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Sustainable Smart Farming and Rural Development in Karabakh

Towards a Broader National Strategy and Policies

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"The digital world is by definition a fast-moving environment where policy needs to adapt to changing circumstances. As new technologies become mainstream, they can bring profound benefits to the economy and to our daily lives. However, it is essential that they be grounded in a set of rules to provide confidence to consumers and business alike."

– EU Commission document, 2017

One of the consequences of the liberation of Karabakh has been the adoption of the Great Return program designed to revive the formerly occupied lands. The First State Program on the Great Return (November 2022) set objectives to ensure the sustainable resettlement of the retuning population to Karabakh and to establish sustainable communities in the liberated areas, integrate the local economy into national and foreign value chains, improve the local ecological environment, and apply environmentally friendly technologies to economic development. These objectives comply with various UN Sustainable Development Goals (SDGs), i.e., SDG8, SDG9, SDG11, SDG12, and SDG13.

The aforementioned presidential decree aims to achieve four main indicators:

- Social conditions: employment opportunities, decent living conditions, the provision of high-standard education and health services.

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- Economic reform: attract new investments and businesses, ensure the development of entrepreneurship, restore agricultural production (including the establishment of a modern irrigation system), and provide for the sustainable development of the region.
- Environment: promote the implementation of the concepts of "smart city," "smart village," and "green energy zone," ensure the effective use of natural resources, and expand the use of renewable energy sources.
- Infrastructure: ensure safety by clearing mines and unexploded ordnance; (re)construct cities, towns, and villages; and provide accessible, reliable, high-quality, and sustainable infrastructure for all.

The next decree the President of Azerbaijan signed in this context was in April 2023, which mandated a new exemplary innovational urban and rural areas development approach in Karabakh. It required ministries to prepare the smart city and smart village concepts in a way that accorded with the tenets of the SDGs. The decree instructs the government to "improve the quality, safety, and efficiency of services provided in the cities and villages of the Republic of Azerbaijan, by applying information technologies in their provision, as well as ensuring the effective use and management of existing resources for those services." The new approach envisions the setting up of "smart farming"—one of the four priorities in the construction of smart villages.

The first benefit of setting up smart farms for sustainable agricultural production is to ensure food security in the region, economic well-being, and the efficient and sustainable usage of water resources. It also aims to conserve energy, reduce air pollution, mitigate the release of CO2 and methane, and prevent soil erosion.

The second benefit is that smart solutions methods attract young, prospective minds to return to their villages and get involved in agricultural smart production, which will help ensure sustainable returns.

The third benefit, as researcher Narmin Ismaylova mentioned in her article in the journal *Caucasus Analytical Digest*, is that smart farming boosts the employment prospects of a non-IDP younger generation in rural Karabakh and other rural parts of Azerbaijan. As she puts it: "today, the unofficial population of Baku and its closest surroundings totals around 4 million people, constituting 40-50 percent of the country's population. Azerbaijan's second-largest city is home to around 300,000 people—almost ten times less than the Baku area." Hence, according to Ismaylova, the incorporation of smart farming into the framework of the smart village concept will "spur migration from urban areas back to rural villages of Karabakh, slow down urbanization, and the rural population of other regions of Azerbaijan would benefit economically." This, she argues, will also decrease the urban-rural divide, and address the poverty problem in rural areas.

Fourth and finally, smart technologies will save farmers' lives from the landmines planted on the liberated territories during the Armenian occupation.

As the implementation of the decrees that led to the establishment of the Aghali smart village, two agroparks (Dost and Shirin Agro) started to operate in line with sustainability goals. While President Ilham Aliyev has spoken of the Dost Agropark as an exemplary model for the liberated region, the government has set about transforming Karabakh into an exemplary smart solutions model for the rest of the country. This should, in turn, drive farmers to transform their traditional production to digital, data-driven smart farming operations. However, as sustainable smart farming is a new endeavor for Azerbaijan, producers face challenges and barriers in the transformation process.

This IDD Analytical Policy Paper will analyze the level of readiness of the existing policies helping farmers to make the envisioned transformation. The analysis will be based on the four main indicators introduced above as a part of the First State Program on the Great Return.

Before doing so, however, it is imperative to clarify the meaning of the "sustainable smart farming" concept.

In a chapter devoted to smart farming technologies published as part of an edited volume titled *A Sustainable Green Future* (2023), a group of Turkish experts led by Bihter Güven state that sustainable agriculture

> covers environmentally friendly farming methods that preserve an ecological balance by avoiding depletion of natural resources. From the environmental point of view, sustainable agriculture promotes farming practices that manage and conserve natural resources by building and maintaining healthy soil, managing water wisely, using renewable energy, improving air quality, and promoting biodiversity. However, agricultural sustainability is a complex concept that aims for economic profitability and social/economic equity besides environmental health. Smart farming is the most recent agricultural revolution that is based on the use of information and communication technologies. It connects smart machines and sensors on farms by IoT (Internet of Things) and makes sustainable agricultural practices data driven.

SWOT Analysis

A detailed SWOT analysis demonstrating the needs and strength of policies that would help to transition to the digitalization of farming in Karabakh is beyond the scope of this paper. Such an undertaking would need to be based on four main indicators: economic conditions and policies (national strategies, laws, regulations), social conditions (demography and level of education), environment (geography, natural resources, business environment, and investments), and infrastructure (internet connection, logistical connectivity, equipment, and maintenance). However, some elements can be highlighted in the remainder of this section.

There is a strong political will—as expressed in the aforementioned presidential decrees—to turn Karabakh into the country's leading smart innovative growth hub. Since the 2020 liberation, the state has allocated billions of dollars to the speedy reconstruction and revival of the region. Moreover, a benevolent economic environment has been established (e.g., no VAT and customs duties, exemptions from income, property, and land taxes for 10 years) in order to attract private investment and businesses to the region. As of this writing, more than 1,500 companies, including 500 foreign companies, have applied to do business in Karabakh.

In addition, the agroparks already operating in Karabakh have established a solid precedent for the further spread of sustainable rural and farming development in the region. Finally, private and public financial institutions are boosting investment by, inter alia, SMEs in the digitalization sector in Karabakh.

For instance, Technopark Istanbul, Türkiye's largest innovation hub and investor in technologies, is partnering with Azerbaijan's innovation agency to transform Karabakh into a high-tech development area. This follows on the heels of another major Turkish technopark—the Gebze Organized Industrial Zone (GOSB)—that launched an investment partnership in the region. One of Azerbaijan's largest banks, Pasha Bank, has also stated that it will invest in the liberated region, in conjunction with the country's Karabakh Revival Fund. And so on. However, there is a need for clear mechanisms through which farmers will have access to financing their sustainable smart farming projects.

Around 30 percent of Karabakh's geography is made up of fertile soil and arable land; in addition, about one-quarter of the country's water resources is located in the liberated region. Taken together, these two facts open to door not only to agricultural production (irrigation) but also to hydro-electricity projects. In addition, they also form the basis of an optimistic assessment that the "green energy" target can be reached. As Nazrin Alizade states in her 2022 article "Karabakh's Green Energy Potential," which appeared in the journal *Eurasian Inquires*, "hydroelectric dams are expected to account for most of the renewable energy generation in the Karabakh region. Moreover, the implementation of renewable energy projects across Karabakh will provide the Azerbaijani leadership's vision to reduce the country's dependence on fossil fuel-based electricity." These plans are also in line with Baku's aim to transform Karabakh's war-damaged lands into sustainable smart cities and smart villages for promoting the sustainable use of natural resources.

These opportunities, however, require a standardization of procedures to reach optimal efficiency and productivity, In this regard, two matters stand out for consideration.

First, there is a need to amend the Law on Cooperatives that regulates unions of farmers participating in joint agricultural production processes, which includes land legislation (Article 2. Legislation on Agricultural Cooperation). Since land reforms were not carried

out in Karabakh as they were in the rest of Azerbaijan in the wake of the restoration of its independence (due to the Armenian occupation, which began in the period in which the Soviet Union collapsed), the enforcement of the law on farmers' cooperatives is still a challenge. According to the Ministry of Agriculture, the document on "Land Reforms" is presently under review. This opens an opportunity to harmonize cooperative smart farming with the Law on Cooperatives. When the reform is completed, farmers should have a chance to reduce production costs, access high-cost smart technologies stemming from IoT, and gain easier access to foreign markets.

Second, there is a need to overcome a lack of producers' competencies and skills as well as condition cross-sectorial policymakers to understand and coordinate the effective management of sustainable smart farming in the context of integrating these into the smart villages concept. For farmers, the lack of digital competence and skills creates barriers to making data-driven decisions in water usage as well as sowing the right crops in the right soil and under the right climate conditions, and so on. Aside from the other obvious challenges, the lack of such skills in farmers can result in adverse environmental impacts through the increase in methane and CO2 emission levels, contributing to atmospheric GHG. As Azerbaijan has committed (under the Paris Climate Agreement) to a 35 percent emission reduction target by 2030 compared to the base year of 1990 and to reduce emissions by 40 percent by 2050 as a voluntary commitment and to create a "Net Zero Emission" zone in the regained territories, Baku has now increased the demand for digital competencies—both for policymakers and producers. The lack of such competence in policymakers and farmers will most likely create barriers to developing unified smart policies and reinforce the inability to optimally coordinate cross-sectorial single platforms for addressing producers' systemic challenges during the implementation phase. For example, one of the challenges is a lack of cyber-security regulations, which increases the threat to producers' data collection being exposed to cyber-attacks.

Recommendations

Given that both smart villages and smart farming are new endeavors in Azerbaijan, there is a need for clear policies to be instituted and new platforms dedicated to the region's digital transformation to be established.

Therefore, the level of readiness of the system to transition to (digital) smart farming for sustainable agriculture in Karabakh (and then, in time, nationwide) should embrace the policies and regulatory mechanisms, social conditions, infrastructure, and environmental conditions that require the adoption of a holistic approach.

Concretely, a "Single Digital Platform Strategy for Smart Farming" should be established.

What is this? The EU Commission defined what it calls a "digital single market" (DSM) in 2015 as "one in which the free movement of goods, persons, services, and capital is

ensured and where individuals and businesses can seamlessly access and exercise online activities under conditions of fair competition, and a high level of consumer and personal data protection, irrespective of their nationality or place of residence." A 2018 EU publication describes the aim of DSM as the establishment of the "right environment for digital networks and services by providing high-speed, secure, and trustworthy infrastructures and services supported by the right regulatory conditions. Key concerns include cybersecurity, data protection/e-privacy, and the fairness and transparency of online platforms." Something similar should be established in Azerbaijan.

Who is it for? The state, rural areas, businesses, producers, and consumers, including national and local government entities, policymakers, education and training institutions, farming communities, individual farmers, and so on.

Why is it important? The establishment of a "Single Digital Platform Strategy for Smart Farming" would help public, state, and private entities to raise challenging policy issues that require coordinated action by the state (cross-sectorial ministries and agencies) as well as public and private entities. Such a platform would also help all small and medium-sized farmers and businesses wrestling with similar problems, notwithstanding the fact that they reside in disparate geographic locales—i.e., they are too dispersed to be able to seize all the opportunities and overcome all challenges in this transitional process. With a single platform, stakeholders would not only raise and solve challenging policy issues such as cybersecurity and/or smart cooperatives, but also establish fair market competition whereby all producers could trade their products online in conditions designed to ensure equal economic opportunity, equitable access to local and global consumer markets, and uniform access to goods and technical services needed throughout the production value chain.

Within the overarching recommendation to establish a "Single Digital Platform Strategy for Smart Farming," several implementing recommendations can be put forth:

- The Ministry of Education and Science, the Vocational Education Agency, the Ministry of Labor and Social Protection, the Ministry of Agriculture, and the Ministry of Finance should provide appropriate regulatory and financial support.
    - This would require the establishment of accessible and affordable short- and long-term digital and high-tech skill training programs for farmers in smart villages (including distance education programs). In this regard, it may be useful to note that the EU Commission's New Skills Agenda for Europe recommends that digital skills should be seen as part of citizens' essential skill set for the future.
    - The government apparatus should also support the development of large-scale smart farms in Karabakh by providing digital and high-tech training programs within the framework of connecting and modernizing farms through ICT-driven solutions. The collaboration of producers (farmers), retailers, and ICT organi-

zations would establish a benevolent environment for the speedy digital transformation of the liberated areas, boost employment opportunities, and attract young people to return to these rural areas.

- The Ministry of Agriculture should complete the process of land reforms as a pre-requisite for a harmonization of the Law on Cooperatives with the smart cooperatives concept. This would be a good pretext for establishing fair online trade and the setting of fair competition rules for farmers.

- The Ministry of Communication and Digital Technologies, together with the Ministry of Economy and the Ministry of Agriculture, should develop cyber-security standards for the data protection of farmers in Azerbaijan.

- Finally, the Ministry of Agriculture, the Ministry of Economy, and the Ministry of Ecology and Natural Resources should develop policies that would support and monitor compliance with certain greening obligations (i.e., common agricultural practices and policies beneficial for the climate and the environment) that are part of direct aid to farmers.