

SWOT ANALYSIS OF KARABAKH'S AGRICULTURE: OPPORTUNITIES FOR APPLICATION OF AGRICULTURAL INNOVATION SYSTEMS

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ABSTRACT

The liberation of Azerbaijan's Karabakh territory from Armenian occupation promises prospects for the region's development and various sectors of the economy as a whole. Because the goal of reviving Karabakh is to revive the region with a new concept, using new methods, technologies and innovations. From this point of view, the opportunities created in agriculture, which is one of the priority sectors of the Karabakh economy, can open new opportunities for both Karabakh and Azerbaijan. The article aims to do the SWOT analysis of Karabakh's agriculture within certain limits and the opportunities of applying Agricultural Innovation Systems (AIS) in the region, which are used in many developed countries in the direction of this analysis. For this purpose, the SWOT analysis was conducted. Studying the region's specific realities reveals the possibility of implementing several applications of AIS in Karabakh and the positive impact of these applications on the country's economy. The results can be used in the current multifaceted plans for Karabakh and their implementation.

Keywords: Karabakh, Agriculture, Innovation, SWOT analysis, Agricultural Innovation Systems (AIS)

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INTRODUCTION

Agriculture sector has always been at the center of state policy (Aliyev and Gasimov, 2018) accompanied by large subsidization (Danilowska et al., 2015; Humbatova and Hajiyev, 2020). However, modernization of agriculture requires adopting the best practices in the sector (Sadigov, 2018). Recalling the huge agriculture potential in Karabakh, the study aims to conduct a SWOT analysis of agriculture in the liberated Karabakh region, highlighting the strengths and weaknesses of the sector, focusing on opportunities and threats from a perspective, and highlighting the possibilities of applying the AIS approach in the region. The 30-year occupation of Karabakh has completely destroyed its economy and infrastructure, industrial enterprises, arable lands, forest complexes, residential, cultural and household facilities etc. have been destroyed. The region's liberation in 2020 was the main goal of the reconstruction. Because to relocate the population to the area, its infrastructure, agriculture, and economic life must be restored. This recovery process aims to restore the region with a completely new concept, modern, scientific, and technological innovations.

The importance of this research is that it is studying the opportunities of applying AIS in our country for the first time, especially in the liberated Karabakh region. Because for the restoration and development of agriculture in Karabakh, there is a need for a system that meets modern realities and is tested in practice. The application of AIS coincides with these realities and can play a special role in developing the region in various directions. One of the key issues here is to study the compatibility of different applications of AIS with the region's agriculture, climate, nature, and other internal features and start the process starting from the most acceptable applications. Some work has been started and is being continued in this direction. Thus, the concepts of "Smart Village" and "Smart City" serve this purpose, i.e., restoring infrastructure. The AIS approach is also part of the "Smart Village" project and covers many detailed applications.

The study examines the agriculture of the Karabakh region in general and comments on the theoretical and statistical picture of the field. Then the theoretical, conceptual bases and various applications of AIS are presented. SWOT analysis of the region's agriculture is analyzed to clarify the real picture of the area. The last part focuses on the opportunities of applying AIS in the Karabakh region within the existing realities. In conclusion, various applications and possible effects are noted, focusing on specific proposals in this direction.

1. RESEARCH METHODOLOGY

In the research, the method of qualitative indicators was preferred as the research method, SWOT analysis, was used in this direction. At the same time, statistical analysis rely on using official, reliable online sources and databases.

The study took into account the impact of various post-occupation decisions. For example, the administrative division of the region differed in terms of pre-occupation and post-occupation periods. Thus, the decision made in 2021 approved a new administrative division of the economic regions of Azerbaijan. As a result of this new division, there are 2 separate economic regions in the area - Karabakh economic region (Khankendi city, Agjabadi, Aghdam, Barda, Fuzuli, Khojaly, Khojavend, Shusha and Tartar regions) and East Zangazur economic region (Jabrayil, Kalbajar, Gubadli, Lachin and Zangilan regions) was created. The research focuses on this new division.

2. SWOT ANALYSIS OF KARABAKH'S AGRICULTURE SECTOR

Looking at the economy of Karabakh, it seems that the basis of the economy is the agricultural sector. Livestock, beekeeping, cocoons, grain growing, tobacco growing, fruit growing, and viticulture are especially prominent among the leading agricultural sectors in the region. The livestock sector is divided into two parts, cattle breeding and sheep breeding, and in these areas, meat-wool and meat-dairy cattle predominate (Azərbaycan Respublikası Regionlarının Sosial-İqtisadi İnkişafı Dövlət Proqramı, 2004). As a result of the region's occupation, as in many areas, the agricultural sector was severely damaged. As a result of the occupation, production capacity was lost, and 300 thousand jobs were left vacant. Six hundred thousand large and small horned animals, 7 thousand farms 1.3 million hectares of agricultural land were abandoned in agriculture (Valiyev, 2008). These statistics show how the occupation of the Karabakh region has destroyed its economy.

Given the unique and important place and role of agriculture in the economy of the Karabakh region, the application of new approaches, scientific methods and, technologies, innovations that meet the requirements of modern times in this area should be one of the main goals. The application of AIS to the Karabakh region, which is used in agriculture in many countries worldwide, can also serve this purpose. To do this, you need to know what AIS is and the possibilities of its application in agriculture.

AIS serves the purpose of forming an ecosystem in the field. In this system, a number of organizations and enterprises in a group create and develop a new or existing procedure or product and apply it to agriculture (Food and Agriculture Organization (FAO), 2018). AIS is characterized by the integration of members involved in its implementation and the dynamic relationship between them (Inter-American Institute for Cooperation on Agriculture, 2014). Examples include organizations involved in the research of a new process or product to be established under AIS, organizations that finance that process or product, organizations that test and apply them, and agricultural producers and farmers who use these applications. Good coordination between these participants facilitates the successful application of AIS in agriculture and, consequently, increases productivity (World Bank, 2006).

Table 1: Countries' share of expenditures on agricultural research (in per cent)

Percentage of expenses	Countries
80-100 %	The Netherlands
60-80 %	Colombia, Estonia, America
40-60 %	Australia, Sweden
20-40 %	Canada, Latvia, Turkey
0-20 %	Argentina, Brazil, China, Korea, Japan

Source: OECD (2019)

It should also be noted that AIS is a system aimed at the cooperation of innovators in the field of agriculture with farmers and the implementation of these innovations by farmers (İsmayilov, 2015). However, it should be noted that AIS also has its own limitations and strengths. The strength of AIS is that it offers a unified path by creating, developing and practising knowledge and skills. Also, the existence of various forms of innovation processes is one of the strengths of AIS. The limitations of AIS are that it is not widely tested in agriculture and that less attention is paid to education in this area (World Bank, 2006). According to the Organization for Economic Co-operation and Development (OECD), some countries have little financial support for

agricultural research and development, regardless of whether they are developed or have large economies. Examples include Argentina, China, Korea, Japan, and Brazil (OECD, 2019). This can be seen more clearly in table 1.

Thus, given that agriculture is a risky area and sometimes a number of different barriers arise, the application of the system sometimes fails. According to a study conducted by the FAO in the African country of Cambodia in 2021, the country's difficulties in agriculture are failing to apply AIS here. Examples include small and scattered arable land, low level of application of smart agricultural methods in the country, weak agricultural infrastructure, incomplete installation of irrigation and drainage systems, and the consequent dependence of crop production on rainwater, that the number of researchers in the country as a whole is small due to the lack of financial support, etc. can be shown (FAO, 2021).

Table 2: SWOT analysis of Karabakh's agriculture sector

	Positive	Negative
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> • Liberation of the Karabakh region from 30 years of occupation • Fertility and productivity of the lands of the Karabakh region • The richness of the Karabakh region in natural resources • Favorable climate of the Karabakh region 	<ul style="list-style-type: none"> • 30 years of occupation of the Karabakh region • The existence of a 30-year gap in agriculture in many parts of the Karabakh region • As a result of the occupation, the population of the region was forcibly removed from agriculture and traditional production opportunities were reduced • Many areas of the Karabakh region are mined and the process of clearing has taken a long time • Destruction of general and technological infrastructure and long-term reconstruction as a result of the occupation • The lasting traces of the war and the violation of the ecological balance • Unspecified mechanism for resettlement
	Opportunities	Threats
External	<ul style="list-style-type: none"> • Smart technology plans for the development of the Karabakh region • Prospects for the development of industry and opportunities for the creation of new jobs • Abundance in the country, the possibility of falling prices, the potential for increased exports • Favorable location and access to the international arena • Opportunity for the establishment of the Azerbaijani brand • Opportunity to attract foreign investment in terms of soil fertility, richness of natural resources and favorable climate of the Karabakh region • The development of the region is a priority of the country's economic policy • Plans to turn the region into a center of technological innovation 	<ul style="list-style-type: none"> • The presence of the border with Armenia and the ongoing aggression of the Armenians • The magnitude of the damage inflicted on some districts of the Karabakh region • Incomplete evacuation of some areas of the region by Armenians and control of peacekeeping forces • Uncertainty in the resettlement process

It should be noted that to apply AIS, the agricultural sector of the region to be applied must first be thoroughly studied, the strengths and weaknesses of the sector, and opportunities and threats must be identified. For this reason, the SWOT analysis of agriculture in the Karabakh region is a necessity. After this analysis, the possibilities of applying AIS in the field can be explored and some suggestions can be made. In this regard, the SWOT analysis of the region should take into account its pre-occupation, period of occupation and post-occupation situation.

Table 2 display a matrix that includes all the factors of the SWOT analysis of the Karabakh agriculture sector.

A- STRENGTHS:

1. **Liberation of the Karabakh region after 30 years of occupation** - 30 years later, the Karabakh region of Azerbaijan was liberated from occupation and its territorial integrity was completed. This fact sets a number of important goals for the country to restore and revive the region. Among these areas, the restoration of the agricultural sector is a priority. Due to the fact of liberation from this occupation, large-scale public and private investments will be made in the region and in various fields, including agriculture.
2. **Fertility and productivity of the lands of the Karabakh region** - Another issue is the fertility of the lands in the region and the productivity of cropping. Thus, the abundance of arable land in the region allows for the development of agriculture. Before the occupation, 199 thousand hectares were used as arable land. In total, 1.7 million arable lands were occupied by Armenians (Ibrahimov, 2021). Nevertheless, the Karabakh region has maintained its fertility. During the occupation, Armenia also received part of its wheat production from 10 thousand hectares of Aghdam, Jabrayil, Fuzuli and Zangilan regions and produced 90 thousand tons of wheat per year ("Ilham Aliyev addressed the nation", 2020).
3. **The richness of the Karabakh region in natural resources** - The Karabakh region is very rich in terms of water, land and forest resources and is distinguished from other regions of the country by this feature. The main water resources of the region are rivers and groundwater sources, and most rivers are formed under specific conditions. In addition, there are transit rivers entering the region from neighbouring countries. As mentioned above, the fertile and productive lands create great opportunities for the development of agriculture. As a result of the occupation, 261 thousand hectares of forest were destroyed by Armenians (Azərbaycan Respublikası Ekologiya və Təbii Sərvətlər Nazirliyi, 2019). However, plans for the self-restoration and restoration of nature will facilitate the revival of this reserve. It should be noted that the state plans to restore the green belt of the region.
4. **Favorable climate of the Karabakh region** - The region's favourable climate allows for growth of different types of plants and development fields. A favourable climate creates fertile conditions for the cultivation of perennial crops, productivity, availability of pastures, etc. The presence of large areas of pasture can meet the fodder base of such livestock in the winter months.

B- WEAKNESSES:

1. **Thirty years of occupation of the Karabakh region** - In the 30 years since the occupation of Karabakh, every part of the region has been a victim of vandalism to varying degrees. Farm facilities, schools, businesses, houses, etc., are destroyed or ruined. As a result of the Armenian occupation, 647.9 thousand hectares of arable land were destroyed (Ibrahimov, 2021). Agriculture is one of the areas affected by this destructive policy. Therefore, it will take some time to recover from this loss. It is generally impossible to recover some losses.
2. **The existence of a 30-year gap in agriculture in many parts of the Karabakh region** - The occupation of Karabakh for 30 years has created a 30-year gap in its agriculture. Of course, this factor does not apply to all areas. As mentioned above, the Armenians used

the arable lands of Aghdam, Jabrayil, Fuzuli and Zangilan regions to produce wheat to varying degrees. However, due to the fact that the agrarian potential of the region is not used, this has led to a certain gap and, consequently, a decline.

3. **As a result of the occupation, the population of the region was forcibly removed from agriculture, and traditional production opportunities were reduced** - 32 years ago, the Karabakh region was occupied, and as a result of this occupation, the local population was forcibly relocated to different regions of Azerbaijan. Suffice it to say that as a result of the occupation of 20 per cent of our territory, more than 290 thousand families were forced to relocate (Valiyev, 2008). Most of these families settled mainly in Sumgayit and Baku. The forced migration of people and their failure to return to their homes for 30 years have led them to engage in various activities in the areas where they live and to move away from agriculture. As a result of this displacement, traditional agricultural skills and opportunities have diminished in most families, and the younger generation, who were forcibly separated from their homes during the war, and now the children of that generation, have turned their attention to other areas rather than agriculture, and it has also reduced the region's traditional production capacity.
4. **Many areas of the Karabakh region are mined, and the process of clearing has taken a long time** - The territories of the Karabakh region have been continuously damaged by various explosives and ammunition for 30 years. These explosives are dominated by landmines, which are more dangerous to humans and other living things. Suffice it to say that in the short period after the Second Karabakh War, 21 Azerbaijani citizens fell victim to landmines. According to the Azerbaijan National Agency for Mine Action (ANAMA), the process of complete demining of the Karabakh region may take about 10-15 years ("BBC, 2022). Assistance is currently being received from many countries to complete the process more quickly. This suggests that the long-term viability of the cleanup process may delay agricultural work.
5. **Destruction of general and technological infrastructure and long-term reconstruction as a result of the occupation** - The consequences of war and occupation are always severe for the aggressor country. In addition to the most serious human losses, the loss of general and technological infrastructure can be noted here. It is the destruction of this infrastructure that causes a great deal of material damage to the country. Of course, the occupation of Karabakh has also led to the destruction of these infrastructures, and as noted above, the destruction of the region with military ammunition and the long-term possibility of a cleansing process indicate that reconstruction work will be possible in the long run. That is, the full use of the Karabakh region and its return to normal may be possible in about 10-15 years. This will have a negative impact on the economy, such as delays in the process.
6. **The lasting traces of the war and the violation of the ecological balance** - The fact that Azerbaijan has been at war for 30 years and the ceasefire is often violated, the damage to nature for military purposes, the burial, explosion of various military ammunition, etc. caused serious damage to the ecological situation in the region. In addition, Armenia's illegal activities and uninterrupted exploitation of its natural resources in the occupied territories have seriously endangered the ecological situation in the region. The destruction of the region's forest resources, flora and fauna, as well as the destruction of rivers with various wastes, are examples of the lasting traces of war.

According to research, the amount of damage to nature and natural resources of the Karabakh region is about 265.3 billion dollars (Azərbaycan Respublikası Ekologiya və Təbii Sərvətlər Nazirliyi, 2019). Also, as a result of the occupation, 43 thousand hectares of nature reserves and sanctuaries were destroyed (Karabakh Center, 2021). Thus, for 30 years, environmental terrorism in the region continued. Changes in the environmental situation can lead to delays in agricultural development.

7. **An unspecified mechanism for resettlement** - The government continues to develop certain return plans for the resettlement of the local population to the liberated lands. However, a number of facts show that this process, like other reconstruction processes, can be carried out only in the medium term. Because at present, there is no clear, agreed mechanism for resettlement. It is clear that in order to return, first of all, it is necessary to create comfortable living conditions for the population there. This can be noted residential facilities, workplaces, educational and other facilities, etc. Because the people who moved to different regions of Azerbaijan 32 years ago have already built their living conditions and adapted to the new conditions there. Therefore, the separation of the population from the current living standards and their return to their ancient homeland will be possible only if there is a certain mechanism. It should be noted that human capital is one of the most important factors for the development of agriculture. Delays in the return plans of the population are one of the weakest nuances for the restoration of agriculture.

C- OPPORTUNITIES:

1. **Smart technology plans for the development of the Karabakh region** - The liberation of the Karabakh region after 30 years has laid the foundation for the implementation of a number of technological plans for the state in its development. Examples of these plans are the "Smart City" and "Smart Village" projects. The plan for these projects will be implemented in 5 areas. The concept of "Smart Agriculture" is one of these areas. Most of the plans to be implemented under the AIS coincide with the approach of the concept of "Smart Agriculture", and this activity will be carried out to restore and revive agriculture in the liberated areas by smart methods.
2. **Prospects for the development of industry and opportunities for the creation of new jobs** - The work done to restore agriculture in the Karabakh region will contribute to the development of this sector, as well as a number of industries. An example of this is the food and clothing industry. For example, with the development of livestock, one of the traditional areas of the region, it is possible to ensure the development of the milk and dairy products industry, with the development of the grain industry, the food industry, the development of cocoons, the clothing industry and other areas. In parallel with the development of agriculture and industry, new job opportunities can be created in the region. Thus, it can stimulate the solution of the unemployment problem in the region and the migration of the population to these areas.
3. **Abundance in the country, the possibility of falling prices, and the potential for increased exports** - The restoration and development of agriculture in Karabakh can be observed in the country's abundance of agricultural products. Due to this abundance, significant opportunities may open up for Azerbaijan in terms of food security, which is currently a serious problem in the world. As a result, the abundance of products can

lead to price stability and some reduction. This can also lead to an increase in the country's export potential. Thus, both domestic needs can be met and additional sources of income can be obtained through increased exports.

4. **Favourable location and access to the international arena** - The favourable location of the Karabakh region, the existing border with Iran and access to Turkey and thus to Europe through the Zangazur corridor can allow it to be recognized in the international context. This, as noted above, could increase the export potential and access to the international arena. The aforementioned corridor's transport channels can improve economic and cultural relations with foreign countries by providing a reliable alternative in this direction.
5. **Opportunity for establishing the Azerbaijani brand - The developing agriculture of the Karabakh region and the growing potential of the country's exports can create conditions for establishing** the Azerbaijani brand in the international arena. During the liberation of the territories, the issue was widely discussed in the world political arena, and the frequent mention of the name Karabakh means a new opportunity for the branding of this name. Examples of this are the famous Karabakh horses and carpets. Thus, as a result of the occupation, Karabakh horses also lived a life of displacement and their numbers decreased. Currently, plans are being made to increase their offspring with special attention. In addition, the development of sheep breeding in the region in the direction of wool will create a basis for the development and revival of carpet weaving.
6. **Opportunity to attract foreign investment in terms of soil fertility, richness of natural resources and favorable climate of the Karabakh region** - The strengths of the region's SWOT analysis, as well as the richness of natural resources and favorable climatic conditions have always been created a potential to attract foreign investors. Even during the 30 years of occupation, the Armenian government has attracted foreign companies and allowed them to engage in illegal activities. These activities were carried out in various fields, including agriculture. In the period after the liberation of the lands, the planned attraction of foreign investment will be carried out within a completely legal framework and with the reliable partnership of Azerbaijan.
7. **The development of the region is a priority of the country's economic policy** - The reconstruction of the region's infrastructure and its economic development is a priority for the state to better implement the plan for a major return to the liberated lands. At present, 2.2 billion manat has been allocated from the 2022 budget to rehabilitate the region. Of course, these funds are not enough to carry out the planned work. But the fact that this process has been going on for years and that there are plans to increase it every day is increasing the attractiveness of the region. The logical consequence of this is that plans are being made to use not only domestic resources, but also foreign resources and investors for the economic development of the region. Of course, the agricultural sector has a special place among these restoration works, and most of the investments will be made in these areas.
8. **Plans to turn the region into a center of technological innovation** - In addition to the concepts of "Smart Village" and "Smart City" to turn the region of Karabakh into a center of technological innovation (Hub), the plan to establish Karabakh University can

pave the way for an educational brand in the region. To do this, the University must be provided with the latest technological innovations, where specialties that meet the requirements of modern times, as well as necessary for the development of the region must be opened. The application of the experience of the world's leading universities in this direction and the involvement of Azerbaijani scientists working in these universities is one of the issues to be considered. Taking into account the realities of the region, specific research centers can be established at the University to study the prospects for innovative development of agriculture.

D- THREATS:

- 1. The presence of the border with Armenia and the ongoing aggression of the Armenians** - The Karabakh region has been liberated from occupation for almost two years. However, the aggression and provocations of the Armenians in those territories continue to this day. The region's border with Armenia and the ongoing Armenian aggression often lead to provocations in the field. This factor can be seen as an obstacle to the development of the region. Because of the attraction of domestic resources, the repatriation of the population, and the attraction of foreign investors are directly proportional to the region's security. This reality is considered one of the main threats to the development of agriculture.
- 2. The magnitude of the damage inflicted on some districts of the Karabakh region** - As a result of the occupation, the Armenians inflicted varying degrees of damage on each district and exploited them. However, some areas have been almost destroyed and erased from the map. It is clear that the restoration of this level of destruction will not be easy and short-lived. On the one hand, the attraction of material resources, on the other hand, the restoration process and the implementation of reparations are serious stages.
- 3. Incomplete evacuation of some areas of the region by Armenians and control of peacekeeping forces** - As we know, the Armenian population is still settled in some parts of the liberated regions. However, the bigger problem is that the Armenian army has not yet left the region. This factor shows that certain threats remain to solve the problem completely, and this is a real threat to the construction process. Because in the future, this may cause panic and confrontation between the local population and the Armenian population. In addition, the presence of peacekeeping forces in certain parts of the liberated territories and the complete lack of control of those units in Azerbaijan is a real threat to future development.
- 4. Uncertainty in the resettlement process** - As noted above, the aggression and ongoing provocations of the Armenians may cause concern among the population intending to relocate. Some people may even refuse to move for fear of another war. The inability to start the migration process and the lack of complete details of the mechanism are among the reasons for the growing uncertainty. All of these is, to some extent, an obstacle to the population's return plans. The need for human capital for the development of agriculture can also be assessed as a negative factor in the development of the sector.

3. AIS IMPLEMENTATION OPPORTUNITIES IN KARABAKH IN THE FRAMEWORK OF SWOT ANALYSIS

The study of the opportunity of applying the AIS approach to the Karabakh region within the SWOT analysis is the main stage of the topic. Here, in accordance with the SWOT analysis results, the application of various AIS methods in the territory of Karabakh will be considered. First of all, it should be noted that the purpose of AIS is to facilitate the work of agricultural producers and farmers using modern approaches, methods, applications and technologies, to achieve a one-touch solution to difficult agricultural issues. AIS applications in agriculture include Smart Agricultural Methods, Drones and Unmanned Aerial Vehicles (UAVs), Smart Irrigation Systems, Smart Fertilization Systems, Smart Greenhouses, for livestock Radio-frequency identification (RFID) barcodes and earrings, Cattle step and Earth tracking applications, Smart Poultry System and other applications (Bilgi Teknolojileri ve İletişim Kurumu, 2021).

First of all, the opportunity of applying **Smart Agricultural methods** in the Karabakh region within the framework of AIS can be considered. Some of these methods are driverless and touch tractors and combine combined with modern technology and innovation. Distinguished by their more complex structures than conventional tractors and combines, these smart machines support farmers by saving their time and reducing workload. Thanks to these smart machines, every part of the land intended for planting is worked out in detail. For example, if fertilizer or medicine is needed for the soil, it can be applied by means of sensors installed in the machines to determine what part of the soil and how much will be needed. These systems are controlled by farmers using tablets or smartphones with just one touch, and these devices can operate continuously, even at night and without regard to weather conditions, using navigation. One of the weaknesses in the SWOT analysis of Karabakh's agriculture is the fact that most of the area is mined and the Armenian aggression, which is one of the threats in the analysis (which we have repeatedly seen in the ceasefire, especially at night) we have witnessed) can create ample opportunities for the use of these tools.

One of the innovations in other applications of AIS is **Drones** and **UAVs**. Thanks to these tools used in modern agriculture in different countries of the world, it is possible to get an aerial view of arable lands, determine the amount of soil moisture, detect diseases and apply treatments to them. In addition, these tools can use soil maps for pre-analysis to determine the right time for planting, irrigation, application of various fertilizers, and harvesting.

Proper irrigation and fertiliser of soils and arable land are also important for agriculture. The **Smart Irrigation System** is one of the AIS methods that uses the right amount of water for each plant and always keeps the plant roots moist. Known as an Smart Irrigation System, the Drip Irrigation method keeps the root parts of the plant at a normal level of moisture, prevents over- or under-irrigation of the soil, and eliminates the problem of water lost through overuse. Another method of AIS used in the field of fertilization is the **Smart Fertilization System**. Like any other irrigation system, this system provides the required amount of fertilizer to the roots of each plant. It is known that the process of fertilization is one of the most complex process. This is because a sudden mistake can lead to both loss of fertilizer and soil degradation as a result of over-fertilization.

Considering the Karabakh region's climatic conditions, it is known that most of the winter months are severe there. For this reason, there are great opportunities for the application of

Smart Greenhouses in the region. It is possible to regulate and apply the weather conditions and the environment necessary for the plant in such greenhouses. Within Smart Greenhouses, even Smart Irrigation and Smart Fertilization methods can be applied.

Given that livestock is one of the main agricultural sectors in the Karabakh region, there is an opportunity to apply various methods of AIS in this area. Animal tracking is possible using **RFID barcodes** and **earrings**. Thus, RFID barcodes and earrings contain all the information about animals. This includes the dates of birth of animals, vaccines, blood relations, etc. All this information is recorded in the computer's memory and farmers are informed about the animal at any time. These labels can be placed under the skin of the animal, hung from the ears or worn around the neck. Through these labels, farmers can easily get information about the animal's nutrition, productivity, weight, disease, pregnancy, or wool production.

Cattle step and Earth tracking applications are also widespread in modern agriculture. These devices are placed on the animal's feet to obtain information about the animal's number of steps, its location, the food it receives, its productivity, and the quality of the product. For example, a decrease in the quantity or quality of milk may be the result of a reduction in the number of steps an animal has, or the animal's illness may be determined by its body temperature and pulse. In addition, the **Smart Poultry System** can be used for poultry farming. Thanks to this system, it is possible to get information about poultry houses' indoor and outdoor environments with smartphones from a distance. For example, it is possible to get information about the amount of heat inside the houses, being full or empty of the containers for food and water, filling them if they are empty, the audible announcement of door closure, and so on.

4. CONCLUSIONS AND RECOMMENDATIONS

As a result of the research, it can be noted that the liberation of the Karabakh region from occupation provided an opportunity to apply a modern approach, such as AIS, first in the region, and then throughout the country. First of all, it is important to use the SWOT analysis to analyze the post-occupation situation of agriculture in the Karabakh region. This is primarily due to the fact that the 30-year occupation of Armenia has hit different areas in the region to varying degrees, and it is important to determine this realistically. In addition, it is important to assess the existing prospects of the region. Therefore, it is possible to study the damage to Karabakh's agriculture and study and predict the possible opportunities within the framework of SWOT analysis, which is the best tool. After this stage, the opportunities that AIS will create in the region can be assessed.

The opportunities of applying AIS in the SWOT analysis framework provide a basis for meeting the requirements of each of the 4 areas of SWOT analysis of the analyzed agriculture in accordance with reality. Thus, the end of the occupation, productivity, favourable climatic conditions, and abundance of natural resources, which are mentioned as strengths, will allow the successful implementation of the above-mentioned applications of AIS. AIS applications aim to reduce the weaknesses and threats of SWOT analysis to zero. Factors such as uncertainty about the return, clearing of mined areas, long-term reconstruction, environmental situation, etc. can be eliminated with AIS applications, or the negative effects can be minimized. Taking into account the possibilities of SWOT analysis, it is possible to implement applications in accordance with these factors. These applications can be implemented by targeting factors such as contributing to the economic development of the industry and the region, the growth of exports, the formation

of the Karabakh brand, the creation of new jobs, attracting foreign investment and so on. A number of suggestions for the application of AIS in the region should be taken into account in the SWOT analysis.

- **Establishment of the Agricultural Innovation Center** - First of all, the state should establish an authorized body to implement the new system in the Karabakh region, and the implementation and control of all issues related to AIS should be entrusted to this body.
- **Construction of general infrastructure** - Although the new system is intended to be applied in agriculture, it is necessary to restore the infrastructure of other areas as well. This is also important because the areas are constantly interconnected, and the poor development of one area can have a negative impact on other areas. For example, without a certain infrastructure in the field of education, the introduction of a new system in agriculture may become impossible.
- **Establish a research center and modern laboratories** - It is important to establish a research center and laboratories in the region to introduce the new system and have detailed information about it. The work to be carried out in these centers and laboratories should be based on international experience, and for the research to be effective, professionals in this field should be involved in the research process.
- **Formation of quality human capital** - Citizens who are focused on innovation, technology, digitalization and other modern areas and therefore migrate abroad should be involved in the region with various incentive plans and build the potential for the system to be applied.
- **Effective construction of a large return plan** - Given the high need for human capital and manpower to implement AIS in the region, resettlement plans for the region should be developed effectively and a clear mechanism should be put in place, as any system application is useless without human capital.

In conclusion, the SWOT analysis of agriculture in the region allows us to say that in the current realities, the application of ais is important in the agrarian development of Karabakh and, therefore in the economic development as a whole, and these applications should be implemented step by step and taking into account recommendations.

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