ECFS Eurasian Center for Food Security

Food Security in Eurasia 2019

Case studies

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Foreword

It has become a tradition to publish annual compilations of case studies on various aspects of food security in Eurasian economies. The Eurasian Center for Food Security (ECFS) implements this initiative and prepares materials together with the World Bank. This edition contains two case studies concerned with important dimensions of food security in the Eurasian region. Case study topics generally cover the most relevant food security issues on which recommendations should be made to allow prompt and effective decision making in future.

Recently, organic agriculture has been discussed a great deal. This is a sector that aims to produce high-quality agricultural products in compliance with modern environmental standards. In Eurasian economies, this sector is beginning to develop mostly at the level of individual farms. However, in order to streamline the operation of the organic agriculture system, it is necessary to take a number of steps at the regional level: to develop and support organic farmer cooperation, to introduce efficient agricultural technologies, to adopt and implement unified regulatory legal acts, and so on. Many of these issues and their implications are discussed in the study by S. Meloyan and A. Rykalin.

Providing for food security in arid Central Asian countries is a matter with its own challenges. Farm activities are jeopardized by climate change, which increases drought intensity. The problem is most evident in the Aral Sea Region of Uzbekistan, where 60–80 percent of the population is rural. Agricultural production becomes a highly topical issue in the context of soil degradation and desertification. Putting in place a mechanism that would enable the population to adapt to the region's climate challenges is matter of significance at both national and international levels. The authors of the study—T. Khamzina, M. Konyushkova, and M. Nechaeva—conducted an in-depth analysis of the negative implications of climate change for the agricultural sector of the Nukus District in Karakalpakstan. On that basis, they propose necessary climate-smart agriculture strategies and state support measures for agricultural producers.

Case study materials have been traditionally used in management decision making at the regional level as well as in the training of various food security specialists. ECFS and the World Bank came up with the initiative to organize training in food security issues for young teachers from the Eurasian region (altogether 14 people) based on the earlier published case studies. In January 2020, the Moscow State University held a weeklong workshop under the guidance of D. Watson and J. Gentry from the Tarleton State University (United States) and with the participation of ECFS teachers. During the training week, the trainees not only listened to lectures but also had a detailed discussion of specific study case issues—such as the application of modern technologies with a view to promoting and using case study results for practical and educational purposes.

We hope that our joint work will continue in the near future.

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The Role of Marketing Cooperatives in Developing Russia's Organic Agriculture Value Chain

Artur Rykalin, Sergey Meloyan

Executive Summary

Organic agriculture could be a good prospect for numerous smallholder farms in Russia and other post-Soviet countries, which are in serious competition with large federal and global agricultural holdings. The cooperatives of organic farmers could both strengthen their bargaining power in the market without loss of independence and efficiency, and also make organic products more accessible to consumers who are not yet completely familiar with them and who cannot afford them because of the stagnation of real disposable income. Sustainable working models of organic farmers' cooperatives could contribute significantly to improving both the quantitative and qualitative characteristics of available nutritious food and could provide income and employment to a large number of individual farmers.

The purpose of our study is to identify policy measures for the accelerated and sustainable development of organic farmers' cooperatives in Russia. Since the situation with a large number of smallholder farms that are barely profitable is similar in many post-Soviet countries, the tools proposed by this work could also be applied there. Even though advanced foreign countries, cooperatives, and similar producer organizations are actively used to include many farmers in global food systems, in Russia these farmers still do not occupy a stable position in the food supply chains. The formation of markets for organic products both opens up new competitive prospects for farmers and poses additional challenges for them around the development of new technologies, certification, and the search for new markets.

Modern measures that support agricultural cooperatives are no longer focused on market mechanisms and entrepreneurial efficiency, but instead on subsidized instruments. The legal cooperative form today has become the goal, not the means: the process of creating cooperatives dominates the farmers' sustainable independent and market-effective work. Rural cooperation is also hindered by the general situation in agriculture and rural areas. Many factors are leaching resources and people from rural areas: accelerated urbanization; the disparity between the prices of agricultural products and other commodities; a negative image of rural life, which includes lower incomes and less robust social infrastructure; excessive regulation of farmers' activities; and the legal insecurity of entrepreneurs.

The key to the successful development of organic farmers' cooperatives is the reorientation of state support from providing subsidies and regulation (tight policy) to creating incentives and opportunities for independent market-oriented development (soft policy). The main policy recommendations that emerge from this study relate to the educational, institutional, economic, and information spheres. Cooperative education, along with regulation, taxation, and incentives, should be such that farmers themselves are interested in starting and developing cooperatives, not so that they are unpromising and uncompetitive and constantly need to be artificially financed through government support.

While cooperatives are difficult to manage and it is complicated to follow formal procedures; while starting them significantly boosts the amount paid in taxes and increases the risks of various regulatory inspections; while there are frequent cases of hostile bankruptcy and raider attacks on small businesses with subsidiary liability; and while there is a shortage of methodology for training cooperative personnel, then the probability of qualitative improvement in the situation with sustainable agricultural cooperatives will remain low.

The experience of leading agricultural countries shows that the sound functioning of the agricultural cooperative system could have a positive effect for many stakeholders of the entire organic food supply chain: for consumers, processors, retailers, agricultural holdings, and organic farmers and their families. The governmental and nonprofit sectors could also optimize their investments and subsidies by delegating a number of development and support functions to cooperative structures.

Background

Some regional authorities in Russia attach particular importance to organic agriculture (Юга 2019). For example, the law "On the Development of Organic

Production in the Krasnodar Region" was adopted on November 1, 2013, supplementing the federal law "On Organic Production and Amending Certain Legislative Acts of the Russian Federation."

The adoption of laws concerned with organic products was initially positively regarded by organic producers, because—according to the plan—it was intended to distinguish certified products from the self-named "organic," "eco," and "bio" products. According to experts, the fake organic food market comprises about 98 percent of food that is sold as "organic" (Союз органического земледелия 2019).

Today in Russia about 50 companies are producing organic food according to international standards, and another 50 companies are producing according to Russian standards. Until Russia recognizes international standards, Russian companies will continue to face restrictions and will not be fully recognized at the international level (Союз органического земледелия 2019).

It takes from one to three years to transition from conventional farming to organic farming and obtain organic certification; this procedure costs about 300,000 to 800,000 rubles per year. The conversion period in crop production lasts about three years; in livestock farming it lasts for several months. Thus, for many small farms the process of entering the organic market will be slow and expensive. Understanding this, many regions are introducing additional support measures. For example, support for organic producers in the amount of 1,000 rubles per hectare is available in the Tomsk region. The Voronezh region plans to fully reimburse the costs of organic certification, and the costs of certified organic pesticide and herbicide preparations by half. For comparison, in German Bavaria, organic farmers receive about 31,000 rubles per hectare for organic certification and agro-environmental measures, which makes up about 70 percent of all the support allocated to them (Литвиненко 2019).

The main challenges for the organic market in Russia, according to the Union of Organic Agriculture (Союз органического земледелия 2019), are the large share of counterfeit products on the market (98 percent), the presence of unscrupulous certifiers, the low level of awareness on the part of both farmers and consumers about the benefits of organic foods, the low profitability of farmers, outdated production methods, a shortage of qualified personnel and training methods, and low incomes of consumer households.

In Russia, in 2018, 85 percent of the demand for organic goods was met by imports; at the same time this demand grew by about 10 percent over the course of a year (Литвиненко 2019). According to the National Organic Union, Russia's share in world markets for organic products is only 0.2 percent.

Separate efforts are being made by the state to develop agricultural cooperation. In 2018, 2.64 billion rubles were allocated for grant support for the development of the material and technical base of agricultural consumer cooperatives (SPOK), which is 77.2 percent more than was allocated in 2017. This financing is carried out as part of a program to support smallholdings and agricultural cooperation, in which funds were also allocated in 2018 for the development of family livestock farms (4.49 billion rubles) and support for beginning farmers (3.93 billion rubles) (Министерство сельского хозяйства Российской Федерации 2019).

The potential personnel basis of agricultural cooperation is vast: according to the 2016 All-Russian Agricultural Census, Russia had 23.5 million people with private land holdings, 174,800 peasant farms, and 24,300 micro and small enterprises. In 2018, 1,249 new jobs were created in SPOK, an increase that, among other factors, is explained by the overfulfillment of financial support by the regions of the Russian Federation by 52.9 percent of support for cooperatives.[1] According to the plan for 2024, the number of SPOK members should grow by almost a third, to reach more than 500,000 people.

One of the most important barriers for organic food producers in Russia is the search for profitable sales. This happens for several reasons. First, the real disposable incomes of the Russian population have been declining for several years. This trend is reflected in the level of poverty and debt among consumers and the corresponding level of stagnation

[1] Data in this section are from Rosstat, available in English at https://eng.gks.ru/ and in Russian at https://www.gks.ru/519.

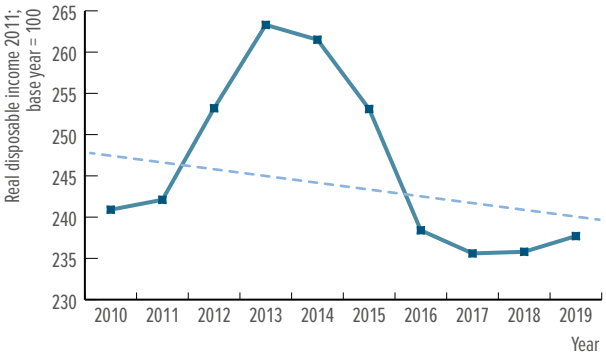
in retail trade. Even with a low subsistence level of 10,753 rubles, there are 20.9 million poor people in Russia (14.3 percent of the population). Only in 2019 did retail annual turnover in comparable 2011 prices slightly exceed the 2011 mark. Household debt on bank loans and debt securities more than doubled from 2013 to 2019. In 2019, the real disposable cash incomes of the population have not yet reached the level of 2013 (see Figure 1).

Second, organic products are more expensive than inorganic analogues. Third, the fashion and the habit of Russians buying organic products—as, for example, the Europeans do—have not yet developed. Fourth, global competition is high in the market of food products, which narrows demand for organic products.

Despite a number of restrictions on the demand side, the prospect of the market for organic food products attracts many entrepreneurs. Growth from Knowledge (GfK) researchers found that most Russians (82 percent) consider their health and vigor to be their main personal asset.[2] The given indicator for Russia exceeds the world average (64 percent of people worldwide consider health and vigor to be their main asset) (Игнатьева и Федотов 2018). Retailers, in turn, also strive to be trending and to create specific brands. A striking example is the growth in popularity and the branch network of VkusVill (Камитдинов 2019). The Auchan hypermarket chain has launched a line of products, Auchan BIO, which have been certified for organic production. The Moscow Azbuka Vkusa chain separately allocated the Our Farm product line and the Globus hypermarket chain launched Globus Vita to sell organic products.

The small size of the average farm creates additional restrictions on the sale of organic products. The smaller the farm, the more difficult it is to sell its products because of the lack of economies of scale. It is expensive for small farms to solve all the complex of tasks of production, certification, processing, and sales. Large agricultural holdings, as a rule, use intensive conventional methods, but numerous smallholders could become suppliers of organic products.

Figure 1. Real Disposable Incomes of Households



Data source: Telegram app, Macro Markets Inside channel (@russianmacro).

Problems in marketing organic food are significant not only in Russia but also in developed countries. There are many ways to combine small producers to strengthen their market and negotiation power, such as associations, unions, joint ventures, and cooperatives. Cooperatives in many countries are a form of smallholder associations, which allows, on the one hand, individual farm identity to be preserved and, on the other, market power to be increased by pooling resources. In June 2019, for example, organic and inorganic blueberry producers from Germany and the Netherlands formed a cooperative to manage the sales phase of their products (Рыкалин 2019a).

In the Netherlands, for many products, cooperatives occupy a large market share (see Table 1). Jos Bijman,[3] respected agricultural cooperative researcher, identified five factors for the effectiveness of Dutch cooperatives: incentive legislation; innovative methods for controlling members of a cooperative; high uniformity of members of the cooperative even in conditions of international growth; pragmatism in the creation and dismantling of federal cooperative structures; and transparent strategy for positioning cooperatives in food supply chains (Bijman 2016).

There are practically no specialized organic farmers' cooperatives in Russia. And a few agricultural cooperatives are focused on the sale of high-quality food products, even if they have not passed

[2] For more information about Growth from Knowledge, see https://www.gfk.com/.

[3] See https://www.vcard.wur.nl/Views/Profile/View.aspx?id=5275&ln=eng for a profile of Jos Bijman.

Table 1. Key Data from Agricultural Cooperatives, Netherlands, 2015

Products and services	Number of cooperatives	Market share 2010[a] (%)	Total members	Total employees
Sugar	2	100	11,000	2,200
Dairy	5	86	1,600	21,500
Fruit and Vegetables	15	95	2,500	2,600
Potatoes	1	100	2,500	1,300
Mushrooms	2	>80	210	230
Flowers	2	95	4,800	2,900
Pig breeding	1	85	1,750	500
Cattle breeding	1	85	25,500	1,300
Animal feed	13	55	30,000	6,200

Source: Bijman 2016.
Note: [a] Although the analytics were performed in 2015, some data were available only for 2010.

organic certification. In this regard, it becomes important to analyze the experience of specific examples of existing cooperatives. One of these is the *Narodnoye Zdoroviye* consumer cooperative,[4] which sells organic products.

The model of the Narodnoye Zdoroviye consumer cooperative is based on the use of more market mechanisms than those provided by state support and nonprofit grants. The business model is focused on solvent demand, sales, and the professional work of the team of cooperative workers with the target audience of consumers who are partial to organic products.

This cooperative is urban, and it has the legal form of a consumer society (cooperative), not an agricultural consumer cooperative.[5] It specializes in long-shelf-life organic products, which helps to promote the sale of the products from remote regions and for export.

Narodnoye Zdoroviye has been operating since 2011 in Moscow. In 2018, 40 active suppliers of products per month used its services;[6] eight of them were micro-farmers (a very small scale for working with traditional stores) and six were beekeepers. Its staff consisted of 24 employees, of whom 13 were sellers and pedestrian couriers.

The products of the cooperative farmers were sold both wholesale and retail. Health food stores, online stores, joint shopping organizers, and restaurants and cafes bought in bulk. Retail sales were carried out in four rented retail pavilions in different parts of Moscow; an online store; and at fairs, exhibitions, and festivals (Figures 2, 3, and 4). Products were delivered both in Moscow and throughout Russia, including in the Commonwealth of Independent States (CIS), especially Belarus.

A daily average of 165 buyers purchased products of suppliers of the cooperative in the amount of 140,000 rubles. The cooperative's suppliers procurement fund amounted to 2.73 million rubles per month, and the employee compensation fund for wages for one employee from 34,000 to 55,000 rubles—totaling 726,000 rubles per month for all employees.

For eight years of its operation, the cooperative attracted no state support, while at the same time it has been a regular taxpayer twice over: both through the cooperative, which pays taxes as a separate entity, and through the cooperative farmers, who also pay taxes. For Russia, the issue of the self-sufficiency of farm cooperatives is an acute one, since the Ministry of Agriculture

[4] *Narodnoye Zdoroviye* means Public Health; it is the name of one of the main consumer cooperatives in Russia.

[5] In Russian law, there are two different forms of cooperative: the consumer cooperative and the agricultural consumer cooperative.

[6] Hereinafter, the data for the Narodnoye Zdoroviye cooperative are based on an interview conducted by the authors in 2019 with its CEO and a joint analysis of the accounting and management reporting.

Figure 2. The Narodnoye Zdoroviye Cooperative Presents Organic Products at the Korenskaya Fair in the Kursk Region

Source: Collection of the Narodnoye Zdoroviye cooperative.

Figure 3. The Narodnoye Zdoroviye Cooperative Presents Organic Products at the Annual City Day Holiday in Moscow

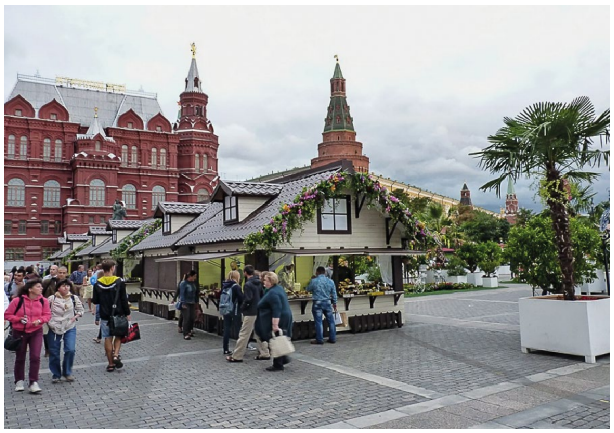
Source: Collection of the Narodnoye Zdoroviye cooperative.

allocates large resources to support them, but the effectiveness of this support leaves much to be desired.

What functions did the cooperative provide in terms of services for its farmers? Narodnoye Zdoroviye is a multifunctional cooperative (that is, it works with sales, marketing, and investment). First, the cooperative directly sells the products of farmers, detaching them from the work of selling. Small producers are engaged in production on the ground and cannot conduct systematic sales in cities. For many suppliers, the cooperative generated a large share of the sales. For example, in 2010, for one of the first major fireweed tea producers in Russia, the Kirov company Vyatka Ivan Tea,[7] the cooperative's long-time supplier Mikhail Metelev was able to independently sell only 300 kilograms of tea out of the 1.2 tons produced (25 percent). By 2011, the cooperative sold 84 percent of the company's volume. As a result of the increased sales and of promotional marketing activities such as fairs and social media marketing, new wholesale buyers were found, making it possible to increase production in 2012 by more than five times; and in 2013 production more than doubled from the previous year.

Second, the cooperative performs many marketing functions to increase the popularity of farmers,

Figure 4. The Narodnoye Zdoroviye Cooperative Presents Organic Products in Manezhnaya Square in Moscow



Source: Collection of the Narodnoye Zdoroviye cooperative.

their products, and direct marketing. Publishing materials on social media and on the website, popularizing through consultants in their own retail stores, participating in various fairs, and receiving and transmitting feedback from consumers about products—these are just some of the marketing activities undertaken by the cooperative. For example, during a festival in the center of Moscow, a famous restaurateur tried tasting porridge made of dinkel wheat (also called *spelt*) and dried fruits from the Tula organic producer Cherny Hleb, and

[7] For more information about Vyatka Ivan Tea, see http://en.vyatsky-ivan-chay.ru/.

then began to order these products for a network of restaurants.[8]

For many manufacturers of organic products, the Narodnoye Zdoroviye cooperative was a kind of business incubator. With close cooperation, farmers found additional distribution channels and learned how to work on the market for their products. In particular, the Rostov-based company Bio-Khutor Petrovsky continues to make test sales in the Moscow region through a cooperative.[9]

The cooperative also acted as an incubator for entrepreneurs. Some employees and partners of the cooperative have launched their own small businesses: one began to participate in food fairs throughout Russia on a professional basis, one founded online stores and retail outlets. All this has led to the expansion of participants in the market of organic products and an increase their physical accessibility for end consumers.

Third, the cooperative took over investment functions in specific cases, providing financial support to suppliers. For example, the beekeeper Vladimir Lysov from the Penza region was able to pay off an expensive loan and organize the full sale of his products thanks to the cooperative; the producer of Altai green buckwheat Alexei Grishin received financing to develop production capabilities.

In 2010–12, the organic products industry was only beginning in Russia, and many products—such as fireweed tea, Dagestan urbech (a paste made of ground nuts and seeds), green buckwheat, dinkel wheat, sourdough bread, and unrefined oil—were not widely known to consumers. The cooperative was one of the guides of nascent organic popularity, helping manufacturers from distant regions to showcase their unique products. Almost all the work was carried out directly between the cooperative and the primary producers, without the support of the Ministry of Agriculture or other institutions designed to promote farmers.

The model of the Narodnoye Zdoroviye cooperative is applicable to working with a grocery characterized by long shelf life and relatively casual storage conditions. Organic producers of perishable products can use, for example, the cooperative model of community-supported agriculture (CSA), or *solawi*.[10] According to experts from the International Federation of Organic Agriculture Movements (IFOAM), such models of direct interaction between farmers and consumers offer opportunities, especially for small farmers, to develop local markets for organic food.

The basis of solawi is the joint management of the production and supply of organic products by producers and consumers. Consumers interested in obtaining quality products create a joint project with one or more organic farmers to produce the desired set of products for them. All participants in the process share responsibility, risks, financing, and the harvested crop. The organic farmer in this scheme acts as the project operator on the land, who is a professional in the production of organic food. Consumers establish a fund to cover all the costs required, including fair pay for farmers. As the crops are harvested, consumers get affordable organic farming products every week.

A farmer in such a cooperative model receives sales and financing. Consumers receive quality products at cost and the ability to influence the method of farming and the range of products. By reducing the intermediate links many costs are avoided, which in turn affects the affordability of organic food.

Solawi projects are not widespread in Russia. Examples include the Tula farm Forest Gardens by Georgy Afanasyev (Фахрутдинов 2015), who offers consumers a subscription for weekly deliveries of farm products. So far, to complete the full assortment of the product basket, the project still has to purchase products from neighboring farmers, but in the future, the transaction—including delivery and the full range of products—will be carried out completely with their own products.

[8] For more information about the organic producer Cherny Hleb, see http://www.hlebio.ru/ (in Russian).

[9] For more information about Bio-Khutor Petrovsky, see https://biohutor.ru/ (in Russian).

[10] The term *solawi* comes from the German *solidarische Landwirtschaft* (SoLaWl); see Netzwerk Solidarische Landwirtschaft, https://www.solidarische-landwirtschaft.org/index.php?id=92. Information about community-supported agriculture can also be found at https://www.ifoam.bio/en/community-supported-agriculture-csa.

Policy Issues

The main issue in the development of organic farmers' cooperatives in Russia is **how to create conditions that encourage organic farmers to join in cooperatives to strengthen their market position**.

The Ministry of Agriculture of the Russian Federation has made many attempts to stimulate the development of agricultural cooperatives. In a new phase of support, a third-party operator—the MSP corporation (MSP)[11]—was selected to provide professional training in how to create and develop cooperatives and how to use existing support measures.[12] MSP subsidizes interest rates, guarantees its support, promotes products on the Internet, searches for premises and contractors to market products, participates in government and corporate procurements, provides standard documents for creating and managing a cooperative, provides leasing support, and provides information about government support and how to participate in regional support programs. Together these comprise a set of basic support measures.

For federal outreach, MSP, together with the Ministry of Agriculture, has organized regular training and co-financing for centers of competence in the field of agricultural cooperation as part of the federal project Creating a Farmer Support System and Developing Rural Cooperation.[13] Their local activities are designed to initiate the successful development of agricultural cooperatives.

Despite the allocation of significant resources and actively conducted training seminars, the question of the effectiveness of the regional centers remains open. According to the Russian Presidential Academy of National Economy and Public Administration (RANEPA) experts, the activities of quickly created centers are not always focused on the target support recipients, do not take into account the existing territorial structure of cooperative system, and are not provided with qualified personnel (Дятловская 2019). Some farmers and cooperatives note that, despite the informational hype surrounding the cooperative campaign, few reach real positive results. In particular, the online trading platform organized by MSP does not provide a significant volume of sales, and measures of financial support and subsidies require a lot of time for formal bureaucratic procedures.

Today there is a shortage of qualified personnel available for agricultural cooperation, which is complicated by the constantly changing conjuncture. Urbanization, globalization, digitalization, and other trends require constant change in order to remain viable in the market. Cooperative forms and principles do not stand still but are being transformed in accordance with social changes. Successful cooperatives are becoming increasingly market oriented in order to compete with corporations owned by investors, not just users (Антонова 2019). Government authorities should be sensitive to changes and adapt cooperative legislation and support accordingly. For example, Sweden decided to further increase the transparency of the cooperative sector and issued an updated code for cooperative management (Svensk Kooperation 2019). Swedish cooperatives occupy a significant share of the labor market and social economy: the 100 largest cooperatives make annual revenues of more than 34.08 billion British pounds and employ 100,000 employees (Voinea 2019).

In addition to the cultural and historical problems of farmers' distrust in establishing cooperatives, legislative incentives to transition to cooperative forms of farming are also lacking. Moreover, farmers face difficulties in finding specialists in cooperative management, accounting, and law to defend the cooperatives' interests. Because of specific cooperative accounting requirements, banks are not willing to recognize their collateral base; this results in low available financing.

Registering and starting a cooperative could significantly increase its costs to farmers, especially those who are forced to work in the shadow economy—those who pay little or no taxes and who file no official accounts because their business is not profitable enough to pay all the taxes and follow

[11] For more information about the MSP corporation, see https://corpmsp.ru/razvitie_selkhozkooperacii/ (in Russian).

[12] For details about MSP's programs, see https://agro-coop.ru/#button (in Russian).

[13] For details about this project, see http://government.ru/docs/36560/.

all the regulations. Registration costs, the need to pay high social taxes for workers, overregulation, and the costs of lawyers to ensure that the formal management procedures are followed—all these only discourage small farmers from formal cooperatives.

The system of cooperation is blocked by its very low incidence. Representatives of tax services and courts do not always understand the operating principles of such a rare form, which affects various tax claims and litigation for cooperatives and their farmers. This increases the transaction costs of cooperatives and makes them less attractive than more common legal forms.

The creation of a cooperative may also create additional risks because of the subsidiary liability of its members. The seizure of land and other resources by raiders or fines from inspection bodies can bankrupt a cooperative and lead to farmers' loss of property. Few owners will want to jeopardize their assets, especially when property rights are poorly protected. Some lawyers advising cooperatives admit that it is more convenient to conduct business through the legal forms of a limited liability company or an individual entrepreneur.

The use of cooperative formations for the development of organic farmers is relevant not only for Russia, but also for most post-Soviet republics, in which many types of smallholder farms in rural areas are highly competitive with large global and local players.

Armenia is no exception. In Armenia, out of 72 organic farms, only three are organized as cooperatives. One of these cooperatives is still in its transitional stage, and one is engaged only in the collection of wild plants. The main organic producer is essentially only the consumer cooperative Agricultural Association Lukashin, which not only carries out the production of organic fruits and vegetables, but also processes, packages, stores, and markets them. The cooperative was created in 2005 by 42 members, and since 2009 it has produced organic products. At present, it includes 134 members, eight of whom are involved in the production of organic products.

Lukashin's organic products are sold in Armenian supermarkets, but domestic demand remains insignificant. More promising is the export market. In particular, after the annual Biofach organic exhibition in Germany a few years ago, negotiations are underway on deliveries to France.

What are the benefits of cooperation for organic farmers in Armenia? First, managing shared gardens is easier than managing many disconnected gardens. Second, it becomes possible for a cooperative association of farmers to participate in various forms of grant support, which would not be available to each farmer separately. Third, the possibility of attracting professional counseling is increasing. And fourth, banks give advantages—such as a higher probability of loan approval and better terms for those loans—to cooperatives, because the risk of default is reduced.

What are the challenges facing organic farmers in Armenia today? First, there is a shortage of permitted remedies (such as organic pesticides and herbicides) for organic farming. Second, consumer awareness of the benefits of organic products is still low. Third, the rules for organic labeling have not yet been developed, so consumers are misled about the quality of the food. Fourth, many organic farmers cannot achieve sustainable development and cease production after the grant period is over. Fifth, although organic production is not economically attractive compared to ordinary production, the prime or direct cost to the farmer is 5 percent to 10 percent higher, and retail prices are higher by 20 percent to 30 percent, which is significant for a country where 28 percent of the population is considered at or below poverty level. Sixth, there is a monopoly of the certification organization, which affects the overpricing of services. In contrast, in Poland more than 20 organizations carry out organic certification. Seventh, essentially no direct government support tools are available for organic producers, and the Austrian Development Agency is making a greater contribution. And eighth, a crop insurance system for organic producers has not yet been established, which does not encourage farmers to switch to a new risky production method.

The organic farming system of Armenia, like the system in Russia, lags significantly behind that of developed countries; therefore, it is largely focused on foreign partners both in terms of technologies and sales. For example, ACBA-Credit Agricole Bank, together with the German Conservation and Biodiversity Union (NABU) and the financial support of the Austrian

Development Agency, held a training seminar for 250 participants of the Armenian organic agriculture system. The cooperation of these organizations in Armenia began as early as 2015 within the framework of the project Development of Organic Agriculture (АрмИнфо 2019).

The training program contained modules of a technological as well as an organizational nature. The focus was placed on wild plants and other organic commodities—namely organic honey, tea, and herbs—that have high added value, can be stored for a long time, and can be easily transported. Moreover, these products are not so competitive in world markets.

The proposed model of cooperative marketing of organic food is relevant not only for Russia, but also for the countries of the focus region, including Armenia. On the one hand, Armenian cooperatives can sell products in the country and for export. On the other hand, Russian cooperatives can buy products directly from Armenian farmers. For example, Armenian farmers directly supply dried fruits to the Narodnoye Zdoroviye cooperative, which then exports them to Europe and supplies them directly to consumer cooperatives.

Stakeholder Groups

The circle of stakeholders interested in the development of organic farmers' cooperation in Russia is wide: consumers; rural micro, small and medium enterprises; food supply chain participants; and government and nonprofit organizations.

Consumers. Agricultural cooperatives would be useful not only for agricultural producers, but also for consumers. Shortening the supply chain of relatively expensive organic products would reduce the price for the final consumer. Cooperative participants would save public resources by not having to use them to pay for delivery, storage, administration, and sales. The resources thus saved could be distributed between farmers and consumers through increased revenues and lower prices.

Consumers are not limited only to purchasing goods, but they can also be active participants in the process. By buying organic food they become investors. By becoming solawi members they would also help farmers to share risks and guarantee sales. Consumers of organic food are becoming much more than just consumers.

Micro, small, and medium enterprises (MSMEs) in rural areas. There are many MSMEs in the Eurasian region, and it is becoming increasingly difficult for them to compete with national and global agricultural corporations. Despite the early stage of the organic market in the post-Soviet space and the existing restrictions on it, small farmers would find a promising niche in the production of organic food. To increase their bargaining power, they need the consolidation that could be attained by forming cooperatives.

Through organic production, MSMEs could compete in quality with large agricultural holdings, and through formal and informal cooperation—by providing economies of scale—in cost. Best international practices of developed countries indicate that cooperative models of organic food marketing would be in demand both from farmers and from the state and consumers.

Food supply chain participants. As the system of organic farmers' cooperatives develops, participants in the food system will receive a greater supply both in terms of quantity and variety and also receive greater opportunities for marketing and attracting resources.

Government and nonprofit organizations. State and nonprofit organizations spend a lot of resources on rural development programs and farmers' support. Sustainable organic farmers' cooperatives would be able to take on some of the social and economic functions that are currently being provided by those organizations.

As the agricultural cooperative system develops, state and nonprofit organizations would provide protection from stronger stakeholders, such as agricultural holdings, organized crime groups, unscrupulous inspection services, and fertilizer trading companies. The interests of the latter may be affected as organic agriculture grows in popularity—synthetic fertilizers, which are banned in organic agriculture, make up most of the fertilizer trading

companies' business; these companies will certainly try to hold onto their market share, and this looming conflict may present a risk for the development of organic farming and cooperation.

Agricultural holdings. Small organic farmers and their cooperatives are unlikely to be able to compete in the near future with conventional large farms as they have different market segments, economies of scale, and price categories. Instead, cooperatives will be able to effectively integrate into the economy of agricultural enterprises. This could take the form of a contract to manufacture certain products; the joint use of processing facilities, equipment, or other resources; and the provision of retail space.

Federal and regional authorities interacting with strategic agricultural holdings are also interested in promoting such cooperation between small and large business configurations. In global competition, agricultural holdings have switched to a model of productivity growth—this means automation, digitalization, and job cuts. The incorporation of organic farmers' cooperatives by agricultural holdings could become a compensatory measure for social policy in rural areas.

Some agricultural holdings may see competition from cooperatives and take aggressive measures to challenge this rivalry. Regional authorities should balance this process, acting as ombudsmen for MSMEs in rural areas. Furthermore, agricultural holdings can thus increase efficiency even in some of their processes by incorporating organic agriculture cooperatives. The prospects for mutually beneficial cooperation of agricultural holdings, farmers' cooperatives, and regional authorities are described in detail in a 2018 interview with the Governor of the Belgorod region (Савченко and Никулин 2018).

Policy Challenges and Options

Well-functioning cooperatives will be able to provide marketing and sustainable development to a large number of organic farmers. In turn, this will lead to increased food security, both by expanding healthy food production and by increasing accessibility of organic products to consumers.

Policy makers in Russia are experiencing a shortage of models for the sustainable development of organic farmers since, on the one hand, the organic agriculture sector is just beginning to take shape in the country and, on the other hand, the effectiveness of government support for farmers remains low, unlike support for the large agricultural holdings. The country's top leadership clearly defined the prospects for the development of organic agriculture. The Ministry of Agriculture also actively decided to support agricultural cooperation by initiating the creation of a federal network of centers of competence. Based on our studies, we identified **six main challenges and options for meeting them** that policy makers face in promoting organic farmers' cooperatives.

The first big challenge for state support for cooperatives is the shift in goals: many cooperatives are focused not on successful development, but instead on obtaining grant support. As a result, a lot of resources are spent on meeting grant requirements rather than on real development. Often, within a few years of receiving a grant, cooperatives either stop working or significantly reduce their activity. And growth indicators in subsidized cooperatives are often the result not of natural development, but of the artificial attraction of state money. Existing state support for cooperatives is initially based on paternalism and subsidy models rather than effective business models. If there is no payback model or the model is not adequate to meet the demands of modern food chains, then state injections of finance may have a weak effect.

It is advisable to first create prerequisites for organic farmers in sales, then verify the viability of the business model in practice and implement it in contracts, and only after that to think about creating a formal cooperative and providing financing. Do not first create a cooperative, allocate funds, and then look for someone to sell products to. A different sequence of implementation can give diametrically opposite results.

At the initial stages, organic farmers can join forces without establishing a formal cooperative, and the state can help them in this effort. For example, the state can help to provide commercial space in accessible areas on preferential terms, assist with bidding for public or corporate procurement,

and facilitate negotiations with retailers. Informal cooperation in the early stages will have minimal transaction costs. Practice and market testing will provide feedback and test hypotheses. If successful, stakeholders can then think about the further development and formalization of cooperative relations. And the market will determine which organizational form is better to choose for a farmers' association.

In modern food systems, the focus has shifted from production to sales; successful marketing—including not only selling but also meeting demand and remaining competitive—is not simple to implement. For example, one of the largest Russian retail chains of quality products, VkusVill, has been selecting a sales format for 10 years (Камитдинов 2019), and its experience indirectly indicates demand constraints for organic products. The format of more expensive products works mainly in Moscow and other affluent agglomerations or very large, affluent cities, so the focus should be on high-income customers.

VkusVill is a clear example of the comparative effectiveness of a market approach, thanks to which more than 400 suppliers of quality food have access to regular sales. It also advertises manufacturers, enhances the popularity of quality products, and gives manufacturers feedback from consumers. It turns out that such a system of agricultural extension works through hands-on practice and a focus on results. For many manufacturers, VkusVill is an incubator, while the state has not spent a single ruble on its support but, on the contrary, regularly receives taxes from it. Public services, in contrast, sometimes do not contribute to the development of product projects because of overregulation focused on fines, rather than on prevention and counseling. In one example of this overregulation, in 2018, with no warning the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) presented VkusVill with a fine of 6 million rubles (Камитдинов 2019).

A large amount of work undertaken to popularize organic products was also carried out by the LavkaLavka cooperative, which organized sales of organic products through several shops, cafes, restaurants, and markets. For many years, without any kind of state support, they told Russian consumers about organic products and responsible food consumption. For some farmers, sales through LavkaLavka have become the starting point for finding regular customers. And over its nine years of operation, the business model has been constantly changing in search of a sustainable solution (Евдокимов 2019). A successful format has not yet been found and the project is in crisis (The Dairy News 2019).

The second important challenge for state participation in the system of agricultural cooperation is overregulation. Sometimes the risks for farmers of inspections significantly exceed any market or natural risks. And even grants for development may be insignificant in comparison with the costs that may arise during various checks of a formally created cooperative. The system of inspections and regulation often does not work to improve the quality and friendly prophylaxis, but instead results in fines and interference in economic activity.

Excessive regulation is still preserved for exporters, even in the context of the strategy used for export orientation. A large number of necessary documents and lengthy customs checks significantly increases the cost and makes Russian food less attractive to importers. These difficulties are noted by beekeepers, potato growers, and grain traders. This harms both exporters and the state, which does not receive taxes on products that are not exported.

Weakening regulations and introducing the institution of farm ombudsmen, which could quickly suppress any raider attacks, are relevant today for the development of organic farming. Penalties for the shops of the Narodnoye Zdoroviye cooperative, raider seizure of the cooperative Family Capital, long-term raider attacks on the Rostov holding Skvo, the tragedy in the Krasnodar village of Kushchevskaya, the tractor march of Kuban farmers—today there are many signs from all over Russia about the powerlessness of farmers and their associations (Андреева 2017).

The insecurity of property rights is exacerbated by the subsidiary liability of members of cooperatives, which may entail not only the loss of the contributed units, but also of personal property. It is advisable to weaken this norm by indicating in the law limited liability within the limits of the units entered.

To increase farmers' interest in cooperatives, it is important to simplify the procedures for providing and auditing state support. If the application process and the process of conducting inspections both remain exorbitantly costly, then it is hardly worth expecting farmers' proactive participation in government support programs. On the contrary, such an anti-stimulus will create an unfavorable selection of those cooperatives that are aimed not at business, but only at receiving grants.

The third challenge for public policy concerns tax incentives for cooperatives. There is still confusion in the tax services and courts over the double taxation of cooperatives. For sustainable development, the cooperative must be profitable, which means that there may be claims for taxing the income of the cooperative and farmer. It turns out that the farmer pays tax twice on the same product: once upon delivery to the cooperative, and once upon delivery by the cooperative to the buyer. On this basis, there have been many lawsuits throughout Russia. Such legislative confusion discourages farmers from selling through cooperatives.

For comparison, there is recent American experience in tax incentives for agricultural cooperatives. At the end of 2017, a law was passed in the United States that provided tangible tax incentives to farmers selling their goods through cooperatives. According to the innovation, a fifth of the total sales through the cooperative is subject to a tax deduction. If the farmer's taxable profit is less than 20 percent of the goods he supplies to the cooperative, then he can be generally exempted from tax payments. When selling to a non-cooperative company, the farmer's tax deduction will be 20 percent based on his profit, not revenue. Such a tax benefit is provided until 2025. Many sales companies have begun to analyze the possibility of registering as a cooperative to carry out their trading activities (Polansek and Weinraub 2018).

Business climate often changes, and with it the forms of agricultural cooperation. But Russian legislation does not adapt to dynamically changing economic conditions. Modern farmers need flexible and different forms of cooperation, especially for the new solawi models and rural-urban cooperatives. Organic farmers should have a choice of different cooperative forms specifically suitable for their models. In modern cooperatives, it is advisable to include not only farmers, but also enterprises concerned with processing, logistics, wholesale and retail sales, and other participants in the supply chain.

The legislative convenience of managing cooperatives should be supplemented by economic incentives. Clear preferences—such as the tax deduction in the United States proportional to the volume of products sold through a cooperative, or the exemption from social taxes for cooperative workers in Spain—can attract active entrepreneurs who will independently master the cooperative laws and start to implement successful business models (Schneider 2018).

The fourth public policy challenge is sales. Marketing is a traditional problem for many farmers; therefore targeted government support for organic farmers' cooperatives in the form of preferential conditions for trade could be successful. This could take the form of farmers' markets, weekend fairs, seasonal fairs, festivals, electronic venues, and so on. Also promising for cooperatives is their participation in tenders for the supply of products to state and corporate institutions. In Europe, for example, some schools, hospitals, and municipalities systematically increase their share in the procurement of organic products (European Commission 2014).

Additional opportunities for organic farmers can open in electronic trading platforms. The experience of integrating small producers on such marketplaces as Amazon, eBay, Alibaba, AliExpress, and Avito.ru suggests that e-commerce can be a good sales channel.

The fifth public policy challenge is education about cooperatives. In Russian culture, cooperation today is discredited. A trail of negative memories of Soviet collective farms and cooperatives stretches back to the late 1980s. Private enterprise and individualism, on the contrary, have become popular. Therefore, for the emergence of an active public interest in cooperation, it is necessary to show its positive aspects in the media. This can be done through both documentary and feature films, materials in newspapers, blogs, and social media.

In the concept of creating incentives for business-oriented cooperatives of organic farmers, education plays a major role. This is an indirect important

support. Many farmers today simply do not own the technology and do not know where to buy organic seeds, how to grow products according to the rules, how and to whom to sell those products, or how to get certification. A similar educational and scientific gap has developed in the field of training for cooperation.

The sixth challenge to public policy is to create a system for transferring practical experience to organic farmers, or those who want to be organic farmers, through ongoing demonstration projects. Today in Russia there are few examples of successful cooperatives and organic farmers; therefore, at the first stages of fostering organic farming it is important to promote internships, practice, and the exchange of experience in advanced foreign and domestic organic farms. Moreover, it is advisable to provide opportunities for training not only to farmers and students of agricultural universities, but also to all participants in the organic agriculture food chain, including representatives of the Ministry of Agriculture. It is also important to award Russian farms, which can act as demonstration and educational platforms for the dissemination of knowledge. For example, for many years Germany has had a program that provides a network of demonstration organic farms that host educational events (Рыкалин 2019b).

Accordingly, we suggest **six policy options**, which may have positive effect on the further development of cooperation in organic agriculture.

1. Reorient efforts to advance organic agriculture from subsidizing formal cooperatives to accelerating business-oriented cooperatives.

2. Simplify legislation for the management of cooperatives.

3. Provide tax preferences for farmers selling their products through cooperatives.

4. Provide trade infrastructure.

5. Create a federal network of rural advisory services for the ongoing training of farmers.

6. Create a federal network of demonstration organic farms to exchange experiences.

Assignment

1. Explain the main instruments of organic farmers' government support in Germany and describe which of them are used in Russia.

2. Find information about the number of lawsuits against agricultural cooperatives in Russia.

3. What is the subsidiary liability of cooperative members? Compare the positive and negative sides of the existence of such a norm in cooperative legislation.

4. What is a difference between organic and ecological agricultural products in accordance with the terminology proposed by the Ministry of Agriculture in the bill "About Ecological Agricultural Products, Raw Materials and Food"?

5. Why does the practice of many developed countries shift focus from cooperatives to producer organizations?

6. What are the fundamental advantages and disadvantages for a farmer of becoming a cooperative member?

7. What are the cultural and historical features of the post-Soviet space, in comparison with Europe and the United States, inhibiting the broad development of cooperatives?

Policy Recommendations

Given the limited resources available for any policy measures, it is recommended to focus on the training and education system, legislative simplifications, tax incentives, and marketing infrastructure. The recommendations presented are not very resource-intensive for the budget and can be implemented within the framework of existing structures—namely, the Ministry of Agriculture, the Ministry of Economic Development, the MSP corporation, centers of competence, the Association of Peasant (Farm) Farming and Agricultural Cooperatives, the Russian Rural youth union, the Russian University of Cooperation, and the Central Union. The

implementation of the policies will give a clear market signal to various stakeholders, especially farmers, consumers, agricultural holdings, participants in the supply chain, and nonprofit organizations.

Education system

- ✓ Refresh the training of modern specialists in management, accounting, and taxes for cooperative organizations within the existing infrastructure of the Russian University of Cooperation.
- ✓ Establish a system of short- and medium-term internships in advanced agricultural cooperatives in foreign countries for agricultural producers, scientists, researchers, and representatives of the Ministry of Agriculture.
- ✓ On the basis of the Russian University of Cooperation, the centers of competence in cooperation, the Ministry of Agriculture, the MSP corporation, and the Russian Rural youth union, establish a training system for organic farmers to explain the benefits of cooperatives, and establish typical instructions for their creation.
- ✓ Organize a system of encouraging and rewarding cooperatives of organic farmers who are ready to participate in the activities of a demonstration network for learning and sharing their experience.
- ✓ Publish material in the media on the benefits and advantages of organic farmers' cooperatives.
- ✓ Explain to society and consumers the value of organic agriculture and emphasize the importance of responsible consumer choice of organic food.

Legislative simplifications

- ✓ Abolish or limit the subsidiary liability of cooperative members to the amount of membership dues paid.
- ✓ Simplify registration, operational management, and reporting procedures for cooperatives.
- ✓ Eliminate double taxation of income of the cooperative and its members.
- ✓ On the basis of cooperation centers of competence or regional representations of the Ministry of Agriculture, organize the work of ombudsmen for agricultural cooperatives' members.
- ✓ Expand the number of and possibilities for cooperative organizational and legal forms, in particular for models of rural-urban cooperatives and solawi.

Tax incentives

- ✓ Provide a proportional tax deduction for organic farmers selling their produce through cooperatives.
- ✓ Exempt employees (who may also be members) of organic farmers' cooperatives from paying a unified social tax.[14]

Marketing infrastructure

- ✓ Provide daily or occasional retail infrastructure on preferential terms for organic farmers' cooperatives.
- ✓ Set target levels for the share of purchases of organic food by state and social institutions.

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[14] The unified social tax is a special tax on salary beyond the income tax.

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Abbreviations

CIS	Commonwealth of Independent States
CSA	community-supported agriculture
GfK	Growth from Knowledge
IFOAM	International Federation of Organic Agriculture Movements
MSMEs	Micro, small, and medium enterprises
MSP	the MSP corporation
NABU	German Conservation and Biodiversity Union
RANEPA	Russian Presidential Academy of National Economy and Public Administration
SPOK	agricultural consumer cooperatives

Land Use Adaptation to Prevent Adverse Effects of Climate Change on the Yield of Irrigated Croplands in the Nukus District, Uzbekistan

Tatyana Khamzina, Maria Konyushkova, Marina Nechaeva

Executive Summary

The environmental conditions in Uzbekistan make it quite challenging for the country to provide food security: it faces a hot arid climate, prevalent weakly developed desert soils, pronounced land degradation and desertification, and a shortage of independent domestic water resources. These issues are exacerbated by climate change, manifested in Uzbekistan by more severe drought. Climate change consequences pose a threat to food security, especially in areas where agriculture plays a dominant role in communities' livelihoods. Located in the northeastern part of Uzbekistan, the Nukus District is a rural area. Irrigated farming is the main component of the agriculture sector, producing crops and accounting for 40 percent of the district's employment.

Historically, the dry, hot climate has compelled farmers to adapt and use most acceptable practices to survive. However, currently, the pace and magnitude of climate change are beyond those to which current agriculture practices can adapt. The aim of our case study is to work out policy options for adapting and enhancing the resilience of farmers in the Nukus District to climate change.

Proposed policies include the widespread adoption of climate-smart agricultural practices that will mitigate the influence of climate change and ensure sustainable agricultural food production. To achieve this goal, farmers must overcome hurdles arising from environmental issues, a lack of investment resources, and the insufficiently harnessed potential of local innovative initiatives and of internationally recognized most effective practices.

The full participation of decision makers on agricultural development at the national and subnational levels will contribute to the achievement of the goal. Local communities (farmers, *dehkans*,[1] and households) that are negatively affected by climate change are direct beneficiaries and key stakeholders in the implementation and expansion of good practices and sustainable farming methods.

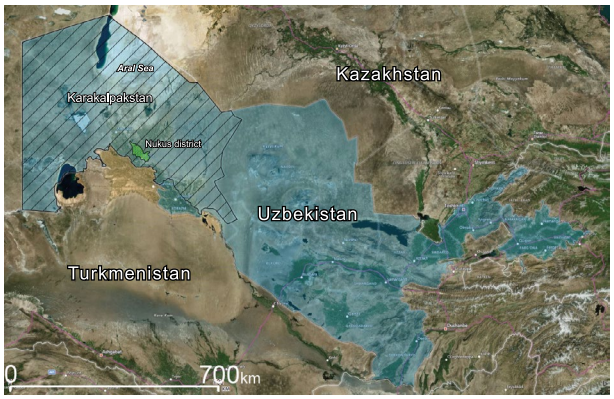
Background

Environmental and Climatic Conditions in the Nukus District

The Nukus District is an administrative unit of the Sovereign Republic of Karakalpakstan, which is part of the Republic of Uzbekistan, located in the Amu Darya delta in the Aral Sea basin (Figure 1). The Nukus District has an area of 943.91 square kilometers; its flat landscape has an elevation of 100–149 meters above sea level. The environmental and climatic conditions of the district are generally similar to those in Karakalpakstan and are invariably difficult for crop farming. Its inland location, deep inside the Eurasian Continent, and its abundant solar radiation define its arid harsh continental climate with hot summers, cold winters, wide seasonal air temperature variation, and extremely low total precipitation rates (Figure 2).

Because of very dry climatic conditions and contrasting seasonal temperatures, the area's soils have low natural fertility and humus content and plants have an insufficient nutrient supply. The flattened terrain impedes natural groundwater outflow and contributes to secondary soil salinization under irrigation. The Nukus District is situated in the lower reaches of the Amu Darya;

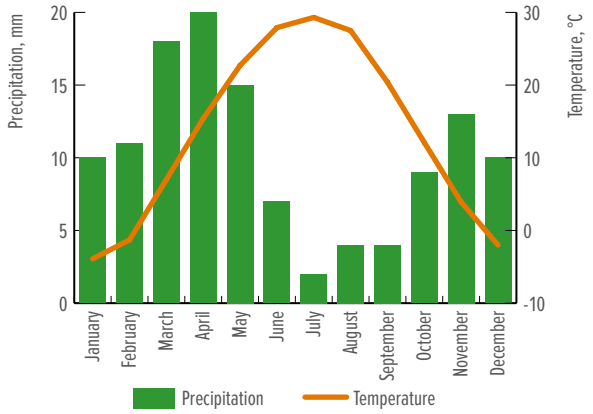
Figure 1: Location of the Nukus District in Karakalpakstan



Source: Author, based on https://www.bing.com/maps.

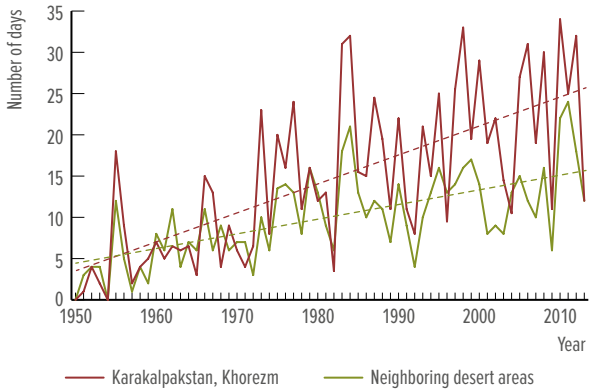
[1] *Dehkan* farms are family small-scale farms engaged in the production and sale of agricultural products on the basis of the personal labor of family members on the backyard plot granted to the head of the family as a lifelong inheritable possession.

Figure 2: Annual Cycles of Air Temperature and Precipitation, Nukus, 1986–2016 Average



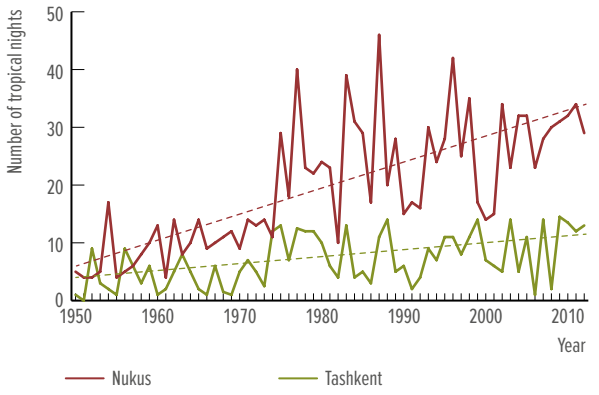
Data source: Uzhydromet.

Figure 3: Variation in the Number of Days with Heat Waves



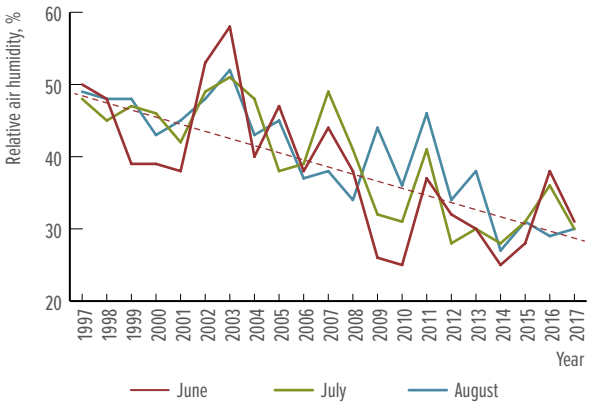
Source: Uzhydromet 2016; UNEP 2016.
Note: A *heat wave* is a period of at least five consecutive days with a significant excess over mean daily temperature.

Figure 4: Changes in the Number of Tropical Nights



Source: Uzhydromet 2016; UNEP 2016.
Note: A *tropical night* is one with an average temperature of 22°C or more.

Figure 5: Changing Air Humidity in Summer, by Year (Nukus)



Source: Uzhydromet 2016; UNEP 2016.

for this reason, it receives water that is already polluted by water users from upstream areas. In the region, the mineral content of inflowing river water is as high as 1.5–1.8 parts per thousand; the water hardness is twice as high as the maximum permissible concentration. In spite of the harsh environmental and climatic conditions, irrigated crop cultivation dominates the district's economy and, in 2018, was the main source of income and livelihood for 38,941 rural residents whose share in the total population of the district was 80 percent (State Committee of the Republic of Uzbekistan on Statistics 2018).

Climate Change and Its Implications

According to the National Communications of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change (UNFCCC), recent decades have witnessed almost a twofold increase in the severity and frequency of droughts typical of the Uzbek climate (UNEP 2016). Climate change impact is particularly painful for the northern areas of Karakalpakstan. In the past, the climatic conditions of this region depended on the water of the Aral Sea. The Aral Sea was a natural regulator, mitigating the cold of Siberian winds and summer heat. Now it is hotter in summer and colder in winter, and the air humidity has dropped (Figures 3–5). In addition to the overall warming,

climate change has enhanced the extreme thermic conditions: it has led to an increase in heat waves (five or more consecutive days with a significant excess over the mean daily temperature), the number of nights with an average temperature above 22°C (*tropical nights*), and a decrease in the relative humidity of air in summertime. These changes have led to an increase of evaporation and a corresponding growth in the need for irrigation.

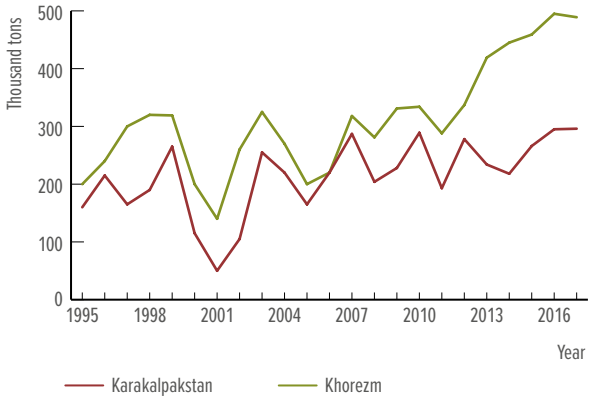
Newly formed on the desiccated Aral Sea bed, the Aralkum Desert has turned into a new "hot spot" and a source of dust and salt transported to adjacent agricultural lands, enhancing their degradation and impairing their crop-producing ability. A recent example: on May 26–27, 2018, a salt storm transported salt "clouds" from the side of the desiccated Aral Sea bed for great distances. Salt was deposited on roads, houses, and vegetation, covering them with white powder like rime ice or frost dew.

Soil salinization in the Nukus District of Karakalpakstan reduces the crop yield. As expert estimates demonstrate, in 2018 the shortfall in production of main crops amounted to 16 percent (8,110 tons), ranging from 3 percent (winter wheat) to 33 percent (potatoes) depending on the salinity tolerance of the crops (Table 1).

During the extreme drought of 2000–01 with its record-breaking low flow of the Amu Darya River, Karakalpakstan received only 30 percent of the water required for land irrigation. As a result, the area received a catastrophic reduction in irrigated areas: a decrease in yield from 14 percent to 17 percent (winter crops) and from to 45 percent to 75 percent (other crops) took place there. Losses of the gross grain harvest amounted 150,000–200,000 tons (Figure 6) (State Statistics Committee 2018).

Increasing the frequency and extremeness of droughts is the biggest threat to Karakalpakstan's food security (Box 1).

Figure 6: Total Yields of Cereal Crops in the Low Reaches of the Amu Darya River



Source: Author's calculations, based on data from the State Statistics Committee 2018.

Table 1: Losses of Gross Output of Agricultural Crops Caused by Soil Salinization in the Nukus District, 2017

	Winter wheat	Rice	Maize	Vegetables	Potatoes	Fruit	Grapes
Area, 1,000 hectares	5.70	0.08	1.80	1.30	0.30	0.22	0.21
Actual harvest, tons/hectare	1.93	1.93	1.89	15.00	12.10	1.14	10.40
Crop losses, tons/hectare	0.06	0.34	0.59	2.44	3.94	0.34	2.83
Shortfall in production							
1,000 tons	0.32	0.03	1.06	3.16	1.18	0.08	0.59
%	3	18	31	16	33	30	27

Source: Authors' calculations, based on data from the State Statistics Committee 2018.
Note: Potential yields are yields that can be produced by a crop depending on soil salinity degree adopted in accordance with Food and Agriculture Organization of the United Nations (FAO) estimates. The potential yield at non-saline soils (100%) in tons/hectare is estimated according to national field experiments.

Box 1. The Drought of 2000–01: Facts

The drought of 2000–01 became a catalyst for desertification and environmental degradation processes. The solute concentration of the water entering Karakalpakstan was 2.1 grams per liter; its hardness was 17 milligrams per liter. Lake systems and wetlands in the northern part of Karakalpakstan, with an area of about 160,000 hectares, almost completely dried up by the end of 2001. As a result of the loss of the wetland habitat of animals and birds, 46 species of fauna were added to the list of the Red Book of Uzbekistan. Fifty-one farms, which rented about 60,000 hectares of lake systems, were on the verge of bankruptcy.

About 200,000 households (1,000,000 people) completely lost their crops. The most affected population (about 600,000 people) needed food, drinking water, and assistance in the supply of agricultural resources. According to estimates by the Ministry of the Economy, agricultural damage in the lower reaches of the Amu Darya (Karakalpakstan and Khorezm) amounted to US$50 million in 2000 and US$80 million in 2001.

Source: Khasankhanova 2013.

Identification of Climate-Smart Farming Practices Used in the Nukus District

It is very important for future development to assess the actual capacity of land users, available technologies, and opportunities; this should be done to reduce the region's vulnerability to adverse climate-related factors. Land use analysis in the northern districts of Karakalpakstan enabled the identification of climate-smart practices that are currently used or were used in the past, and that were demonstrated or are demonstrated now under national/investment projects.

Existing best practices and traditional methods

- ✓ Autumn sowing of wheat in growing cotton fields without primary tillage
- ✓ Agricultural afforestation (establishment of forest shelterbelts to protect agricultural fields)
- ✓ Biological methods of plant pest management
- ✓ Development of greenhouse facilities

Techniques and technologies supported by national and/or investment projects

- ✓ Improved crop rotation in the two-crop system (cotton-wheat) with the introduction of legumes and green manure crops
- ✓ Laser-guided field leveling
- ✓ Zero tillage (no-till) practice
- ✓ Afforestation of degraded parts of arable lands

In this region, the use of best practices ensures a certain level of readiness of the farming sector to climate change.

Interviews for this study with local stakeholders show that the Nukus District offers quite a lot of examples of successful climate-smart practices, but they are not widely replicated. Key obstacles for upscaling climate-smart practices include: (1) low awareness, experience, and knowledge; (2) a shortage of agricultural machinery; (3) the high initial investment costs of introducing technology; (4) a shortage of water resources; (5) the absence of administrative support and adherence to traditional stereotypes (in the case of zero tillage); and (6) the lack of motivation to invest money to get long-term results (in the case of forest shelterbelts).

Policy Issues

National Agricultural Policy

Uzbekistan has been successfully managing to avert threats to its national food security for almost three decades. After it acquired independence in 1991, the country took transformational measures to reform its agriculture sector, which resulted in noticeable achievements. These achievements include grain

independence and a domestic supply of staple food that almost fully meets the country's needs.[2] The government provides significant resources for activities to support sustainable land management from internal sources of finance of resources.[3] Large-scale technical activities improved the water supply to 1.7 million hectares and ensured land improvement on 2.5 million hectares (Government of Uzbekistan 2019a). In the recent decade, international donors (the Asian Development Bank, the Inter-American Development Bank, the International Fund for Agricultural Development, and the World Bank) implemented over 20 major projects worth more than US$1.5 billion to support institutional reforms; to reconstruct irrigation and drainage infrastructure; and to establish extension services, develop training programs, and so on.

The new stage of the country's development, including the development of agriculture, started in 2017. The policy document to identify the national policy priorities was the *Action Strategy in the 5 Priority Areas of Development in the Republic of Uzbekistan in 2017–2021* (Government of Uzbekistan 2017a). The strategy envisages comprehensive, systemwide interventions to eventually turn the agriculture sector into an up-to-date, diversified, and sustainable system of production, processing, and marketing.

The newly developed Concept of Efficient Use of Land and Water Resources in Agriculture is aimed at restoring soil fertility; introducing up-to-date irrigation and farming methods; implementing innovative tillage strategies; promoting new agricultural trends based on international experience; developing crop breeding and seed production; maximizing the yields of croplands and agricultural outputs, along with their downstream processing and selling; developing a modern system of logistics and marketing; and accelerating the integration of research and practice.

According to the low-carbon development strategy, by the year 2030 the adaptation capacity of water management and agriculture will increase by about 40 percent in the most vulnerable areas prone to desertification, land degradation, and droughts (CER/UNDP 2015).

Uzbekistan has joined the National Policy to Combat Drought Initiative of the Food and Agriculture Organization of the United Nations (FAO), the World Meteorological Organization (WMO), and the United Nations Convention to Combat Desertification (UNCCD) (WMO/UNCCD/FAO/UNW-DPC 2013). The implementation of this initiative will make it possible to refocus from response measures (in a crisis) to preventive measures that ensure readiness to respond to drought. Under the climate agenda, Uzbekistan ratified the Paris Agreement in 2018 to contribute to the stated common goal.

The Government of Uzbekistan and the global community pay much attention to addressing issues arising from the Aral catastrophe. A special charity fund called Muynak-2019 was set up. Under the Aral Sea Region Development Program, it is planned to implement 67 projects in 2017–21 (Government of Uzbekistan 2017d) to improve the quality of life and water resource management, with a total cost amounting to US$1.2 billion. In 2019, 100 billion Uzbekistani soms will be made available for afforestation of 500,000 hectares on the desiccated Aral Sea bed (Government of Uzbekistan 2017d, 2019b). To provide a programmatic approach to addressing the problems, a UN Multi-Partner Human Security Trust Fund for the Aral Seas Region in Uzbekistan was established under the aegis of the UN.[4]

Adaptation Policy Issues

Issues related to irrigated land fertility: Currently, the irrigated land fertility rate in the Nukus District is below average because of inefficient land use and the low potential of adaptation to unfavorable natural and climatic conditions. Under a long-term development strategy and with the intensification

[2] Currently, the share of grain imports does not exceed 5 percent of total consumption whereas, in the early 1990s, grain imports accounted for over 80 percent of total consumption.

[3] Sustainable land management helps to adopt climate-smart agriculture because it is also aimed at striking a good balance between resource utilization and long-term maintenance of production capacity.

[4] Further information about the trust fund can be found at https://www.uz.undp.org/content/uzbekistan/en/home/library/poverty/un-multi-partner-human-security-trust-fund-for-the-aral-sea-regi.html.

of crop cultivation, there are plans to diversify the range of crops by switching to the cultivation of grains, leguminous crops, vegetables, oil-producing plants, melons and gourds, fruits, and so on; moreover, a reduction in the area planted with cotton is planned. However, to improve the fertility of irrigated lands, maintain soil health, and adapt to climate change, it is necessary to undertake an additional set of activities (including implementing efficient crop rotation, increasing organic matter in the soil, applying new drought-resistant and salt-tolerant crop varieties, and so on).

Issues related to the recording of irrigation water use in agricultural fields: The restructuring of the farming sector has produced numerous water users—both farmers and dehkan farms. To ensure efficient and equitable allocation of water within farms, water user associations have been set up in the country; there are also agencies that monitor and control conditions of irrigated lands. However, proper recording of water use for agricultural fields has not yet been put in place and the irrigation system features have poor water use discipline. Because of the lack of water meters, each norm-based diversion of irrigation water to farmers' fields is measured only "approximately." This leads to high irrigation rates as well as loss of water to leakage and surface discharge to fields located close to the water source; farms located at the farthest distance to the water source are facing a shortage of irrigation water. For this reason, farmers are not motivated to introduce water-saving technologies and save irrigation water.

Issues related to irrigated land improvement: The ongoing process of irrigated land improvement is focused on renovating and restoring drainage systems as well as activities aimed at efficient use of water resources under ongoing regional programs. A special Land Reclamation Fund has been set up under the Ministry of Finance. But this limited focus on drainage-related works only fails to bring about long-term success. According to guidelines and recommendations of the World Bank, drainage infrastructure reconstruction projects should be implemented concurrently with the rehabilitation of irrigated lands within their catchment areas, using innovative approaches and technology to ensure high rates of return from improved land and growth of agricultural productivity (World Bank 2009).

Issues related to the lack of integration between crop production and cattle breeding in the irrigated area: Farm restructuring in the irrigated area had led to a concentration of livestock farming in dehkan farms, which disrupted in the relationship between crop production and livestock production. As a result, the access of the crop cultivation farms to organic fertilizers decreased. Fields of alfalfa, an important crop in a rotation, were replaced with wheat, which has impaired the feeding base for livestock farms.

These and other policy issues exist today, but they are being gradually addressed at the government level. Food policies are being evaluated and adjusted with due regard to population growth, pressure on natural resources, and burdens on agricultural producers.

Stakeholder Groups

In Uzbekistan, the range of land use stakeholders is vast and includes ministries, agencies, institutes, decision makers, farmers, dehkan farms, and households. Each of these stakeholders undertakes different activities and plays a different role in decision making about the promotion and upscaling of climate-smart best practices at different levels. Stakeholders can be grouped by level:

National-level stakeholders include government organizations, ministries and agencies, and research and development institutions as well as nongovernment and nonprofit organizations. The two ministries responsible for agricultural policies and decision making in agricultural production and food security are the Ministry of Agriculture and the Ministry of Water Management of the Republic of Uzbekistan. The Ministry of Innovation Development is responsible for developing research and innovation activity; to do this, it needs financial resources. Responsibilities for environmental management, monitoring, and sector-specific responsibilities related to natural resources rest with several ministries and institutional entities, including the State Committee on Ecology and Environmental Protection; the Ministry of Health; the State Committee of the Republic of Uzbekistan on Land Resources, Geodesy, Cartography and

State Cadastre; the Centre of Hydrometeorological Service/Uzhydromet, and so on.

Subnational (regional/district)-level stakeholders are, primarily, (1) regional and district *khokimiyats* (local authorities) responsible for implementing government decisions and monitoring their implementation at the local level; (2) regional offices of the Ministries of Agriculture and Water Management, including services in charge of monitoring of salinity, water-logging, and irrigated land conditions, control of water consumption, and drainage quantities and quality; (3) basin irrigation systems administrations and irrigation system administrations (ISAs); and (4) research institutes, nongovernmental organizations, and so on.

The focus of the responsibilities of national and subnational organizations and agencies resides with the implementation of rural development and water management strategies as well as the operation of agricultural and water management facilities and sites.

The local level includes the following stakeholder groups: (1) agricultural producers and their associations; (2) councils of farmers and self-governance bodies; and (3) rural communities whose income depends on agricultural production.

Formally, local-level beneficiaries do not belong to public-sector entities and carry out their own businesses in agricultural production or providing inputs for crop growers.

To clarify the position of various stakeholders based on their interests, the amount of power they have, and their attitude toward institutional objectives and implementation methods, the information on stakeholders has been systematized (Table 2).

Table 2. Key Stakeholders and Their Interest in Land Use Adaptation to Climate Change

Number	Stakeholder	Interest
	PRIMARY STAKEHOLDERS	
1	Dehkan farms	Improvement of land yield and improvement of livelihood
2	Farmers	Sustainable harvests and income
3	Women and vulnerable groups	Sustainable family budgets and access to food
4	Local government bodies	Sustainable production and income
5	Water user associations	Meeting demand for water and improvement of irrigation services
6	The owners of small land plots (dachas) and their associations (Tovarischestvo)	Growing organic fruits and vegetables for own consumption
	SECONDARY STAKEHOLDERS	
7	Ministry of Agriculture Ministry of Water Management	Implementing policy on efficient water and land resources use; integration of adaption approaches in development strategies and plans
8	Ministry of Finance	Implementing financing strategy, mobilization of external and internal resources
9	Uzhydromet	Fulfilling the obligations assumed under the UNCCD and the UNFCCC
10	State Committee on Ecology and Environmental Protection	Ensuring the best use of available resources, monitoring and preservation of the environment
11	State Committee of the Republic of Uzbekistan on Land Resources, Geodesy, Cartography and State Cadaster (Goskomzemgeodezkadastr)	Achieving the objectives under the program for improving soil fertility
12	Ministry of Health	Minimizing the negative impact of climate events and extreme meteorological conditions on population health
13	Ministry of Higher and Vocational Education	Improving training programs, among others
14	Sector-specific and operations services under ministries (basin irrigation systems administrations; irrigation systems administrations)	Ensuring better water allocation and use of water resources
15	Academy of sciences, research institutes, design institutions, and research and production companies	Ensuring access to best practice, services in training programs

(table 2 continued)

Number	Stakeholder	Interest
16	Nonstate nonprofit organizations, mass media, and other institutions of civic society	Improving eco-education, promotion of eco-friendly approaches, and public awareness campaigns
17	Agricultural advisory centers, extension services, and so on	Disseminating knowledge, training land users, and bridging the gap between science and production

Note: UNCCD = United Nations Convention to Combat Desertification; UNFCCC = United Nations Framework Convention on Climate Change.

The comparative position of various stakeholders depending on the degree of their influence and importance in implementation of adaptation activities is reflected in the **Importance/Influence Matrix (Box 2)**. *Importance* in this context refers to the activities of a specific group of stakeholders that ensure the implementation of adaptation measures in agriculture and the land use system; *influence* means the existence of authority to make decisions, provide funding, and monitor the implementation of measures.

Group A includes stakeholders with high importance for activities but low influence. These are, mostly, primary stakeholders that require special initiatives and support. Their involvement and participation are important factors for success in adaptation to climatic change.

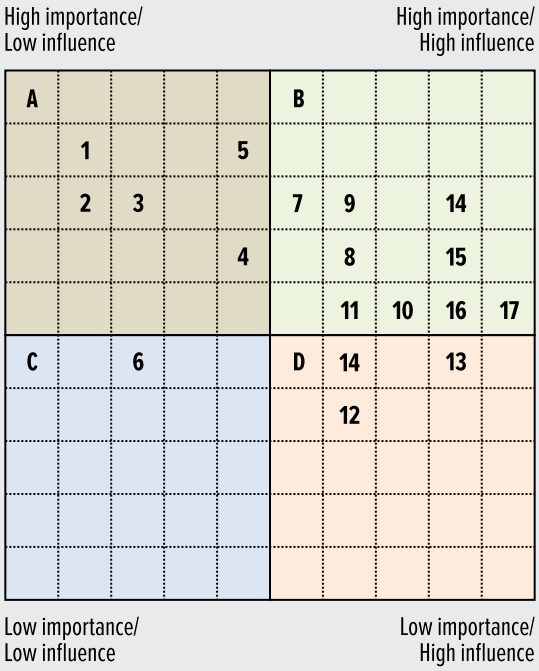
Group B is a group of stakeholders with high importance (responsible institutions such as sector ministries, state commissions, and science and civic society organizations) that may have a substantial impact on success.

Group C (low importance and low influence) in our case is represented by small landowners.

Group D (low importance and high influence) is represented by stakeholders that can influence decision-making and policy implementation, but their interests are not related directly to this activity.

The numbers in the matrix follow the numbers assigned to each stakeholder in Table 2.

Box 2. Importance/Influence Matrix



Policy Options

In order to achieve sustainable production of food, the Nukus District should develop climate-smart agriculture based on the sustainable intensification of crop cultivation. This includes cultivating drought-resistant and salt-tolerant varieties and types of crops and their rotation; implementing soil protection and resource-saving principles of agriculture; and utilizing mechanization techniques to maintain soil health and ensure the efficient management of water resources. It also includes a wider application of innovative approaches, practices, and coordination mechanisms and the involvement of stakeholders, among other actions.

1. **Climate-Smart Land Use Management of Irrigated Salt- and Drought-Affected Lands**

The term *climate-smart land use management* refers to a complex set of interventions, technologies, and approaches designed to mitigate the adverse consequences of climate change on farming, increase the productivity of land resources, and safeguard food security under climate change and variability. The following set of activities is proposed for the Nukus District.

Laser-guided field leveling: In irrigated crop farming, soil and field preparation for the vegetation season is no less important than drainage operations. Laser-guided field leveling is one of the key approaches in the system of measures intended to improve agricultural productivity and ensure water efficiency. The main drawbacks of traditional leveling methods consist of poor precision and uneven the surface of the field. Laser-guided field leveling enables farmers to get rid of these drawbacks and is a recommended up-to-date innovative technique for enhancing irrigated land capacity.

According the Khorezm Rural Advisory Support Service (KRASS), laser-guided field leveling enables farmers to: (1) reduce labor costs by 11–23 percent, (2) reduce the costs of mechanization by 11–14 percent (starting in the second year), (3) reduce the amount of water needed for irrigation by 20–30 percent, and (4) increase cotton and wheat yields by 10 percent (Egamberdiev, Rudenko, and Nurmetov 2012). Laser-guided field leveling capacity is 1–3 hectares per day per leveler. Regarding the frequency of leveling, it is advisable to do it once every five to eight years on dry soil to avoid compacting the soil. The most convenient time is July-August after harvesting winter wheat.

The cost of laser-guided field leveling is about US$350 per hectare. But initial costs are offset by its benefits (Egamberdiev, Rudenko, and Nurmetov 2012).

Deep ripping: To improve soil properties, the soil needs to be periodically ripped up to a depth of 60 centimeters to destroy its compacted layer—the so-called *plough pan*. The effect of deep ripping is manifested in yield increases of 10–30 percent and reduced water consumption of 10 percent. The best time for both deep ripping and laser-land leveling is in summer after the winter wheat harvest. Deep loosening costs pay off as soon as the second year.

Improvement of current crop rotation by combining cotton and winter wheat: In the Nukus District, the farming land fertility score a low 43 (a score of 100 is best), which guarantees wheat yields of about 1.7–1.8 tons per hectare. Low humus content (0.6–0.7 percent) and loss of soil life (soil macro- and micro-fauna) are attributed to low application rates of organic fertilizers and the removal of plant residue from fields. To address the dropping fertility, it is recommended to repeatedly insert legumes and green manures into existing crop rotations and also to use all plant residue left on the fields after harvesting.

Cultivation of double crops and green manures allows a field to be covered with vegetation all year, which reduces nonproductive evaporation from the soil surface and halts re-salinization processes; legume bacteria living in the roots of legume plants absorb free nitrogen from the air to store it in the soil. Plant residues are ploughed back into the soil, where they replenish the stock of organic matter and improve soil structure (Figure 7a, 7b).

Using this technology, land users can harvest two food crops (wheat and legumes) during a single year and earn additional income as well as improve their diet and food security. This technology does not require large additional financial or labor inputs, and the generated income from the double crop harvest not only covers all the costs, but also brings profits (World Bank 2009).

Irrigation best practices: Double crops require additional water resources for irrigation. Lessons learned from projects (World Bank 2009) show that, in Karakalpakstan, with its shallow groundwater table, only one watering of 500–800 cubic meters per hectare is needed for a second crop. Water-efficient irrigation techniques allow irrigation water to be saved with alternating dry and watered furrows and/or using transportable trays.

Minimization of soil treatments: Sowing winter wheat among the growing cotton plants without primary tillage is already used by many farmers

Figures 7a, 7b: Legume Bacteria and Soil Structure after Improved Crop Rotation

Source: World Bank 2009.
Note: Demonstration site in the Beruni district of Karakalpakstan.

because minimized tillage enables the farmer to reduce the number of tractor runs, thus saving fuel and lubricants and depreciating resources; to reduce CO_2 emissions; and to reduce the risk of soil compactness. It also—which is no less important—makes it possible to sow wheat on optimal dates independent of cotton harvesting. This is a promising practice because minor improvements would make it more effective. The Uzbekistan Research Institute of Agriculture Mechanization and Electrification has designed and successfully tested a special-purpose sowing machine to sow wheat among growing cotton.

Balanced plant nutrition (fertilizer system): Mineral fertilization to ensure balanced plant nutrition enables a noticeably broadened scope of moisture uptake by crops when moisture is insufficient (Baliuk, Medvedev, and Nosko 2018). An important role is played by organic fertilizers. The systematic application of manure is good for soil: manure improves its water-physical properties and structure; it also increases the number of beneficial soil microorganisms. In many countries, organic waste composting has become a processing industry using organic wastes to produce fertilizers. Applying composted organic matter demonstrates significant potential for carbon sequestration. For this reason, the farmer should know the agricultural soil properties of his field. Before beginning field operations, it is necessary to test for key soil properties (soil texture, humus and nutrient content, salinity degree, density, water-retaining capacity). The results of such tests will provide a basis for calculating fertilizer application rates that ensure the achievement of yield targets as well as rates and needs for other operations (irrigation schedules, deep ripping needs, and so on).

Forest shelterbelts for irrigated arable lands: In the arid zone, irrigated arable land is a human-made ecosystem; therefore, it cannot regulate itself. One of environmentally grounded management decisions is the establishment of a network of forest shelterbelts to protect fields. Apart from their main purposes (to mitigate dry wind impact and to cool down the air and soil), forest shelterbelts also support the emergence of new ecosystem, improve the human habitat, and diversify the monotonous picture of agricultural lands, creating new agroforest landscapes and improving environmental conditions.

Afforestation of degraded arable lands: In the Nukus District, about 2,500 hectares of long-fallow lands have been withdrawn from agricultural use. These lands have low and unstable yields. A thorough selection of species is important to provide such environmental services as reducing water-logging through transpiration (bio-drainage) and soil salinity control; some species enrich the soil with nitrogen owing to their nitrogen-fixing capacity, and leaf litter enriches it with humus. It was recommended to use

the following three species for the afforestation of Karakalpakstan's salinized degraded lands: Russian olive (*Elaeagnus angustifolia*), which is a nitrogen-fixing species; Euphrates poplar (*Populus euphratica*), which is a fast-growing species; and Siberian elm (*Ulmus pumila*), which is a long-lived species (Khamzina, Lamers, and Vlek 2012). Afforestation provides opportunities to join efforts to combat land degradation and to reduce CO_2 concentration in the atmosphere.

Biological methods of plant pest management: These methods are widely used in Karakalpakstan and in Uzbekistan as a whole. In the Nukus District, there are functioning bio-factories and bio-laboratories for *Chrysoperia* spp., *Habrobracon hebetor*, *and Trichogramma* propagation. Under contracts with farmers, specialists from district laboratories examine the farmers' fields and take plant pest management measures. Biological pest control operations are cheaper than chemical treatments; in addition, unlike chemical treatments, they do not pollute the environment.

2. Institutional Activities for Expanding Climate-Smart Management of Irrigated Lands

Analysis and evaluation of Uzbekistan's state adaptation policy and its institutional framework demonstrate that the country has a favorable environment for developing climate-smart land use in agriculture. The country has put in place a solid institutional framework capable of providing comprehensive technical and scientific support to primary land users in their activities aimed at adopting climate-smart practices.

Since scaling up climate-smart practices is a long-term and evolving process, responsible institutions should constantly interact with partners and organizations at various levels, including national funding agencies and programs, local and national governments, the private sector, civil society, community organizations, and the research community. Each of these groups plays different roles in the scaling up of sustainable land management.

The government—along with educational and scientific institutions and the country's public organizations—pays special attention to increasing knowledge, raising public awareness, and improving access to advanced technologies for sustainable water and land management.

The state provides information to land users in the form of recommendations through state institutions, and by organizing campaigns and individual events. With the joint participation and financing of international projects, the khokimiyats—with the support of the Ministry of Agriculture and the Ministry of Agriculture and Water Resources—initiate an increase in the knowledge and awareness of farmers through events such as fairs and "farmer days."

In accordance with the Decrees of the Cabinet of Ministers of the Republic of Uzbekistan, various forms of rural advisory services have been created; these include counseling centers and distribution services at higher educational institutions, departments, and organizations. A significant contribution to raising awareness and scaling up climate-smart practices for a wide range of beneficiaries is made by national and regional programs and projects implemented in the country.

KRASS is currently operational in the Aral Sea region; the joint AF/UNDP/Uzhydromet project on "Developing climate resilience of farming communities in the drought prone parts of Uzbekistan" is under way (AF/UNDP/Uzhydromet 2019). Land users of the Nukus District can find detailed information on modern resource-saving technologies, including laser-guided field leveling, in the Project Information and Advisory Center in Nukus.

3. Climate-Smart Land Use Activities

The discussion of the proposed set of activities aimed at developing climate-smart land use in the Nukus District of Karakalpakstan with the stakeholders identified this as a priority. Climate-smart land use is consistent with the area of state agricultural policy aimed at a technical upgrade of agriculture, implementation of innovation tillage technologies, wider application of modern irrigation methods, and so on (Government of Uzbekistan 2017a, 2017b, 2017c, 2019a). The recommended climate-smart practices were successfully demonstrated in various agroclimatic regions of Uzbekistan, including northern Karakalpakstan, with a positive response from the farmers.

The proposed climate-smart practices are low risk. Project experience has shown that financial contributions for initial implementation and maintenance pay off the next year. Laser land leveling is the most expensive of the practices. However, in a typical farm cultivating wheat or cotton, the costs are already paid back by the third year. The cost of laser equipment pays off within 1 to 3 years, depending on the source of borrowed funds and the farm field area (WOCAT SLM Database, Laser leveling of the fields to increase the efficiency of on-farm use of irrigation water [Uzbekistan]; Egamberdiev, Rudenko, and Nurmetov 2012).

As stakeholders confirmed, a solid knowledge base and successful pilot projects are needed to implement climate-smart practices. These practices are not yet widely used by farmers in Uzbekistan. The following key obstacles for upscaling climate-smart practices are identified:

- ✓ Low awareness, lack of experience, and lack of knowledge
- ✓ Shortage of required equipment and agricultural machinery
- ✓ Shortage of water resources
- ✓ High initial investment costs of technology introduction (in the case of laser-guided field leveling)
- ✓ Long wait for benefits (in the case of afforestation)

To overcome financial barriers, it is possible to recommend that farmers unite and make centralized purchase equipment through associations of farmers and local authorities (such as khokimiyats and the regional department of the Ministry of Agriculture). Furthermore, the country has leases available to obtain equipment needed to ameliorate lands and water-saving irrigation technologies as well as crediting that reduces economic barriers.

Mass training of farmers within the framework of the Global Environmental Fund's Small Grants Program (GEF SGP) and the UNDP/AF/Uzhydromet project currently being implemented in the northern regions of Karakalpakstan makes a significant contribution to increasing farming potential, reducing one of the main obstacles to mainstreaming laser land leveling on a large scale (AF/UNDP/Uzhydromet 2019).

The overview of state adaptation policy, consultations, and discussions with local stakeholders allows us to be optimistic that the implementation of the set of climate-smart practices is a practicable effort that will realistically help improve the resilience of irrigated agriculture in the face of climate change in the Nukus District of Karakalpakstan.

Assignment

Uzbekistan's approved Concept of Efficient Use of Land and Water Resources in Agriculture until 2030 is aimed at taking integrated measures to address many issues related to the low production capacity of soils and the need for adaptation to adverse environmental conditions and adverse impact of climate change. According to the Concept, one of the strategies for improving cropland productivity is the resumption of using the croplands that were withdrawn from agriculture because of their high soil salinization, the deterioration of their drainage and irrigation systems, the lack of water for soil leaching, and so on.

Assignment: Develop a roadmap and activities to restore the fertility of the Nukus District's arable lands that currently have the status of long-fallow lands because of the loss of productivity for various environmental and economic reasons.

Policy Recommendations

The issue of the adaptation of agriculture to climate change in Uzbekistan is being integrated into government plans and development programs in a way that supports the climate-smart agriculture. It is important to ensure cooperation and the concerted action of various administrative levels as well as comprehensive involvement of all stakeholders (including decision makers, the business community, academia, civil society, and

the rural community as a whole) in the process of adaptation.

In order to improve the knowledge and skills of land users and the agricultural community, it is necessary to:

- ✓ Strengthen and reinforce the operation of existing local information and advisory centers as a link between science, education, and practice.
- ✓ Reinforce knowledge sharing not only among land users but also among decision makers.
- ✓ Increase the efficiency of agricultural budget expenditures with a focus on the implementation of programs aimed at capacity building; testing and adapting new climate-smart technologies; improving soil fertility, disseminating knowledge; building capacity of human potential; and attracting private investment in agriculture, logistics, protection environment, and so on).

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Abbreviations

ADB	Asian Development Bank
AF	Adaptation Fund
CNH	Case New Holland
FAO	Food and Agriculture Organization of the United Nations
GACSA	Global Alliance for Climate-Smart Agriculture
GEF	Global Environmental Fund
ISAs	irrigation system administrations
KRASS	Khorezm Rural Advisory Support Service
SGP	Small Grant Programs
SLM	Sustainable land management
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change

Appendix

Suggested Teaching Methodology Based on the Cornell Case Study Approach

The case studies presented in this publication were developed for use in graduate and undergraduate teaching using a participatory social entrepreneurship teaching methodology developed by Professor Per Pinstrup-Andersen, Cornell University. Initially used for teaching at Cornell University, this type of case studies was subsequently adopted by other universities in the United States, Africa, and Asia. The overall objective of the methodology is to strengthen the analytical capacity of the students within the context of a simulated food policy context. Evaluations by students during the 15 years the methodology has been used have been consistently positive and enthusiastic. To be successful, the methodology requires preparations by both students and instructors prior to each class. The case(s) to be discussed should be made available to the students at least a week prior to the class and it is critically important that all students have read the case study prior to coming to class and be prepared to discuss the pros and cons of various policy options from the point of view of each stakeholder group identified in the case study.

The class should be run as a simulated role-playing meeting of stakeholder group representatives interested in the particular food policy issue to be discussed. One or two students, who should simulate the role as external consultant(s), should give a 10 to 15 minute overview presentation of the case, with emphasis on the policy options identified in the case study and a policy recommendation. Each of the remaining students should be assigned the role of a stakeholder group representative. The assignment may be made a week ahead of the class session or at the beginning of the class session. Then a debate moderated by the instructor follows, in which each stakeholder representative expresses his/her position about the various policy options and the consultants' recommendation.

The moderator should guide the debate by following up on the points made and seek the response of other stakeholder groups. The moderator should call on specific representatives as needed to maintain an exciting, cohesive, and fast-moving debate. Attempts should be made to arrive at a consensus around the consultants' recommendation on one or more policy options. In cases when no consensus can be obtained (likely to be the majority of cases), a brief discussion should be held on the relative power of each stakeholder group and which one is likely to make the final decision about the policy option to be pursued. The length of the debate section of the class depends on the length of the class session. In a 50 minute class session, the debate portion should be limited to 25 minutes, leaving the last 10 to 15 minutes of each class session for the instructor to pull the findings of the debate together and relate them to the broader food policy issue within which the case study belongs. Such a "mini-lecture"—in which the students' experience from the debate and the written version of the case study is placed in a broader food policy context—is critically important.

In order to ensure that all students participate actively, it is recommended that the class size be limited to 20–25 students. Although the methodology was developed for real-time classroom instruction, it could also be used in online distance learning, particularly if real-time video-based interaction among the students could be included. While the above-mentioned mini-lectures would help ensure a cohesive food policy course, experience at Cornell University indicates that the integration of a few lectures based on a textbook would further strengthen the cohesiveness of the course. The textbook used at Cornell is *Food Policy for Developing Countries* by Per Pinstrup-Andersen and Derrill Watson, Cornell University Press, 2012.

ECFS Eurasian Center for Food Security