scientific research, dialectical methods of a general scientific nature were used, as well as specific methods in economic research (Fig. 2).

As for July 1, 2021, 94% is accounted for livestock (1,425 billion tenge) in the structure of agricultural enterprises gross output (provision of services), 4.9% for crop production (75 billion tenge), and 0.1% for other sub-sectors (agricultural services, fishing and forestry, hunting). The growth in livestock production in the first half of 2021 was due to an increase in livestock volume and poultry slaughter in live weight by 5.5% and raw cow's milk yield by 3.2% [5].

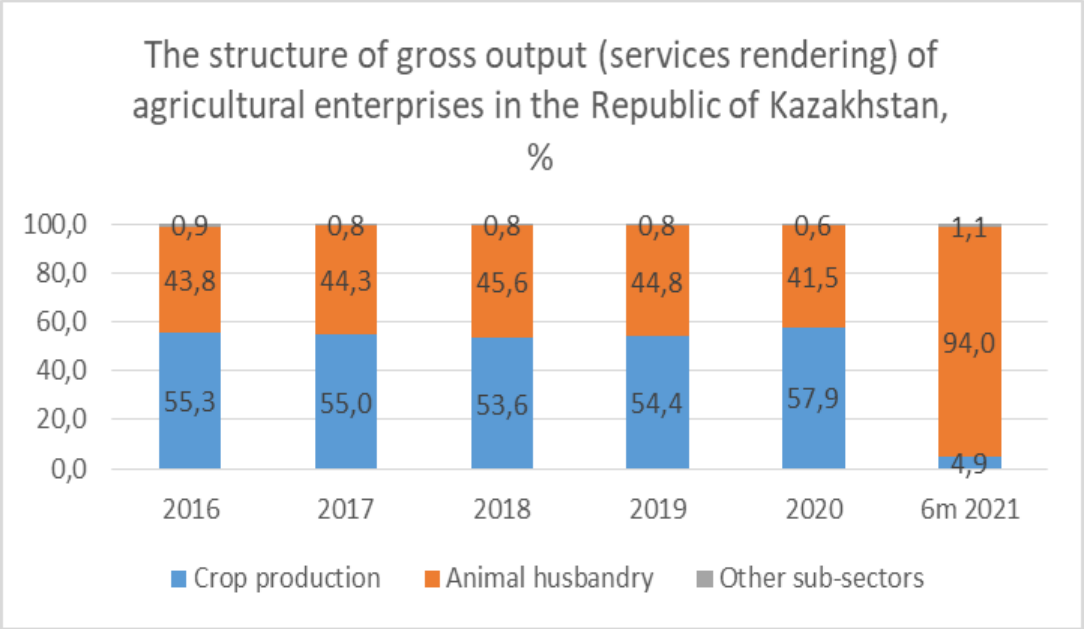

Fig. 2. The structure of agricultural enterprises gross output (services rendering) in the Republic of Kazakhstan

Source: [5].

Over the past five years, the number of operating agricultural enterprises has increased by 5,295 enterprises (by 57.4%). We have to note that with a steady increase in the number of both registered and operating agricultural enterprises, the share of operating agricultural enterprises in the total number of registered agricultural enterprises remained practically unchanged (63.4% in 2016 against 77% in 2020).

As of July 01, 2021, out of 19,581 registered legal entities of agricultural enterprises (4.2% of all legal entities registered in Kazakhstan), only 15,317 enterprises are operating now in the Republic.

Of these, 15,003 enterprises operate in small business (with a payroll of up to 100 people), 262 enterprises in medium-sized business (from 101 to 250 people), and 52 enterprises in large business (over 250 people) [1]. The level of agricultural development in the country is influenced by many factors, the largest of them are:

- Availability of land suitable for pastures and cultivation of agricultural crops;
- Weather conditions accompanying or hindering the development of agricultural enterprises;
- Availability, duration and quality of life of farmed animal breeds (poultry, cattle, small cattle);
- The production processes used;
- Support for agricultural organizations at the state level, etc.

The Republic of Kazakhstan has all the necessary land resources for the effective development of agricultural enterprises. They include favourable natural and climatic conditions and vast areas of agricultural land, which can be a good help both for saturating the national market and for selling products abroad. Pasturelands are significant, but they are not fully used for their intended purposes. According to statistics, desertified areas and degraded lands make up more than 15% of the country's territory (Fig. 3). About 27.1 million hectares of pastures out of a total of 186.5 million hectares are in extreme degradation.

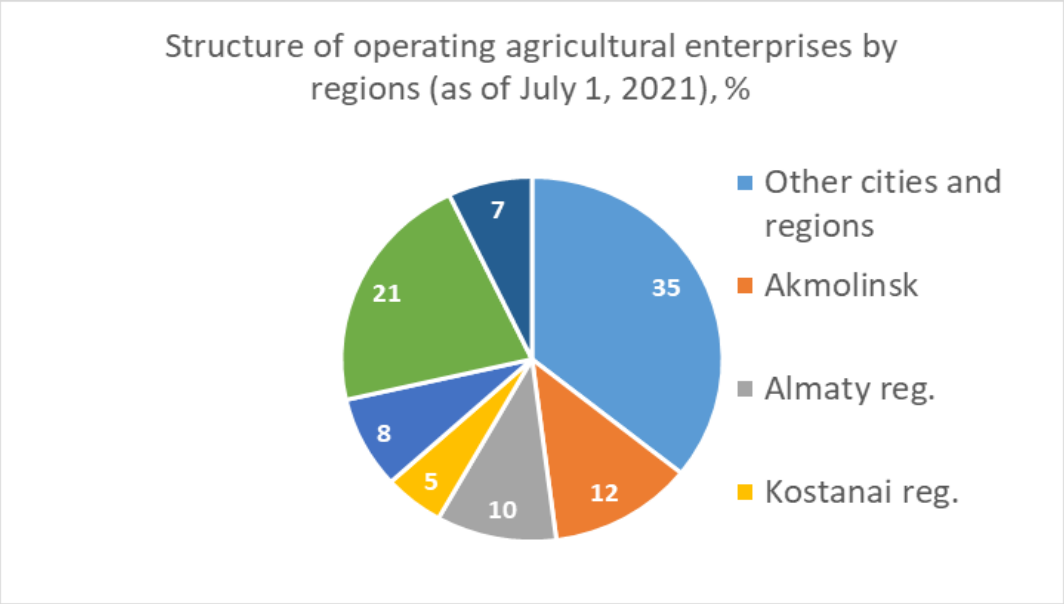

Fig. 3. Structure of operating agricultural enterprises by regions
Source: [5].

Nowadays, the significant depletion of pastures, along the villages, remains one of the main problems, along with the depletion of natural pastures in densely populated areas, especially in the south-eastern part of the country. The fodder lands of the Republic of Kazakhstan occupy 191.6 million hectares or 70.3% of the territory, of which 186.5 million hectares are pastures and 5.1 million hectares are hayfields. Natural forage lands are the main source of pasture fodder and a significant part of the harvested hay. 77% of the republic's pastures are located in flat terrain, including 25% in the sands; sloping pastures of mountains and small hills make up 18%; valley and lowlands - 5%. The main lands of hayfields are concentrated in floodplains and river valleys - 71%; in the fall of the plain - 23%, on the gentle slopes of the mountains - 6%. The vegetation of hayfields is intrazonal. The natural forage lands are classified within the following zones: forest-steppe and steppe (19%), semi-desert (12%), desert (39%), small hills (16%), foothill plains (9%) and mountains (5%) according to the “Classification of natural forage lands of the Republic of Kazakhstan” [6].

Table 1 Feed resources of the Republic of Kazakhstan

Zones	Area (M ha)	Dry matter forage reserve (M tons)	Feed units (M tons)	Hayfield area (M ha)	Dry matter forage reserve (M tons)	Feed units (M tons)
Forest-steppe and steppe	32,6	144,6	79,2	1,8	19,7	9,6
Semi-desert	21	65,1	33,6	0,7	-	-
Desert	72,9	199,1	95,9	0,8	8,5	4
Small hills	32,4	95,3	47,6	0,9	4	1,9
foothill plains	18,7	48,9	26	0,7	6,5	3,4
Low and middle mountains	8,9	41	22	0,2	-	-

Source: Kazakh Research Institute of Animal Husbandry and Forage Production [6].

3. Empirical findings

In order to understand the possible volume of cultivated crops and fodder obtained from them it is necessary to have data on sown areas. However, as it mentioned above, today far from the entire sown area used for its intended purposes.

In addition, the use of only pastures and cultivated crops as feed is not enough to obtain high-quality milk and related dairy products that meet the requirements of the Technical Regulation of the Customs Union 033/2013 "On the safety of milk and dairy products" and related CU TR.

Growing crops in itself is only for the production of fodder (one-year-old grasses, silage, and haulage) is not economically feasible now. The sown areas in the Republic of Kazakhstan are generally used for growing highly profitable crops (cereals, oilseeds), as well as crops required for import substitution (wheat, beets, rice, sunflower, etc.) due to the tightening of export-import rules in neighbouring countries [7]. Another problem is the lack of an irrigation system for croplands. Historically, the southern part of the Republic of Kazakhstan is subjected to drying up, which also includes the rivers and lakes preservation problems due to the exhaustive and irretrievable use of water for irrigation by neighbouring states. If in Soviet times, the fields were irrigated by the artificial delivery of irrigation water, now, when most of the lands and ways to them are in private ownership, the general irrigation system does not work, although it can still be restored and maintained through the joint efforts of the state and business [8-10].

Another way to solve the problem of irrigation can be technological solutions for the artificial irrigation of arable land, which as a result can significantly increase yields and water consumption reduction. The development of groundwater sources, the introduction of sprinkler systems, and the storage tanks construction, pipeline systems for water delivery and a whole range of measures for the irrigation development have to be done at the state level [11].

It means that the state should develop and implement a consistent program of support and subsidies, allocation of arable land on favourable terms for SMEs planning or already carrying out the cultivation of crops for the production of feed for cattle.

Also, the main problem of natural feed for cattle and, in particular, milk-bearing cows grazing in natural conditions on pastures is the lack of diversity in the consumption of sowing, as well as elements necessary for the organism of cows, such as: • A, E, D vitamins; • Macro- (calcium, phosphorus, sodium, magnesium); trace elements (iron, manganese, copper, iodine, sulfur, zinc, cobalt).

Almost all large productions cooperate with companies providing feed solution services. That is, specialized organizations are engaged in the analysis, development and implementation of feed systems for production entities. Such kind of approach makes it possible to solve several problems at once:

- Lack of variety and necessary elements in the feed
- Health and digestive problems of cattle
- Low milk yield
- Non-compliance with regulatory and market requirements for quality

At the same time, the biggest share of additives, dietary supplements and feed premixes is imported from abroad, which increases the cost of the final product of local manufacturing companies. It means that the organization of local production of the necessary additives and premixes will significantly reduce the cost of dairy production, and, if necessary, will satisfy the needs of neighbouring countries [2,7,12-15].

Cattle breeding technologies to obtain high-yielding livestock are a separate study topic. In 2020, the average milk yield per head in the dairy farms of Kazakhstan was equal to 4,864 litres, and in household plots it was two times lower at 2,424 litres. On farms, the figure was even lower: 1,835 litres per cow. But here the overall picture was influenced by data from several arid regions (WKR, Atyrau, and Mangystau), where farms have problems with fodder. But in general, household plots and small farms show relatively low milk yields, which can be easily explained by both having similar problems with feed, veterinary medicine, and other conditions that affect the result.

Table 2 Key indicators of the state of the livestock industry in Kazakhstan (1990-2020)

Indicator	year		
	1990	**1998**	**2020**
Cattle, total, thousand heads including cows, thousand heads percentage of cows in herds	9 757 200 3 368 000 34,5	3 999 900 1 956 800 48,9	7 437 645 3 773 070 50,7
Population: dairy cattle, thousand heads including cows, thousand heads beef cattle, including cows, thousand heads	8 615 959 2 972 506 1 141 241 393 728	3 876 032 1 895 380 123 868 60 571	4 962 541 2 520 532 2 475 104 1 252 547
Milk production, thousand tons (2019)	5 641 600	3 364 300	5 820 105
Average annual milk yield per 1 cow, kg.	1 988	1 775	2 347
Average annual increase in milk yield per 1 cow, kg.	-	- 26,6%	+ 11,9

Source: Kazakh Research Institute of Animal Husbandry and Forage Production [6].

When breeding of highly productive imported livestock breeds with a milk yield of 7.5-8.0 thousand and more kg. of milk, it is necessary to take into account the availability of full-time veterinary specialists who have more opportunities to prevent a decrease in indicators of the reproductive functions of cows that do not adapt well enough to new, unusual climatic and forage conditions in the new country. It is known that there is an inverse correlation between the high level of milk production of cows and their reproductive ability [16].

Observations have established that each increase in milk yield of milk-bearing cows by 1000 kg after six thousandth milk yield reduces the reproductive function of cows by 10%, which is not affected by our domestic breeds of dairy cattle, concentrated in farm holds, individual farms and households, if they are provided with comfortable conditions of feeding, maintenance, contributing to the disclosure of their genetic productive potential [12].

In developed countries, there are systems of dairy cattle genetic selection, which determine the main goals for themselves:

- High milk productivity
- High quality and quantity of calf yield
- Health of born livestock
- Length of performance

The depletion of milk-bearing cows occurs due to the following reasons: deterioration of the general condition (udder, hooves, parasites); low-quality and poor diet of feed; low quality content (pens, feeding rooms, maternity rooms); lack of proper and timely care for individuals (including veterinary control); milking quality, etc. [17].

4. Discussion

Breeding work in relation to cattle in the Republic of Kazakhstan is currently at an early stage and based on the other countries' breeding experience, such as the USA, Canada, and the countries of the European Union and on the requirements of the International Committee for Animal Registration (ICAR). ICAR standards are being implemented only now, primary data on cattle is being collected, and the necessary regulatory legal acts are currently under development. In general, the experience of developed countries in implementing of national cattle breeding systems is carefully studied and used as the basis for developing of their own programs, after which the desired result can be obtained within 3-5 years. Accordingly, at present, most of the current highly productive livestock in the Republic of Kazakhstan consists of the specimen imported from abroad (Germany, France, Czech Republic, etc.), imported semen and offspring, which quality also strongly affects the conditions of their keeping, the production sites condition and local processes.

For instance, feeding technologies in most large-scale industries are already quite innovative in comparison with cattle feeding technologies in Soviet times. At the same time, veterinary medicine, as a separate process for monitoring of an animal health condition is poorly developed. Staff training is difficult, because demand in the market is uneven, and the average earnings of these specialists are lower than the earnings of other specialists. This can also include the low quality of training in universities, because the teaching system has not been adapted to the requirements of the market and innovations yet [18-19].

As for the technologies for cattle keeping, including milk-bearing cows, most of the new farms are built using the latest technologies for the construction and cattle keeping, as well as milk production processes. By housing technology, we also mean systems for monitoring and distributing individuals to premises, indoor climate control systems, health control systems, including veterinary medicine, cow milking systems, milk quality control systems, etc. [20].

After receiving fresh milk, they have to cool it and deliver it to the milk processing plant. This process is difficult to standardize without applying a technology, so the process of delivering fresh milk must be strictly controlled, since in case of its violation (temperature, contact with the external environment, long-term storage), the quality characteristics of the milk that goes to processing deteriorate [21].

Having on-farm milk processing facilities, or factories near dairy farms is essential. State subsidies for the construction of such industries are currently unstable. There is no clear approach to support this area, which often repels business from its development in the agro-industry [22-26].

The share of household plots in the production of milk and related products is currently decreasing, because, due to economic restrictions. Small farms cannot produce goods of the required quality and quantity. The reasons are the variety of livestock breeds, poor quality of premises for livestock keeping and production, lack of adequate measures to control the health of the livestock, low quality feed, etc.

Nevertheless, such products hit the shelves of the country, but they are not able to compete with large-scale industries.

In the case of the implementation of the requirements of the Technical Regulations for the safety of products of the EurAsEC, all products that do not meet the new requirements may be out of law [27].

It means that private household plots and other small farms will have no choice but to close their production.

The solution of the problem can be the merging of such small industries with their shares into one or more large industries. Nevertheless, to make it happen, the government has to develop a set of support measures. The issues of building capacities, equipping them with high-quality livestock, introducing of production systems, hiring specialists, etc., can remain unresolved for a long time without the development of an appropriate state program.

5. Conclusion

Based on our research, for the innovative development of the activities of dairy industry enterprises in the Republic of Kazakhstan, adequate and confident support from the state is vital by: Provision of farmland and arable land for growing fodder crops; - Development and implementation of an irrigation system for arable land; - Provision of preferential terms for the construction of dairy farms and factories; Providing preferential terms for the construction of feed processing plants; - improving the quality of training for specialists in the field of veterinary medicine and agriculture. Despite the existing potential for extensive development of the industry in the form of the ratio of pasture area and the number of farm animals, as well as an increase in the number of operating agricultural enterprises by 57.4%, the increase in the share of agriculture in the country's GDP amounted to 0.8-1%, which indicates the need to choose an intensive path based on the realization of the innovative potential of the industry and the country. In order to ensure sustainable development of the dairy sector, a complete inventory and analysis of the use of land and water resources of the country iused to provide fodder for dairy cattle should be carried out. In addition, agricultural integration and cooperation can

ensure the survival of private subsidiary farms in market conditions.

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