

Innovative Solutions for Agricultural Sector Development in Azerbaijan

Anar Hajiyev, Kanan Chalabi, Natig Gurbanov, Stephanie Mairhofer, Viktorija Gudauskaitė

¹Azerbaijan Technical University, Baku, Azerbaijan

²University College for Agricultural and Environmental Education, Vienna, Austria

³Kauno Kolegija Higher Education Institution, Kaunas, Lithuania

^aanar.hajiyev@aztu.edu.az; ^bkenanchalabi@gmail.com; ^cnatiq.qurbanov@aztu.edu.az; ^dstephanie.mairhofer@haup.ac.at; ^eviktorija.gudauskaite@go.kauko.lt

Abstract: *The agricultural sector remains a crucial component of Azerbaijan's economy, offering substantial potential for diversification away from its dominant oil and gas sector. This article explores innovative approaches and technological advancements aimed at fostering sustainable development within the agricultural sector of Azerbaijan, highlighting initiatives that leverage modern technologies and collaborative projects to enhance productivity and sustainability. The central component of the government's 2022-2026 socio-economic development strategy is the diversification of the economy by increasing the share of non-oil sectors, such as agriculture. To support this vision, the Erasmus+ UniClaD project has played a significant role in promoting innovative practices and sustainability principles within the agricultural and agribusiness sectors of Azerbaijan. One of the key achievements of the UniClaD project has been the development of a mobile application called "Feed Calculator," designed to optimize feed rations for livestock farmers. This tool addresses several challenges faced by Azerbaijani farmers, particularly those in small and medium-sized enterprises who often lack access to personal computers and technical skills required to utilize complex software like Microsoft Excel. The "Feed Calculator" simplifies the process of determining optimal animal nutrition, thereby enhancing productivity in the livestock sector, which remains a significant component of Azerbaijan's agricultural output.*

Keywords: Agriculture, Innovation, Azerbaijan, Economic Diversification, UniClaD Project, Sustainable Development, Feed Calculator.

1. INTRODUCTION

The agricultural sector has been one of the leading sectors in the modern world economy and has undergone a long period of development. If we look at history, we will see that the agricultural sector has been one of the leading production areas in most regions of the world for millennia. Even now, such a number of countries continue to recognize themselves as agro-industrial or simply agrarian countries. The technological innovations and socio-economic transformations that took place during the last two hundred years after the first industrial revolution have reduced not the total volume of the agricultural sector, but only its share in the world economy. Currently, giants of the developed world economy, such as the USA, Brazil, China, India, the Russian Federation, France, Germany, Australia, and Canada, occupy the leading positions in the agricultural sector in terms of production volume.

The agricultural sector is one of the largest sectors of the economy, which includes enterprises, organizations and individual farms engaged in the production and processing of agricultural products. It includes sectors such as animal husbandry, crop production, forestry and fisheries.

The agricultural sector performs important tasks such as providing the population with food products, raw materials for industry and export, as well as creating jobs and developing rural areas. To put it more succinctly, the agricultural sector is one of the most stable and reliable sectors of the economy that ensures food security of the country.

In addition to ensuring the food security of the country, this sector also helps to solve urgent issues such as the problem of urbanization and the emptying of rural areas due to the improvement of the socio-economic situation of the rural population, as well as the creation of new jobs.

1.1. The role of the agricultural sector in the economy of Azerbaijan

As it is known, the main place in the formation of the state budget in Azerbaijan is occupied by the oil and gas sector. However, one of the main goals set by the country's leadership is diversification of the economy and increasing the share of the non-oil sector in budget revenues. Azerbaijan, which has quite large historical traditions in agriculture, has great opportunities for the development of the agricultural sector. That is why, along with freight transportation, construction, mining, and green energy, the agricultural sector is one of the main directions in the development of the non-oil sector, and a number of goals have been set at the state level. These goals are reflected in the 2022–2026 socio-economic development strategy of the Republic of Azerbaijan. It is noted that with the

introduction of modern technologies in the agricultural sector, productivity will increase, as well as new jobs will be created, and with the stimulating support of the state, the agricultural sector will grow by an average of 4% annually in 2022–2026.

1.2. UniClaD project on the development of the agricultural sector in Azerbaijan

As mentioned earlier, the agrarian sector, as an important component of the work done in the direction of diversification of the economy of Azerbaijan, has a great potential. However, in order to increase the productivity of the agricultural sector in different directions and accelerate its development, the use of modern world experience in this sector, as well as initiatives from the non-state sector, are extremely important. As the most important of the initiatives in this direction in recent years, UniClaD - the project of increasing the capacity of universities in starting and participating in the development of clusters with the principles of innovation and sustainability, funded by the ERASMUS + CBHE organization of the European Union, draws special attention. The goal of the project is the development of sustainable and competitive agriculture and agribusiness, the implementation of an action plan for agrarian training, consulting and innovation services, and the number of participants in educational events at the end of the period is defined as an annual increase of 20%. One of the most important contributions of the project was researching the possibilities of digitization in the agricultural sector and creating a mobile application to facilitate the work of farmers and smallholders operating in the livestock sector. In close cooperation with the “Agrarian Innovation Center”, the “Feed Calculator” pilot project was developed by the working group of the UniClaD project from Azerbaijan and was made available to farmers engaged in animal husbandry.

2. FORMULATION OF THE PROBLEM

According to the figures released by the State Statistics Committee of the Republic of Azerbaijan, the share of the agricultural sector in the structure of the total domestic product of Azerbaijan in 2022 was 4.8% or 10984.2 million AZN. About half of it, in other words 5446.2 million AZN, was directly allocated to the livestock sector.

According to other statistical indicators, in 2023, a total of 2,618,100 cattle, 7,751,700 small-horned cattle, 5,100 pigs, and 2,979,490 chickens are kept in Azerbaijan.

As we know, meat and dairy products form an integral part of the food ration in Azerbaijan. Again, if we look at the statistical indicators, we will see that in 2022, a total of 368.2 million tons of slaughtered meat and 2264.7 million tons of milk were produced in Azerbaijan. The mentioned statistical indicators emphasize the importance of animal husbandry in the agricultural sector of Azerbaijan, including livestock and poultry, and clearly show the importance of increasing attention to this area.

Azerbaijan's unique climatic conditions, rich soil fund and developed crop farming create fertile conditions for the development of animal husbandry. In particular, the freed Karabakh and Eastern-Zangezur economic-geographic territories are expected to give a great impetus to the increase in the volume of agriculture, including animal husbandry, in Azerbaijan in the coming years.

It is known that in order to obtain high productivity in the animal husbandry sector, either in the meat or dairy sector, it is necessary to ensure a certain nutritional ration of the animals. The correct choice of food ration depends on a number of parameters, such as the type and number of animals in the farm, the required productivity, the types of feed given to animals, the area of the area required for keeping animals and planting the required amount of feed. Determination of each of these parameters requires quite complex calculations.

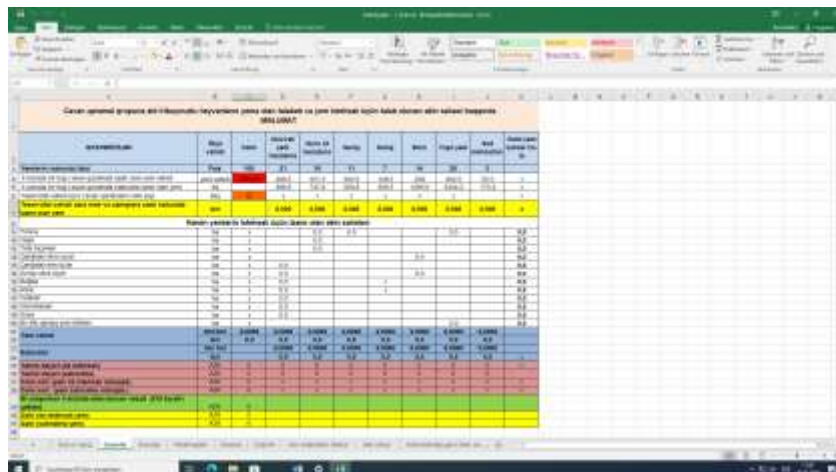


Figure 1. Main page of Excel document prepared for use of farmers

In order to determine these parameters more quickly and to simplify the calculations, the Ministry of Agriculture of the Republic of Azerbaijan prepared special tables for farmers based on the Excel software package (figure 1). These Excel spreadsheets, consisting

of a total of 11 pages and more than 100 practice-based mathematical calculations, were somewhat difficult to use by farmers due to certain technical requirements, although they made calculations easier. So, in order to use the mentioned Excel tables, the farmer must have a personal computer, the Microsoft Office software package loaded on this computer, as well as the skills to work directly with the Excel program. However, experience shows that most farmers with small and medium farms not only do not have such skills, but in some cases do not even have personal computers at all. These factors limit the actual use of those Excel documents and reduce their practical importance for farmers.

3. SOLUTION OF PROBLEM

In order to eliminate the mentioned shortcomings, the partners of the UniClad project from Azerbaijan based on the data provided by the Ministry of Agriculture of Azerbaijan created a mobile application "Feed calculator" and presented it to farmers as a pilot project. The presentation of the software intended for use on smartphones running the Android operating system was carried out in 2020 (figure 2).



Figure 2. User interface of the "Feed calculator" mobile application

The software helps livestock farmers to determine the ration of cattle (separately for cows and buffaloes, as well as for young ones), cattle (small horned animals: sheep and goats), poultry, pigs, as well as equines (horses). allows it to be done. "Feed calculator" has a very convenient interface and allows farmers to perform calculations through any device with an Android 5.0 and higher operating system, as well as to obtain information about the current weather forecast based on the geographical area determined by the mobile device's GPS signal through an Internet connection.

At the next stage of the "Feed calculator" project, work was carried out to make the website more accessible and easier to use for all farmers. With the support of team members from Azerbaijan Technical University who were sent to Austria's University College for Agricultural and Environmental Education (HAUP) in Vienna for research experience under the UniClad project, international partners of the UniClad project, and the Azerbaijan Food Safety Agency, the website <http://yemkalkulyatoru.aztu.edu.az> was created and launched (figure 3). Unlike the mobile application of the feed calculator, which was designed only for Android devices, the website is available in two languages—Azerbaijani and English—and is adapted for use on all types of mobile devices and computers. Additionally, it is possible to calculate the total annual feed fund needed for the livestock on the farm by including the types and numbers of various large and small ruminants, as well as birds. It should be noted that the "Feed calculator" mobile application can perform these calculations not in a general form, but only individually. By also operating in English, the website not only supports farmers in Azerbaijan but also small farms around the world, contributing to one of the main goals of the UniClad project: "the creation of conditions for better integration of innovations into agro-industrial production on the sustainability principles".

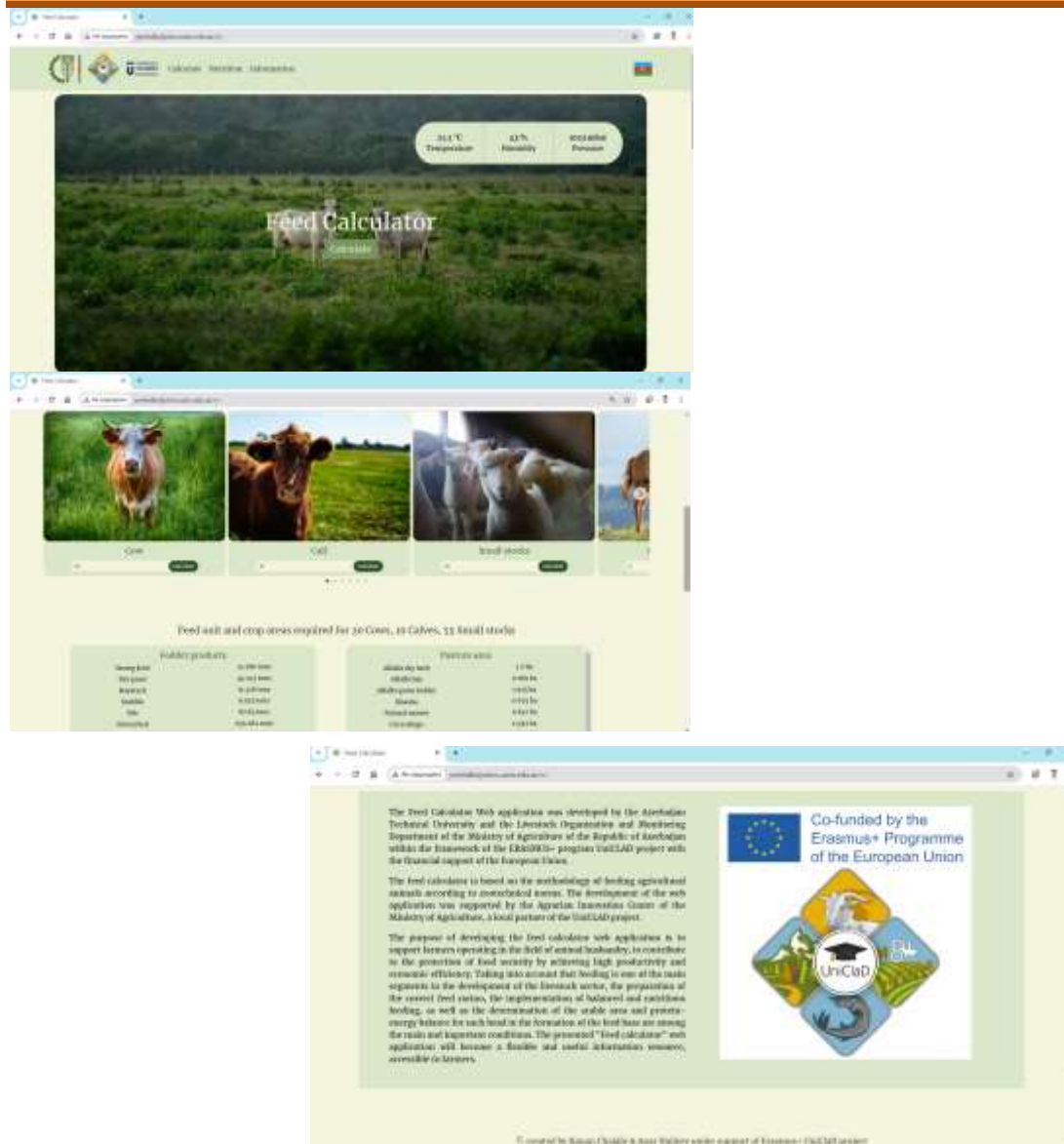


Figure 3. Interface of <http://yemkalkulyatoru.aztu.edu.az> web site

4. RESULTS

The development and implementation of the "Feed Calculator" mobile application and website as part of the UniClaD project have successfully addressed the challenges faced by Azerbaijani farmers, particularly those in small and medium enterprises. The mobile application and website significantly simplified the process of determining optimal feed rations for various types of livestock. By transitioning from complex Excel-based calculations to a user-friendly mobile interface, farmers can now easily calculate animal nutrition requirements without the need for advanced technical skills or access to personal computers. The pilot project demonstrated that the "Feed Calculator" enhanced productivity and sustainability within the livestock sector, directly contributing to the goals set forth in Azerbaijan's socio-economic development strategy for 2022-2026. The platform's expansion, through the development of a bilingual website accessible on all devices, further supports the integration of technological solutions into the agricultural sector, offering benefits to both local and international users.

5. CONCLUSIONS

The introduction of innovative tools such as the "Feed Calculator" has proven to be a crucial step in fostering sustainable development in Azerbaijan's agricultural sector. By providing farmers with easily accessible and practical solutions, this initiative promotes efficiency in animal husbandry, enhancing overall productivity in the agricultural industry. Moreover, the project aligns with the broader goals of economic diversification, which are vital for Azerbaijan as it seeks to reduce its dependency on the oil and gas

sectors. The success of the UniClaD project and the feed calculator highlights the potential for further technological advancements to transform agriculture, not only in Azerbaijan but also globally. Continued investment in innovation, capacity-building, and international collaboration, such as through the Erasmus+ program, will be key to sustaining this momentum and achieving long-term agricultural sustainability.

6. ACKNOWLEDGMENT

This article prepared under support of Erasmus+ program, project KA2 n° 609944-EPP-1-2019-1-LT-EPPKA2-CBHE-JP “Enhancing capacity of universities to initiate and to participate in clusters development on innovation and sustainability principles” (UniClaD).

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