



Food and Agriculture  
Organization of the  
United Nations

Comprehensive analysis of the  
**disaster risk reduction system**  
for the agricultural sector in Tajikistan



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Required citation:

FAO. 2022. *Comprehensive analysis of the disaster risk reduction system for the agricultural sector in Tajikistan*. Budapest.  
<https://doi.org/10.4060/cb8435en>

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ISBN 978-92-5-135691-3

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# Acknowledgements

Under the technical guidance of Daniela Mangione, Resilience Focal Point, and Cheng Fang, Economist, at the Regional Office for Europe and Central Asia (REU) of the Food and Agriculture Organization of the United Nations (FAO), this document was developed and written by Anvar Homidov, with the support of Anastasia Kvasha, Kaisu-Leena Rajala and Tamara van 't Wout. The report was reviewed by Makhmud Shaumarov from the CACILM-2 project, and Daler Domullodzhanov, Ibrohim Ahmadov, Azizbek Sattarov and Firuz Saidov from the FAO Tajikistan office. Valuable review, comments and contributions were received from the following colleagues from the FAO headquarters and regional office: Eran Raizman, Marion Chiris, Keigo Obara, Morten Hartvigsen, Bradley Paterson, Viktorya Ayyazyan, Jorge Alvar-Beltran, Olga Buto, Ana Heurreux, Muratbek Koshoev, Shiroma Sathyapala, Fazil Dusunceli, and Peter Pechacek.

Financial support was provided by the Global Environment Facility-financed Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Landscapes in Central Asia and Turkey (CACILM-2) project.

# Abbreviations and acronyms

ADB	Asian Development Bank
AgroInform.Tj	Agricultural information marketing system in Tajikistan
CIS	Commonwealth of Independent States
CoES	Committee of Emergency Situations and Civil Defence under the Government of the Republic of Tajikistan
DRR	Disaster risk reduction
DRS	Districts of Republican Subordination
ECA	Europe and Central Asia
EWS	Early warning systems
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot-and-mouth disease
GBAO	Gorno-Badakhshan Autonomous Region
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GIS	Geographical information systems
IFRC	International Federation of Red Cross and Red Crescent Societies
JICA	Japan International Cooperation Agency
MoA	Ministry of Agriculture
MoH	Ministry of Health and Social Protection of Population of the Republic of Tajikistan
OSCE	Organization for Security and Co-operation in Europe
REACT	Rapid Emergency Assessment and Coordination Team
SCADA	Supervisory control and data acquisition
TajStat	Agency for Statistics under the President of the Republic of Tajikistan
TJS	Tajikistan somoni (currency)
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WFP	World Food Programme
WUAs	Water User Associations

# Executive summary

**Natural hazards.** Tajikistan is a landlocked mountainous country, prone to various natural and biological hazards, including mud flows, flooding, hail, heavy rain, landslides and earthquakes, animal and plant transboundary pests and diseases. Crops, livestock, forestry, and fisheries are adversely impacted by these hazards, causing substantial damage and losses to the agricultural sector. It is expected that due to climate change, the intensity and frequency of natural hazards will increase in the country (WFP, 2017). Rising temperatures, variability in precipitation, as well as the anticipated increase in the outbreak and spread of plant and animal pests and diseases, will adversely affect the agricultural sector due to its climate sensitivity. In particular, it can lead to the increase in the size of locust-affected areas, one of the most severe agricultural threats in Tajikistan. Due to country's low economic and social development, weak institutional capacities and inability to adapt quickly to changes, Tajikistan is one of the most vulnerable countries to climate change in the Europe and Central Asia (ECA) region.

**Agriculture and food security.** The agricultural sector accounts for around 20 percent of the country's gross domestic product (GDP). Almost three-quarters of the total population resides in rural areas, most of whom are employed in the agricultural sector. In 2017, about 61 percent of the country's total working population was employed in agriculture. The largest share of agricultural land (76.8 percent) is pastures, most of which is natural and used for animal husbandry. Most agricultural products are produced in private subsidiary farms and *dehkan* farms.<sup>1</sup> In 2017, these two types of farms together were responsible for more than 95 percent of the total volume of agricultural production. Private subsidiary farms dominate the livestock sector (accounting for 94 percent of it in 2016, in terms of volume). In terms of crop production, the share of the two types of farms are quite similar (40 percent to 50 percent each) (TajStat, 2018b). Agricultural products from these farms are consumed almost entirely within Tajikistan. The country's agricultural sector could be significantly affected by climate change, because the arid nature of the climate contributes to land degradation and the development of desertification processes. The sector is facing various challenges and constraints related to erosion, deforestation, waterlogging and salinisation as well as the inefficient use of water resources, shortage of irrigated land, lack or limited access to technical equipment and infrastructure, and the deterioration of existing irrigation facilities.

Tajikistan is a food-deficit country that imports a large portion of its food, and is also highly dependent on imports for its fuel and consumer goods. For instance, it is estimated that the country imports half of the wheat consumed by the population (FAO, 2020c). Tajikistan's dependence on food imports will likely continue due to the limited availability of arable land. Despite significant improvements over recent decades, the poverty level remains high. This is particularly true among the rural population where issues related to food insecurity and nutrition are evident, as the majority of those residing in the rural areas are largely dependent on the agricultural sector. Along with internal challenges, the country is exposed to external shocks and stresses, primarily due to the strong dependence on remittances from migrant workers. A limited access to high-quality food, as a result of the adverse impacts of natural hazards on agriculture, contributes to food and nutrition insecurity. At present, the nutritional indicators in Tajikistan are the worst of countries in Central Asia.

**Regulatory framework.** Tajikistan is signatory to a number of international conventions, including the United Nations Framework Convention on Climate Change (UNFCCC), Sendai Framework, Agenda for Sustainable Development, and the Paris Agreement. The country has a number of regulations in the field of disaster risk reduction (DRR) and management. The main law that defines the existing system is the Law on protection of the population and territories from the natural and technological emergencies (No. 53, of 15 July 2004). At the same time, most of the regulations do not directly address the agricultural sector. Similarly, the mainstreaming of DRR in laws related to agriculture and food security is quite limited. Tajikistan has a rather recent National Strategy on Disaster Risk Reduction for 2019–2030 and is currently in the process of making the shift from

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<sup>1</sup>A *dehkan* farm is an independent economic entity with the right of a legal entity engaged in the production, processing and sale of agricultural products based on the use of property and land plots in its possession.

emergency response towards a proactive risk reduction approach. Measures to reduce the adverse impacts of natural hazards and climate change on the population, and key sectors of the economy, are also important elements of Tajikistan's National Development Strategy until 2030. In 2019, the government also adopted a National Strategy for Adaptation to Climate Change for the period until 2030, which stresses that extreme weather events are expected to increase in frequency and severity, that changes in temperature and precipitation due to climate change may lead to reductions in crop productivity and yields, and may have negative effects on food security, nutrition, and ecosystems. However, current agricultural policies do not promote risk reduction, address the existing weak water management systems, and insufficient protection of property rights and land rights, which as a result, do not encourage farmers to cultivate land properly.

**Institutional framework.** The State Commission of Emergency Situations is the governmental body responsible for the formulation and implementation of state policy in the field of protection from and response to natural and man-made emergencies. Apart from the national level commission, similar emergency commissions are established in ministries, agencies, local executive bodies, in settlements and villages, and organizations. The state commission coordinates the Unified State System for the Prevention and Elimination of Emergency Situations, and manages the National Platform for Disaster Risk Reduction. The platform serves as a consultative and advisory body for coordination of governmental agencies and international organizations involved in DRR in Tajikistan. The platform includes representatives from government authorities, ministries and agencies, local and international non-governmental organizations, the private sector, and civil society. The State Committee of Emergency Situations and Civil Defence under the Government of Tajikistan (CoES) is the central executive body responsible for implementation of the state policy in the area of emergency management and civil defence. The Main Department for Protection of Population and Territories of the CoES acts as Secretariat of the National Platform for DRR. In 2001, with support from the CoES and the United Nations Development Programme (UNDP) Natural Disaster Risk Management Programme, a Rapid Emergency Assessment and Coordination Team (REACT) was created, aiming at enhancing coordination in emergency response.

The Ministry of Agriculture (MoA) cooperates with other ministries and agencies and participates in meetings of the Unified State System. It is part of the State Commission of Emergency Situations, and the National Platform for DRR. The Committee for Food Security under the Government of Tajikistan is a central executive body in the field of veterinary medicine, phytosanitary and plant quarantine, plant protection, seed production and breeding. The Agency for Hydrometeorology is the main government agency responsible for monitoring, collecting, processing, analysing, forecasting and preventing hydrometeorological disasters in the country through the dissemination of weather forecasts and warnings.

**Early warning systems (EWS).** The Agency for Hydrometeorology is responsible for monitoring of various meteorological phenomena and preparation of forecasts, which are sent to all government bodies. It provides predictive information to the CoES on the possible occurrence of natural hazards. The CoES then disseminates this information among its structures at the regional, district and local levels. Farmers receive alerts through MoA and its regional and district bodies, as well as through agricultural associations. Local authorities have significant responsibility in disaster preparedness, for example in terms of flood risk management, by strengthening river banks and canals. While decentralization is an important step in linking local measures to risk management, local governments generally do not have the financial resources to manage and mitigate risks. In recent years, Tajikistan has made some progress in developing communications and EWS with the help of international organizations and donors. However, for the agricultural sector and farm management, an EWS currently does not exist.

To inform the public about the approaching threats, the CoES uses all means of wire, radio and television communication, as well as satellite and mobile communication. The National Crisis Management Centre of the CoES has Emergency Response, Communications, and Information Analytical departments. The centre analyses all information coming from all regions, cities and districts. To support more efficient exchange of information between emergency services, better coordination of activities and timely response, the government introduced a single short emergency number – 112. While the country's Agency on Statistics collects and publishes some information of food prices and markets, access to it remains problematic. Since 2011, the Agricultural Information Marketing System in Tajikistan (AgroInform.Tj) has been active in the country. This platform provides various information and services to agricultural-sector partners via the internet, both for free and for a fee.

**Agrometeorology services.** The monitoring network of the Agency for Hydrometeorology consists of 57 hydrometeorological stations. Agrometeorological observations are carried out at 20 stations in parallel with meteorological observations. However, this network is not adequate for agrometeorological monitoring throughout the country. One of the main tasks of the agency is to provide agricultural producers and other agrarian entities with analytical information about the prevailing and expected weather conditions, the possible impact on agricultural production facilities, and the expected productivity of crops. The agrometeorological bulletins and advisory forecasts include very useful information; however, they do not include any information or data on natural hazards. In addition, it seems apparent that the main users of the existing bulletins are government officials and not farmers. Farmers usually receive weather-related information from television or radio channels, but may not always be able to receive this information in a timely manner. Within this context, sending SMS alerts and messages to farmers may be helpful so that they can take action based on weather forecasts.

**Disaster risk reduction in agriculture.** The CoES plays a leading role in disaster preparedness and response within the Unified State System for the Prevention and Elimination of Emergency Situations. It supports emergency commissions which provide coordination at the national, provincial, city, and district levels, and at the level of *jamoats* and organizations.<sup>2</sup> The Unified State System also includes representatives of MoA. However, at the moment there is no separate comprehensive preparedness plan for the agricultural sector. In its national development priorities, the Government of Tajikistan recognises the overall need to reduce vulnerability of the country, as well as the agricultural sector, to climate change, climate-related and other natural hazards. Nevertheless, progress in integrating DRR into the agricultural sector is limited. Even though Tajikistan has the institutional structures, as well as legal and policy frameworks in place, only a few institutions from agriculture, food security and nutrition are involved in it, through specific sectoral DRR policies and goals. Some of the reasons for that include: limited resources to adequately adapt to climate change and respond to emergencies; a lack of an overall coordination system in DRR in agriculture between producers and local authorities; a lack of information on the mechanism for determining direct and indirect damage to agricultural producers.

Overall, Tajikistan has a rather well-defined preparedness system of plans and regular exercises and emergency drills. Post-disaster needs assessment activities are carried out by the emergency commissions within the framework of the Unified State System. In case of a disaster, commissions on disaster damage assessment are organized, which include appointed representatives from each ministry participating in the Unified State System. These commissions are responsible for conducting damage and loss assessments; however, there is no officially approved and precisely described methodology. While the Agency on Statistics regularly collects statistics on both crops and livestock production, it does not conduct agricultural surveys on disaster impact. The agency's source of data on damage and losses from disasters are reports on emergency situations submitted by the CoES. Agricultural insurance is currently only theoretically an effective mechanism for the protection of agricultural entities. This is due to the fact that the recognition of voluntary agricultural insurance is not supported.

**Programmes and projects related to DRR.** Over the past decade, a number of projects related to agriculture and DRR, EWS and agrometeorology services have been implemented in Tajikistan. These projects and programmes, supported by international organizations, aim at ensuring food and nutrition security, promoting climate-change adaptation activities and more sustainable use of available resources, improving locust management practices, and so on.

**Conclusions and recommendations.** Tajikistan has laws and decrees that define the regulations in the field of disaster management and a National Strategy on DRR for 2019–2030. However, the mainstreaming of agriculture or climate change in these documents is rather limited at present. The National Strategy on DRR covers issues in general, as disasters affect all sectors of the economy, but does not directly address agriculture specifically. A similar situation prevails with sectoral legislation, which quite rarely mentions DRR and the potential impact of climate change. The National Strategy for DRR, National Strategy for Adaptation to Climate Change, as well as the National Development Strategy, all mention food security as a priority. Tajikistan has an institutional system in place for DRR – the Unified State System for the Prevention and Elimination of Emergency Situations. The State Commission of Emergency Situations acts as the main coordination body of the Unified State System, while the CoES is the central executive body. Tajikistan also has a National Platform for DRR. Agriculture-relevant partners are included and involved in the existing DRR system, particularly MoA (through the State

<sup>2</sup>The concept of *jamoat* in Tajikistan implies local government in rural areas (similar to municipalities). Each *jamoat* includes several villages. The function of *jamoats* is to regulate land issues, taking into account the level of migration, solving social issues, and collecting land taxes.

Commission and National Platform), although its role is not prominent. The ministry's role includes general tasks and powers of the members of the State Commission, it does not have a special budget for preventive measures. No adequate sectoral-specific DRR strategies have been developed so far (including for the agricultural sector).

Tajikistan has an operational EWS in the country; however, at the moment, there is no EWS that focuses on the agricultural sector and farm management. The Agency for Hydrometeorology is responsible for preparing weather forecasts and warnings. Farmers receive alerts through MoA and its regional and district bodies, as well as through agricultural associations. Some gaps in the country's EWS are: weak coordination of decision makers; lack of clear responsibility and management structure; insufficient information on the list of relevant services available for farmers; lack of an adequate disaster database. The existing network of stations of the Agency for Hydrometeorology is not adequate for agrometeorological monitoring throughout the country. There is a need to produce real-time data from the automatic stations and they should be scaled up. Current agrometeorological forecasts do not cover the level of farmers and *dehkan* farms. Developed bulletins do not include any information on natural hazards and the practices that can be implemented to reduce their adverse impact on crops. In addition, the main users of the bulletins seem to be government agencies, rather than farmers. The main challenges and constraints for the agency include the lack of highly qualified specialists, low wages, and the lack of modern agrometeorological technical equipment. There are free mobile applications developed by AgroInform.Tj; however, at the moment only around 8 percent of all farmers in the country are using their services.

According to the National Disaster Risk Reduction Strategy for 2019–2030, no government agency is currently directly responsible for disaster risk assessment and risk reduction. At the same time, under the Sendai Framework for Disaster Risk Reduction, the Committee of Emergency Situations and Civil Defence prepares reviews of emergency situations in the country. Overall, Tajikistan has a rather well-defined preparedness system of plans and regular exercises and emergency drills. The lack of a preparedness plan and methodology for determining damage in agriculture is often mentioned as one of the main problems in the agricultural sector. The existing damage assessment process implemented by the authorities does not provide a full range of information and does not comply with the provisions of internationally accepted methodologies. This process also does not take full advantage of modern technologies. The current role of insurance in providing compensation for losses due to adverse weather conditions, is minimal. The law on insurance activities does not include provision on agricultural insurance in case of a disaster. Agricultural insurance is voluntary and is not very much accepted by the population, mostly due to the lack of trust in the effectiveness of the existing insurance system, and hence an unwillingness to use the services of insurance companies.

Thus, suggested recommendations covering various problematic aspects include:

#### **Recommendations for improvement of the regulatory framework**

- Amend the regulatory legal documents related to agriculture issues in terms of reducing the risk of natural disasters and climate change, including in the Law On state regulation of ensuring the fertility of agricultural lands; the Law On soil protection; and the Law On dehkan farms.
- Consider the possibility of the development of an agricultural code.
- Enhance the regulatory framework regarding the dissemination of information on disaster damage and losses.
- Develop a law on the insurance of agricultural production.
- Explore the experience of other Central Asian countries in the field of agricultural insurance.

#### **Recommendations for improvement of institutional framework and coordination mechanisms**

- Identify supervisory and executive bodies for the prevention, reduction and elimination of emergency situations.
- Strengthen the role of the National Platform for DRR.
- Improve the mechanisms for allocating funds to reduce risks and create monitoring procedures to enhance risk management in agriculture.
- Create a coordination group to be active in case of emergency situations, which would include representatives of key ministries and departments.
- Enhance the dialogue between government agencies, private sector, civil society and local communities to support their participation in the disaster risk management process.

## Recommendations for improvement of early warning systems

- Create an integrated EWS for preventing natural disaster risks using the latest technology.
- Develop a list of services for farmers and water user associations on weather and natural hazards related directly to agriculture, including plant and animal pests and diseases.
- Establish a national and local disaster information exchange database.
- Potentially develop a notification system that would send farmers SMS alerts and messages.
- Improve the existing market information systems.
- Design and provide training on the use of market information and market intelligence for producers, the agro-industrial sector, and traders.
- Develop action plans for adaptation to climate change in the agricultural sector at all levels, taking into account different agroecological conditions and natural-disaster risks.
- Organize training courses for *dehkan* farms with the purpose of determining the risks of natural disasters.
- Collect and disseminate information on traditional DRR and climate-change adaptation techniques.

## Recommendations for improvement of agrometeorology services

- Improve the mechanism for providing agrometeorological information at the level of the district administration, *dehkan* farms.
- Improve the system of agrometeorology services provision based on the use of modern information and communication technologies.
- Provide comprehensive year-round monitoring of weather and climate parameters and their impact on specific crop production and productivity.
- Support formal collaborations and agreements between relevant national institutions engaged in the development and communication of agrometeorological information to farmers.
- Determine the medium- and long-term effects of climate change and based on that develop an effective strategy for DRR, climate-change adaptation and sustainable diversification of the agricultural sector.
- Assess the adverse impacts of hydrometeorological phenomena on agricultural production.
- Improve the methodology for predicting the flowering of early-flowering fruit trees.
- Distribute agrometeorological information to all interested legal entities and individuals.
- Ensure that agrometeorological information has a sufficient lead time to alert farmers in a timely manner in order to allow them to take preventative action.
- Invest in communicating information through channels used by farmers, for example through Viber or other mobile applications.

## Recommendations for improvement of the disaster risk reduction system

- Conduct risk assessment and vulnerability analysis taking into account gender, age, disability factors, and develop a set of appropriate measures.
- Carry out measures to assess the risks and protect farm animals in case of natural disasters. When planning preparedness for emergency situations, it is necessary to create an emergency animal protection group at the community level.
- Modernize the existing natural hazards preparedness and response system at all levels, taking into account: introduction of new technologies for warning and protection against natural disasters; introduction of a natural disaster forecasting system, including in agriculture; development of a methodology for determining the damage from natural disasters in agriculture.
- Create an enabling environment for the introduction of new technologies to reduce the impact of climate change and manage the risks of natural disasters.
- Prepare an organized and coordinated action plan based on clear definition of the roles and resources of various organizations, information processes and a roadmap for specific partners in case of need, and develop disaster preparedness measures at local and regional levels with the participation of all relevant partners.
- Set up and implement a gender-sensitive system to provide information and support, as well as raise awareness and give training to the population at risk.
- Raise awareness and strengthen technical and institutional capacity of partners to implement DRR measures.

- Increase the capacity of authorised state bodies and civil society in adaptation to climate change and disaster risk management.
- Strengthen the warning system of natural disasters through the use of information and communication technologies, adaptation to climate change and other vital aspects, including coordination of all partners.
- Improve the existing procedures and mechanisms for assessment of disaster damage and losses.
- Develop and establish an information management system that allows to effectively collect, account for and analyse reliable information about the impact of natural hazards.
- Develop, demonstrate and implement innovative and systemic environmental solutions, including ecosystem-based approaches or nature-based solutions, to help reduce and manage the adverse impacts of natural hazards on agriculture.



# Introduction

Tajikistan is prone to natural hazards such as flooding, avalanches, landslides, extreme temperatures and drought, which are aggravated by climate change. Such events damage and destroy land, crops, infrastructure, reducing sources of income and affecting people's livelihoods, in particular those residing in rural areas. Total losses from natural disasters for the 1997–2018 period amounted to USD 589 million, or on average more than USD 25 million per year (Government of the Republic of Tajikistan, 2018). Damage and losses are expected to increase with rising temperature and precipitation levels due to the anticipated climatic changes (Heltberg, Reva and Zaidi, 2012). Reducing the adverse effects on the sector is highly important, also given that the majority of its population reside in the rural areas and rely on the agricultural sector for their food, income, and livelihoods. Based on preliminary data, in 2019 agriculture accounted for 19.8 percent of the country's GDP (TajStat, 2020a), while in 2017 the sector employed over 60 percent of the workforce of Tajikistan (TajStat, 2018a).

Agricultural DRR measures are needed to reduce, prevent and mitigate the significant impact of natural and biological hazards on the sector. Agricultural growth and productivity depend on food production systems that should be able to mitigate production disruptions due to external shocks and stresses, such as climate variability. This requires strong emphasis on the implementation of specific sectoral measures, the application of DRR technologies and methods, as well as more sustainable use and management of vital natural resources such as land, water, soil, and genetic resources. This is of high importance given that the country is prone to natural hazards such as drought, flooding and landslides, which have resulted in reduced agricultural productivity, increased losses, and worsened living conditions for farmers and their communities. At the same time, the country has limited resources to adequately adapt to climate change and respond to emergencies (WFP, 2019).

Tajikistan's agriculture can be significantly affected by climate change, where, among other things, the arid nature of the climate contributes to land degradation and the development of desertification processes. Prolonged dry periods, together with common high air temperatures in spring and summer, may increase the risk of desertification processes in the southern and central regions of the country. In future, the country's water sector will have to provide more water for the needs of the economy, especially for irrigated agriculture. Irrigation rates (service fee for delivery of the water) for main crops can increase by 20 percent to 30 percent, thus increasing the net cost of food production. This scenario would be catastrophic considering drought is becoming more common – leading to a growing demand for irrigation. Poverty will increase, while living standards and life expectancy will decrease (M. Ergashev, personal communication, 2019).

This Comprehensive analysis of the disaster risk reduction system for the agricultural sector in Tajikistan is part of a series of country baseline studies on the DRR system in the agricultural sector, conducted by the Regional Office for Europe and Central Asia (REU) of the Food and Agriculture Organization of the United Nations (FAO). Other countries included in the study series are Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Turkmenistan, Ukraine, and Uzbekistan. Similar reports analysing the DRR and management system for the agricultural sector in Western Balkan countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia) were completed in 2018.<sup>1</sup>

The country baseline studies review the current status of DRR, EWS, and agrometeorology services in the agricultural sector, including legislation, policies, capacities and services related to the DRR system. They also assess the gaps and what is needed to improve and strengthen these areas. The results of the country studies will be used as technical background reports for the development and implementation of capacity-development initiatives. This report was developed based on primary (interviews) as well as secondary (literature review) data sources. Information on gaps, challenges, constraints and opportunities was collected through semi-structured interviews with relevant national officials and experts, following the provided guidelines and the developed questionnaire. Questions were largely based on the questionnaire of the Capacity for Disaster Reduction

<sup>1</sup>The Western Balkan studies are available at: <https://www.fao.org/europe/resources/disaster-risk-reduction-and-management/en/#c589778>

Initiative (CADRI)<sup>2</sup> Capacity Assessment and Planning Tool for Disaster Risk Management for Food Security and Agriculture and for Climate Services. A number of experts from core organizations involved in this field were interviewed during the preparation of this report; the full list of names can be found in Annex I. The interviews took place in April 2019. As well as helping to assess the current capacities for the implementation of DRR, EWS, and agrometeorology services in agriculture, this research analyses what is needed for the agricultural sector to enhance resilience to climate variability and change.

This study was conducted under REU Regional Initiative 3, that focuses on 'Managing natural resources sustainably and preserving biodiversity in a changing climate'. Financial support was provided by the Global Environment Facility (GEF) through the Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Systems in Central Asia and Turkey (CACILM-2) project.

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<sup>2</sup>CADRI brings together six United Nations organizations – FAO, OCHA, UNDP, UNICEF, WFP and WHO. This UN-led interagency initiative delivers customised capacity development support in DRR.

# Country background

Tajikistan is a landlocked mountainous country located in the southeastern part of Central Asia. Its elevation varies from 320 metres to 7 495 metres, while more than half of the territory is situated above 3 000 metres. The country has a wide variety of soils, diverse habitats, flora and fauna (UNECE, 2017). Its climate is sharply continental, with hot summers and mild winters, and varies from semi-arid to polar in the Pamir mountains. In the valleys in the northern and southern part of the country, the annual precipitation is less than 200 mm, while in the foothills, it reaches 400 mm to 600 mm. Precipitation is not only unevenly distributed across the country, but also during the year. The largest amount of precipitation falls in winter and early spring. Due to the unique climatic conditions, a decrease in precipitation is observed as the terrain increases in altitude. In the eastern Pamir mountains, there are alpine deserts, where the annual precipitation is less than 100 mm. In general, the areas located below 2 500 metres are usually used for agriculture.

Figure 1 provides an overview of the country in terms of its geographical characteristics.

Figure 1. Map of Tajikistan

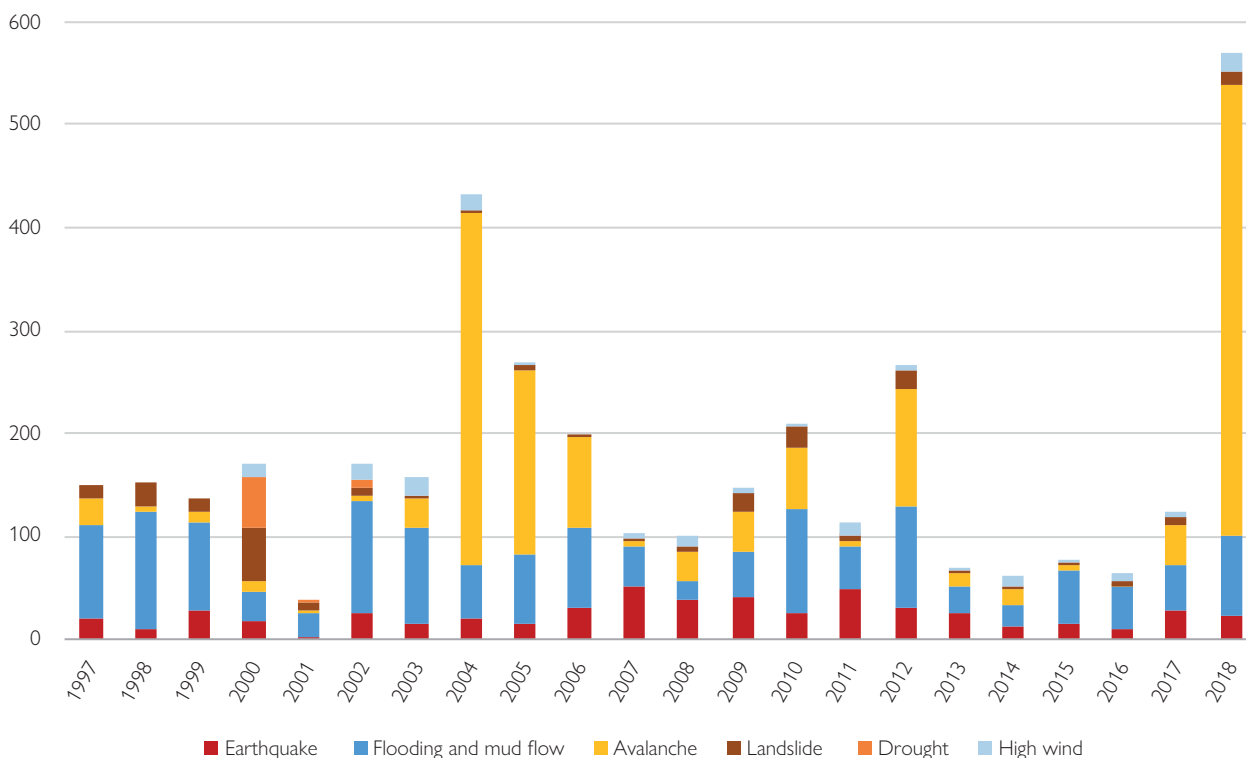


Source: UN GIS, 2020.

# Natural hazard profile

According to the Committee of Emergencies and Civil Defence (J. Kamolov, personal communication, 2019), a total of 4 194 emergencies caused by natural hazards occurred in Tajikistan from 1997 to 2018. During this period, the years with the most emergencies recorded were 2004 (434 cases in total), 2012 (308 cases), and 2018 (577 cases). On average, 233 climate-related hazards occurred annually. Hydrological disasters (avalanches and mud flows) are the most common (as shown in Figure 2), due to the fact that over 93 percent of the country is made up of mountains. It is estimated that during the 1997–2018 period, 1 462 natural hazards were associated with avalanches, and 1 345 with mud flows. However, statistics for the same period show that Tajikistan is also quite prone to earthquakes (523 cases), landslides (235 cases), and flooding, especially in the Pyanj river basin (114 cases). It is estimated that over 80 percent of natural hazards in Tajikistan are related to water, including flooding, drought, avalanches, mud flows, and landslides (J. Kamolov, personal communication, 2019). Figure 2 shows the number of main natural hazards that have occurred in Tajikistan during the 1997–2018 period.

Figure 2. Occurrence of main natural hazards in Tajikistan, 1997–2018



Source: J. Kamolov, personal communication, 2019.

Over the past two decades, Tajikistan has experienced a significant surge in disasters caused by natural hazards. The National Strategy on Disaster Risk Reduction for 2019–2030 (approved by the Decree of the Government of the Republic of Tajikistan dated 29 December 2018 No. 602) noted that according to official reports, the total damage resulting from natural disasters that occurred in 1997–2018 (as per the average annual exchange rate, but excluding inflation) exceeded USD 589 million. Mud flows accounted for the largest financial damage (in all economic sectors combined), with an average of about USD 15 million per year. The second most significant source of financial loss is drought (USD 5.4 million), mainly due to the drought that occurred in 2000–2001. In third place in terms of financial damage is earthquakes (USD 3.3 million) (Government of the Republic of Tajikistan, 2018).

Earthquakes pose one of the greatest threats to the country, since around 63.2 percent of the population resides in areas of high seismicity (Gupta, 2009). They can inflict the largest losses and endanger not only the urban and rural population, but also affect important infrastructure (such as hydroelectric power plants), and they can have a cascading effect, inducing other hazards such as landslides and fires (Takeuchi *et al.*, 2019). Severe earthquakes can be expected in Tajikistan every 80 to 120 years (AXCO, 2019). Some of the most recent and significant earthquakes include an earthquake in Kumsangir in 2006 that caused USD 1.16 million (0.05 percent of GDP) of economic losses; an earthquake in the Pamir mountains in 2010; an earthquake in Gorno-Badakhshan Autonomous Region (GBAO) in 2015, with estimated damage of around USD 5 million, or 0.06 percent of GDP (Takeuchi *et al.*, 2019).

Flooding and mud flows are among the most frequently occurring disasters, which impact not only mountainous and sparsely populated hilly areas, but also large cities. Floodings usually occur either in the spring after heavy rain, or during snow melt during the summer. However, it is expected that changes in precipitation patterns will lead to more frequent unseasonal flooding (Takeuchi *et al.*, 2019). The western part of the country is prone to mud flows (UNDP, 2011). Recent disasters caused by flooding include the floods and landslides of 2004 (damage estimated at least around USD 21 million, or 1 percent of GDP); in 2014, a series of floods and mudslides significantly affected agricultural lands, killing 1 300 head of livestock, and leading to the loss of 1 200 ha of land; floods and mud flows across Tajikistan in 2015 caused economic damage of USD 100 million (1.3 percent of GDP); in 2018, nine villages were hit by flood, with estimated losses to infrastructure of several million dollars (official losses were not published) (Takeuchi *et al.*, 2019).

Landslides also pose a significant threat, particularly since they are often triggered by other hazards like heavy rain, flooding, and earthquakes. There are around 50 000 landslide sites in the country, out of which 1 200 pose a threat to settlements or important facilities. In total, 36 percent of country's territory is exposed to landslides, with around 728 000 people (11 percent of total population) living in landslide-prone areas (Takeuchi *et al.*, 2019).

Tajikistan is also prone to drought, particularly the southern parts of the country. For example, in 2000–2001 as a result of drought, the country lost a significant share of its agricultural crops and half of the country's population was directly affected by it (S. Safarov, personal communication, 2019). Smallholders and rural poor were hit the hardest. As a result, crop yields dropped by between 30 percent and 40 percent. In 2001, crop yields for rice declined by around 30 percent; production of grain reduced by 10 percent, of rice by 52 percent, of fruit by 47 percent (Takeuchi *et al.*, 2019). It was also reported that donor support was delayed and inadequate. The International Federation of Red Cross and Red Crescent Societies received around USD 6.2 million to address the consequences of the drought, instead of the requested USD 14.5 million (IFRC, 2002). In the end, the cost of the disaster was estimated at around 6.6 percent of country's GDP (Takeuchi *et al.*, 2019).

Avalanches are one of the most common hazards in the country. At the same time, the distribution and risk of avalanches are still studied insufficiently in most of Tajikistan. It was assessed that nearly 75 percent of the country is prone to avalanches, with 30 000 to 40 000 potential avalanche spots (OSCE, 2018). Avalanches typically occur at the end of the winter on steep slopes with significant snowfall. They generally happen due to slope failure or snow accumulation by moving snow. There can be different triggers for avalanches (partially unknown) which complicate their prediction. Sudden avalanches can result in the loss of lives and damage to infrastructure (OSCE, 2018).

Hail poses another risk that is particularly important for agriculture. Hail occurs regularly, particularly due to country's geography (abundance of mountains and steep valleys), affecting crops and fruit trees (AXCO, 2019). Extreme temperatures, cold waves specifically, also pose significant risks. For instance, the estimated cost of a cold wave in winter 2008 was around USD 840 million (16.3 percent of GDP). It affected 2 million people and caused, among other things, damage to crops and seeds, and increased the mortality rate of livestock (Takeuchi *et al.*, 2019).

Natural hazards such as flooding, drought, avalanches, and landslides, recurrently damage, destroy and adversely impact land, crops, infrastructure and livelihoods, accounting for approximately 4.8 percent of Tajikistan's GDP. During the period 1991–2000, annual losses from disasters caused by natural hazards amounted to one-third of the total losses in agriculture (Government of the Republic of Tajikistan, 2019a). It is expected that these losses will increase in the future, considering the anticipated rising temperature and precipitation levels (Heltberg, Reva and Zaidi, 2012). The impact of climate change can be clearly observed in the melting of glaciers in

Tajikistan, which provide up to 60 percent of the river flow in the country. Over the past few decades, more than a thousand have disappeared (K. Abdualimov, personal communication, 2019). According to a review made in 1983, there were 9 000 glaciers in the country, covering 7 979 km<sup>2</sup> (Government of the Republic of Tajikistan, 2014). An assessment performed by the Organization for Security and Co-operation in Europe (OSCE) in 2018 concluded that there are between 6 094 and 7 109 glaciers on the territory of Tajikistan, covering a total area of 6 854 km<sup>2</sup> to 9 539 km<sup>2</sup> – this inconsistency is related to different approaches used for the identification of glaciers (OSCE, 2018). The effect of the reduction of glaciers and water availability can impact, apart from agriculture, the energy sector, such as Tajikistan’s hydroelectric power plants. Developing measures to adapt to climate change requires the joint effort of all relevant partners, including the different ministries, the private sector, non-governmental organizations (NGOs), and citizens (M. Ergashev, personal communication, 2019).

The valleys of southwest Tajikistan experience frost-free periods of 230 to 260 days, which is a characteristic of these areas. When moving north, this duration decreases; for example, a frost-free period of 214 days in Khujand (Government of the Republic of Tajikistan, 2014). The Zeravshan Valley, the mountainous regions of central Tajikistan and the western Pamirs, belong to the transition zone from the valleys to the highlands, where the weather in summer is cloudy and dry, but cooler. This zone is characterised by a consistent decrease in temperature the higher the altitude (WFP, 2017).

An assessment of damage from different types of natural hazards in agriculture was conducted, comparing the available data for 2014 and providing estimations for 2030 (Table 1). Besides hazards, it also covered environmental challenges such as water logging, intense precipitation and pasture degradation, which is the result of extreme weather events and further aggravates the impacts of natural hazards such as flooding and landslides (CAREC, 2015).

Table 1. Assessment and projection of damage from various types of natural hazards and disasters in agriculture in Tajikistan, 2014 and 2030

Risks and Hazards	Total damage to the country in USD per year			
	2014	2030	Average annual increase per year USD / year	Growth index 2030 compared to 2014
Drought	22 230 000	42 210 000	2 814 000	1.9
Pasture degradation	4 131 000	41 310 000	2 754 000	10.0
Intense precipitation	342 000	531 000	35 400	1.6
Water logging	324 000	504 000	33 600	1.6
Flooding	144 000	2 313 000	154 200	16.1
Decrease in air temperature/ frosts	126 000	126 000	0	1
Duration of snow cover	90 000	90 000	0	1
Landslides	63 000	540 000	36 000	8.6
Agricultural insects and pests	63 000	630 000	42 000	10.0
Dust storms	45 000	45 000	0	1

Source: CAREC, 2015.

It is expected that within the country’s current economic, social and institutional context, the potential losses from natural hazards in Tajikistan are estimated at 20 percent of GDP, for an event with a 200-year return period (WFP, 2017).

# Biological hazards

## Plant pests and diseases

Various biological hazards are affecting the agricultural sector in Tajikistan. Governmental decree No. 477 of 31 August 2012 approved a list of particularly dangerous pests that are highly impacting crops in Tajikistan, which include: locusts, mulberry pyralid, field rodents, sunn pest (corn bug), late blight (potato blight), wheat yellow rust and leaf (brown) rust. Ineffective preventive measures, together with a suitable climate, create favourable conditions for reproduction of pests (Government of the Republic of Tajikistan, 2014). Rising temperatures associated with changing climate will only increase the risks of pest attacks and spread of plant pests and diseases. It can lead to the increase in the size of locust-affected areas, one of the most severe agricultural threats in Tajikistan. Locusts affect around 100 000 ha of agricultural land each year; however, due to effective control measures, actual agricultural losses are generally low. As locust habitats and breeding areas are situated across the country's borders with Afghanistan, Uzbekistan, and Kyrgyzstan, regional cooperation is another important aspect that has to be considered in the fight against locust infestation (Broka *et al.*, 2016).

Until 2003, Tajikistan had a Specialised State Institution for Locust Control, which later became part of the State Institution for Plant Protection and Chemicalisation of Agriculture, where a small locust control department was set up with three specialists. In 2007, 35 000 ha of crops were destroyed by locusts. This event resulted in the creation of a State Unitary Enterprise Locust Control Expedition. Annually, around USD 1 million is used in Tajikistan to deal with locusts (Government of the Republic of Tajikistan, 2014). In 2010, a locust control programme in Tajikistan for 2011–2015 was introduced by the governmental decree No. 573, 30 October 2010 (Government of the Republic of Tajikistan, 2010). Most of the budget for the programme was used to spray locust breeding grounds in the mountain areas near the border (Broka *et al.*, 2016). At present, the main method for locust control is the use of chemical pesticides, which are imported from abroad due to their higher quality and greater effectiveness. In addition to several emergency projects (in 2007–2009, 2012–2014 and 2019–2020), FAO has been supporting Tajikistan in the framework of its Programme for improving national and regional locust management in Caucasus and Central Asia (CCA), launched in 2011 to the benefit of ten countries, with the financial support of the United States Agency for International Development (USAID), the FAO-Turkey Partnership Programme (FTPP), and Japan International Cooperation Agency (JICA). JICA support has more specifically included a Phase I project from 2015 to 2019, which contributed to regional cooperation and strengthening of human and operational capacities, and a Phase II project, which started in 2020 and will last until 2025. It will be implemented by FAO in cooperation with Tajikistan's Ministry of Agriculture and State Unitary Enterprise Locust Control Expedition (JICA, 2020).

Impacts of climate change and insufficient forest protection activities lead to the increase in the forest area prone to pests and diseases. In Tajikistan, the main forest pests include *Neoris huttoni* (a species of Lepidoptera), pistachio seed eater, fruit beetles (*Cydia*, *Grapholita* and *Laspeyresia*), silkworm, and powdery mildew. Dendrophagous beetles are another major forest pest (Government of the Republic of Tajikistan, 2014).

Protective measures against plant pests include preventive, mechanical, agro-technical, biological and chemical methods. The biological method for plant protection is based on the combined use of entomophages and micro-organisms. However, at present, the chemical method remains the leading plant protection method in Tajikistan. The Tajik Academy of Agricultural Sciences and the Tajik Agrarian University have been entrusted to develop instructions and recommendations for workers in the horticultural and viticulture industries with regard to the application of advanced technologies for combating pests and diseases, as well as newly imported pesticides. For effective and sustainable management of plant pests and diseases, there is a need to establish a regular surveillance and EWS, strengthen the capacities of national institutions, and improve seed systems. An improvement of inter-institutional collaboration through coordination platforms engaging plant protection, plant research, extension and seed-related institutions would help integrated management of plant pests and diseases.

In Tajikistan, the use of pesticides and their mixtures is carried out according to a “list of chemical and biological products approved for use in the Republic of Tajikistan”, approved by the decision of the Chemical Safety Commission of the Republic of Tajikistan (No. 4 of 11 June 2004). As of 2020, the updated list was in the process of being approved. In many cases, the cause of pesticide contamination of feed crops is the furrow irrigation technique used for their cultivation. The content of organochlorine and organophosphorus pesticides in animal products is also associated with the processing of slaughtered cattle in order to combat ectoparasites. Excess nutrients pollute the environment, freshwater, and even threaten the ozone layer of the stratosphere. For instance, nitrates accumulate above the permissible norms not only in water but also in plants – both in food and in forage, and nitroamines can be formed from nitrites, which have a carcinogenic effect (FSCI, 2014).

The Law of the Republic of Tajikistan on plant quarantine and protection No. 1567, dated 2 January 2019, includes a chapter focusing on pesticides and agrochemicals and their safe use. According to it, the safe handling of pesticides and agrochemicals is implemented by the government. Executive authorities carry out state registration in order to provide permission for the production, use, transportation, storage, destruction, advertising, and import of pesticides and agrochemicals.

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## Animal diseases

The most important diseases (from an economic point of view) that are threatening livestock in Tajikistan are echinococcosis, anthrax, foot-and-mouth disease, pest of small ruminants, Newcastle disease, and tuberculosis. Some of these are important zoonoses. Available data for 2005–2013 show a low number of cases of these diseases, recognising brucellosis as the main risk, which is reported every year. While reported cases represent less than 1 percent of cattle and small ruminants, the actual infection rates are probably higher, due to a lack of reporting and detection (surveillance) capacity. Anthrax was also reported every year during the analysed period, with annual losses of less than ten animals. Human infection from livestock diseases was also recorded – for brucellosis (650 to 1 500 cases per year) and for anthrax (15 to 50 cases per year). Many livestock diseases common in Central Asia are highly contagious and it is often impossible to control them on a national level, as they become trans-boundary – for instance, foot-and-mouth disease, brucellosis, and pest of small ruminants (Broka *et al.*, 2016). This is mainly due to the very low capacity of the veterinary services to prevent, early detect and control these diseases.

Due to the low capacity of the veterinary services, both public and private, vaccination against livestock diseases in Tajikistan is quite low, with the exception of foot-and-mouth disease (estimated at 100 percent) and anthrax (reported as high). Farmers’ limited interest in protecting livestock health can be explained by a combination of factors, such as the expectation that the government will pay for the vaccinations; distrust in the quality of vaccine; lack of awareness of the costs and benefits of such activities; and limited cash to pay for vaccinations. Current law obliges the government to provide vaccines for the major livestock diseases (listed above). However, the available budget is not sufficient to cover all producers, so the Veterinary Service distributes available vaccines only to state-owned livestock farms and high-risk zones. The remaining farmers have to purchase imported vaccines themselves. Farmers might also consider livestock disease as a low risk and prefer to accept potential losses instead of paying for the vaccination (Broka *et al.*, 2016).

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## COVID-19

It is also important to mention the risks related to the most recent and large-scale global health crisis of our time – the spread of COVID-19. This pandemic significantly affected the financial situation of the participants of the agrifood value chain (crop and livestock producers, traders and processors). The majority of crop farmers interviewed by FAO reported problems with access to seeds and fertilizers (FAO, 2020a). The pandemic resulted in a significant increase in the retail prices of key food staples (for instance potatoes, wheat flour, mutton, beef, milk, apples) during the first six months of 2020, compared with the previous year. This negatively affected food security and nutrition in the country, as it considerably lowered the affordability of normal diets. Households in Tajikistan on average spend 53 percent of their budget on food, while for vulnerable groups this parameter is even higher (for instance, in 2019 pensioners allocated 62 percent of their budget on food). In April 2020, the government introduced a temporary ban on the export of some agricultural products, including all cereals and legumes, rice, wheat flour, eggs, potatoes and all types of meat (the ban was lifted at the end of May

2020). To address the increased food prices, the government implemented some price stabilization measures, including the release of staple foods from strategic reserves, and by introducing purchase quotas to moderate panic purchases. The government also introduced COVID-19 preparedness and response plan with a budget of USD 115 million, which provides support in the form of cash-based transfers, social services, and in-kind support (FAO, 2020a).

# Climate change and expected impact on agriculture and food security

Tajikistan experienced a temperature rise of 0.1 °C to 0.2 °C during every decade from 1940 to 2012. The number of days with a temperature of 40 °C and above has been increasing. The largest temperature increase per decade was observed in Danghara and in Dushanbe (0.5 °C to 0.8 °C). The mountainous areas experienced an average increase of 0.3 °C to 0.5 °C per decade, while in the highland areas (above 2500 m), the increase was between 0.2 °C and 0.4 °C. During the 2001–2010 period, the average temperature of the decade for areas located between 1 000 metres and 2 500 metres above sea level was 0.8 °C higher than the norm. In the highland areas, the observed increase was 0.2 °C above the norm. Moreover, average temperatures were between 0.1 °C and 1.1 °C higher in winter, and between 0.1 °C and 1.3 °C higher in spring, while average autumn temperatures in all mountainous areas increased by between 0.6 °C and 1.1 °C (Government of the Republic of Tajikistan, 2014).

The continued melting and retreat of glaciers associated with climate change is of substantial concern to Tajikistan, since the glaciers and snow reserves are the main sources of irrigation water. The total area of glaciers in Tajikistan is more than 6 percent of the country. Glacial runoff in a typical year is about 20 percent to 30 percent of the total annual runoff, while in dry years it is more than 50 percent of the annual runoff. Approximately 30 percent of the ice cover has been lost since 1930, while the current annual melting rate is 0.5 percent to 0.8 percent. The country's largest glacier, the Fedchenko Glacier, retreated by a distance of 1 km and lost about 5 km<sup>3</sup> of ice since the beginning of the twentieth century. Small glaciers in the lower reaches receive the greatest impact of climate change and are melting at unprecedented rates. For example, in Diakhandar, a glacier with a surface area of less than 1 km<sup>2</sup>, located in the upper reaches of the Karatag river, has melted completely. The size of the Zeravshan glacier decreased in size by 10 percent between 1927 and 2010, and retreated by 2.5 km (Government of the Republic of Tajikistan, 2014).

Climate change is likely to adversely affect Tajikistan, due to the country's high dependence on climate-sensitive sectors (energy, agriculture, water management), which makes it extremely vulnerable, in addition to its relatively low ability to adapt. The World Bank, in 2010, identified Tajikistan as the most vulnerable country in Central Asia to climate change, while it ranked 100 out of 182 countries in the 2019 global adaptation index of the University of Notre Dame. It is expected that climate-induced losses will increase with rising levels of temperature and precipitation (World Bank, 2013). It is expected that rising temperatures may negatively affect the state of the country's water resources, agriculture, transport and infrastructure, as well as the country's health system and health of the population. In addition to socioeconomic factors, Tajikistan's vulnerability to climate change is aggravated by the lack of quality infrastructure and a range of institutional issues, especially in the agricultural sector (Babajanov *et al.*, 2012).

In comparison with 1961–1990, by 2030 the average temperature is projected to rise by 2.3 °C (following an annual increase of 0.2 °C to 0.4 °C in all regions of the country), with the increase experienced more sharply in winter. Precipitation is likely to increase by 8 percent in areas up to 2 500 metres and may possibly decrease by 3 percent in mountainous areas. In some parts of Tajikistan, agricultural productivity may fall by 30 percent by the end of this century (Government of the Republic of Tajikistan, 2019a). Reduced agricultural and pastoral productivity may adversely impact food and nutrition security in Tajikistan, while changes in biodiversity and ecosystems may lead to increases in the outbreak and spread of infectious diseases via food and water (UNECE, 2017). Table 2 shows the hazard-proneness of areas in Tajikistan.

Food production in Tajikistan suffers from a shortage of irrigated land. The irrigated agricultural sector is of great importance in ensuring the country's food security. About 80 percent of agricultural production comes from irrigated land. The total volume of water taken from all sources for irrigation is on average 8 km<sup>3</sup> to 10 km<sup>3</sup> per year. More than 90 percent of the total water intake from natural sources is used for the needs of irrigated agriculture (Government of the Republic of Tajikistan, 2015). At the same time, only 7 percent of all land resources

Table 2. High-priority climate risks and hazards in agriculture per region in Tajikistan

Climate risk and hazards	Gorno-Badakhshan Autonomous Region		Sughd region		Khatlon region		Districts of Republican Subordination	
	East	West	Zeravshan valley	Syr-Darya river basin	South-west	South-East	East	West
Pasture degradation			x		x	x	x	
Decrease in temperature	x	x	x					
Dust storms					x			x
Drought				x	x			x
Wind storms	x			x	x			x
Increase in temperature					x			x
Agricultural insects					x			x
Duration of snow covering		x					x	
Avalanches		x					x	x

Source: UNDP, 2014.

are irrigated, of which 97 percent are subject to soil degradation, including erosion, waterlogging, deforestation, and salinisation. Soil desertification has become one of the major problems of the country – long periods of aridity, along with high air temperatures in spring and summer, lead to land desertification, particularly in southern and central Tajikistan. Within the context of global warming, land demand for irrigation is expected to increase by at least 20 percent to 30 percent compared to present conditions, just to keep crop production at the same level. As a result of climate change, crop volumes still might be reduced by between 5 percent and 30 percent by 2050, which may also lead to forage shortages, and reduced quality and quantity of livestock. As an example, in the Khatlon region, one of the largest food-security challenges to be addressed is related to the outdated irrigation infrastructure, most of which is destroyed or not functioning (Bann *et al.*, 2012). The Water Sector Reform Programme of the Republic of Tajikistan for 2016–2025 listed aging and deterioration of the existing irrigation and reclamation infrastructure, breakdown of pumping stations, shortage of machinery and mechanisms, and a high level of water losses, among the main issues in the water sector. The efficiency of irrigation systems in the country is often at only around 40 percent to 50 percent (Government of the Republic of Tajikistan, 2015).

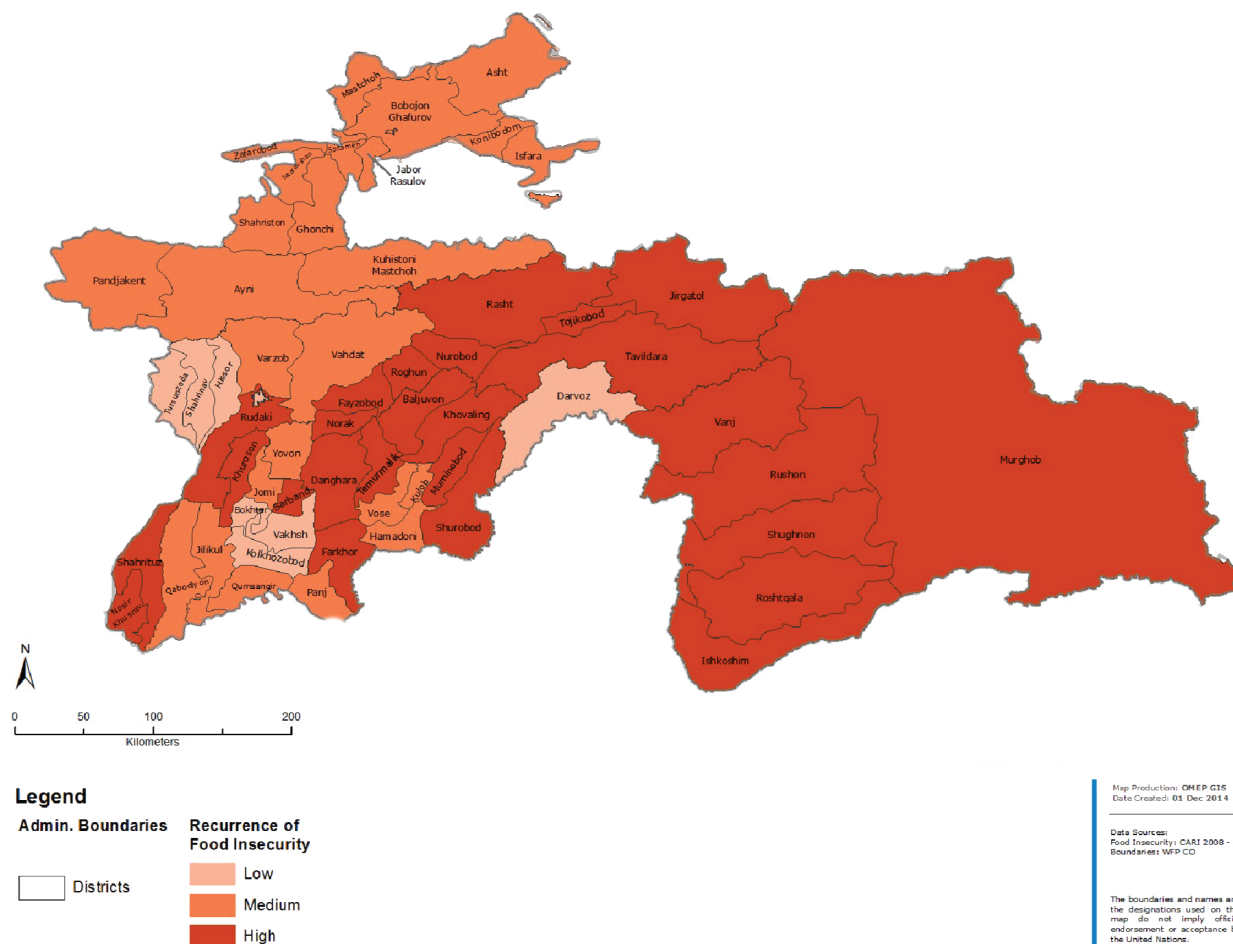
Rising temperatures will also impact ecosystems in terms of increasing plant pests and diseases, which may in turn adversely affect food production, as well as food safety. Tajikistan is a biodiversity-rich country; however, due to climate change, it is expected that a change in the vertical distribution borders of vegetation and wildlife may occur. The warming of the land surface will have a noticeable effect on grassy vegetation. In high mountain pastures and alpine meadows, this impact is expected to be favourable, unlike the state of winter pastures and hayfields, which may deteriorate as a result of a decrease in precipitation and temperature change.

It is anticipated that due to a decrease in the volume of river flow and an increase in temperature, the *tugai* ecosystem will degrade as these types of vegetation and forests require adequate moisture and precipitation, and if frequent and prolonged drought occurs these may be at risk.<sup>3</sup> As a result of global warming, changes in the phenology of tree shrubbery and grassy vegetation will also be observed (FAO, 2008).

In general, a number of studies have been carried out on the territory of Tajikistan that allow us to assess the levels of climatic vulnerability of individual regions (World Bank, 2013; WFP, 2015; CAREC, 2015; Broka *et al.*, 2016; OSCE, 2018). For example, the most vulnerable areas in terms of food security in Tajikistan are presented in Figure 3. This map was developed based on the World Food Programme's (WFP) food security indicator (Consolidated Approach for Reporting Indicators for Food Security) for 2008–2012 (WFP, 2015). These areas could be divided into three zones: highland regions – Rasht, Tajikabad, Vahdat city, Nurabad, Lyakhsh, Murghab; hilly regions – Fayzabad, Khovaling, Baljuvan, Shuraabad, Muminabad; lowland regions – Khuroson, Jaloliddin Balkhi, Vakhsh, Bokhtar, Sarband, Jaihun, Panj, Jomi, Dusti.

<sup>3</sup>*Tugai* is a form of riparian forest or woodland associated with fluvial and floodplain areas in semi-arid and desert climates in Central Asia. These wetlands are subject to periodic inundation and largely depend on flooding and groundwater rather than rain. *Tugai* habitats usually follow the courses of rivers.

Figure 3. Recurrence of food insecurity affecting more than 20 percent of the population, 2008–2012



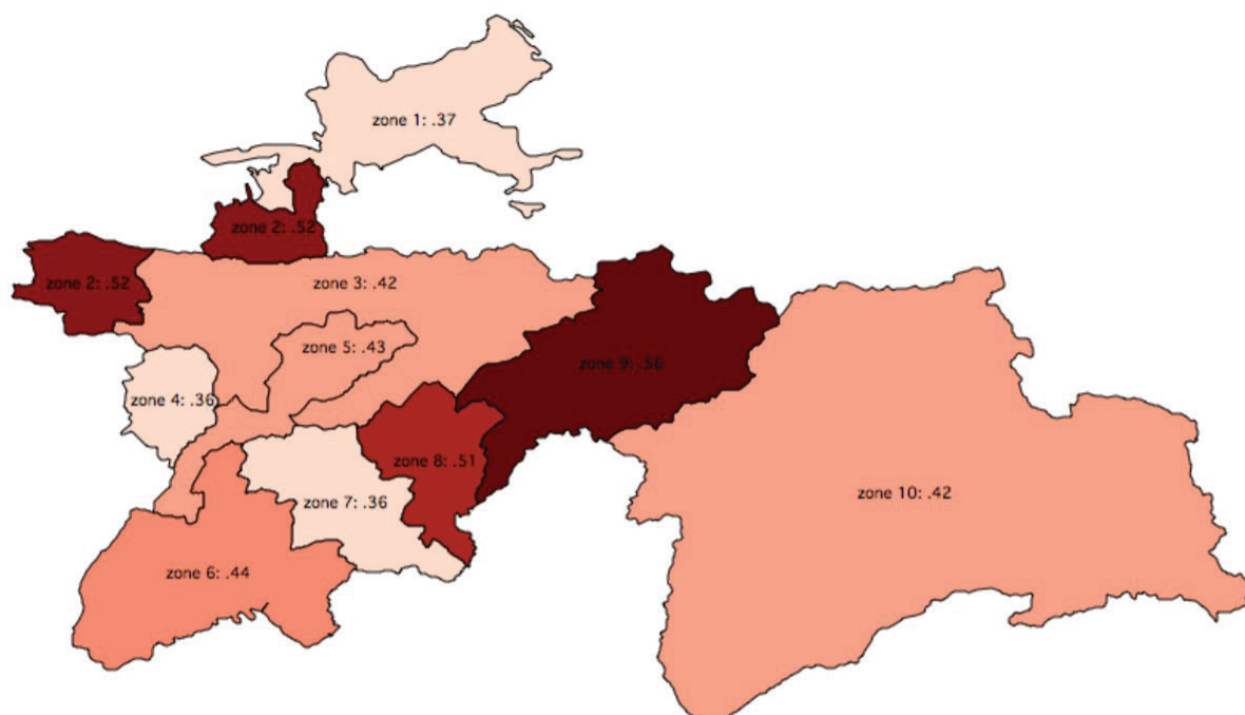
Source: WFP, 2015.

All regions of Tajikistan have a relatively high risk of food insecurity and vulnerability to climate change. The vulnerability map for ten agroecological zones of Tajikistan is provided in Figure 4. The vulnerability index was calculated by Heltberg and Bonch-Osmolovskiy (2011) as a function of exposure to climate variability and natural disasters, sensitivity to the impacts of this exposure, and capacity to adapt to climatic changes. Despite the fact that some zones are characterised by low climatic and food risks, all regions have a risk level that is above average. In addition, there are virtually no sustainable sources of income in these areas, the majority of the poor are farmers, and they depend on remittances.

Climate change could increase irrigation demand, accelerate land degradation, and increase damage and losses to crops due to pests, pathogens, fungi, and weeds. Farmers that have witnessed productivity declines over the years indicate post-harvest losses as one of their growing concerns. Due to limited knowledge, a lack of access to logistical service, markets, and absence or limited availability of infrastructure (for storage among other things), post-harvest losses are estimated to be around 46 percent (Faiz Hayet, 2019). Higher temperatures may increase vector and pest infestations. Climate-induced extreme weather events and thermal shocks may increase morbidity and mortality rates of livestock (Heltberg, Reva and Zaidi, 2012).

The lack of human and institutional capacity to reduce effectively and manage risks and adverse impacts of climate change makes it extremely difficult to reduce vulnerability and build resilience to the expected climate-related challenges. The anticipated climatic changes may not only reverse the development gains achieved in the past by reducing agricultural yields, and by increasing the costs of food and the outbreaks of vector-borne diseases, but may also lead to more people falling into extreme poverty (Heltberg, Reva and Zaidi, 2012; Government of the Republic of Tajikistan, 2014; Faiz Hayet, 2019).

Figure 4. Vulnerability map of Tajikistan (for ten agroecological zones)

Zones:

- |                                                                               |                            |
|-------------------------------------------------------------------------------|----------------------------|
| 1. North Sughd lowlands                                                       | 6. South Khatlon lowlands  |
| 2. South Sughd hills, Pedzhkent-Shakhristan-Ganchi                            | 7. Southeast Khatlon hills |
| 3. DRS (Districts of Republican Subordination)-Sogd: Varzob-Zarafshan-Surkhob | 8. Northeast Khatlon hills |
| 4. West DRS lowland, Tursunzade-Shakrinav-Gissar                              | 9. East DRS mountains      |
| 5. West DRS hills, Rudaki-Vahdat                                              | 10. Gorno-Badakhshan AO    |

Source: adapted from Heltberg and Bonch-Osmolovskiy, 2011.

Existing agricultural policies focus excessively on cotton production, while the country also has weak water management systems, and insufficient protection of property rights and land, which does not encourage farmers to cultivate the land properly. Existing policies also do not aim to reduce the adverse impacts of climate change on the agricultural sector. Productivity growth in agriculture is limited due to the presence of limited and worn-out infrastructure, the lack of technological progress, and high taxation and land tenure regulations (Babajanov *et al.*, 2012).

# Agricultural and food security profile

Agriculture accounted for 18.6 percent of the country's GDP in 2009, while in 2014 it reached 23.5 percent. In more recent years it remained around 20 percent (19.8 percent in 2019, based on preliminary data). At the same time, in monetary values, over the 2009–2019 period the total value of agricultural production (in GDP) increased by 70 percent (from USD 923.6 million to USD 1.6 billion (TajStat, 2019a). About 73.6 percent of country's population resides in rural areas, most of whom are employed in the agricultural sector (TajStat, 2020a). According to the Agency of Statistics, the average age of the rural population in 2018 was 28 years. As a proportion of the total rural population, 46.6 percent are younger than the working age,<sup>4</sup> 46.6 percent are of working age, and 6.8 percent are older than the working age. In general, the rural population of Tajikistan is considered young (TajStat, 2018c).

In 2017, about 61 percent of the country's total working population was employed in agriculture (TajStat, 2018a), while 70 percent to 80 percent of all women are (formally or informally) involved in agricultural work. This shows that the sector is the main source of income for the majority of the country's rural population and is essentially an entry point for the improvement of women's conditions and food security (Faiz Hayet, 2019). At the same time, it is important to take into account that the majority of jobs in agriculture are unofficial, mainly due to the high rate of social tax of 20 percent (FAO, 2020b). In 2019, the combined agricultural, forestry, and fisheries sector had the lowest wages and salaries of around USD 65 per month (TajStat, 2020a). It is also especially important to mention the gender pay gap – while in 2008 women's wages amounted to 65 percent of men's wages, in 2016 gap increased (to 47 percent). At the same time, a large proportion of women undertake agricultural work without receiving any payment at all – in 2012, more than half (59 percent) of women engaged in agriculture were not paid, 24 percent were paid in cash and in-kind, 13 percent in-kind, and only 5 percent in cash (FAO, 2020b).

In 2017, around 3 658 200 ha of Tajikistan's territory was comprised of agricultural land, including permanent pastures, arable land, and land under permanent crops. The largest share of agricultural land, namely 2.8 million ha (76.8 percent of total agricultural land) is pastures, most of which is natural and used for animal husbandry (Table 3). Due to land degradation, the total pasture area has decreased over recent decades. One of the main reasons for the degradation of rangelands is the intensive grazing of livestock, which leads to wild perennial grasses being trampled down. Loss of vegetation leads to further depletion of land, reducing its ability to sustainably recover. The lack of pasture turnover affected the territory of all winter and 80 percent of summer pastures – negative tendencies of land degradation and a reduction of natural productivity are observed on them (Umarov, 2019).

Over the 1991–2017 period, the share of agricultural land of total land fund also decreased rather significantly (from 29.7 percent to 26 percent). The share of arable land of total land declined from 5.7 percent in 1991 to 4.6 percent in 2017. Among the reasons for the decrease are a deterioration of the technical condition of irrigation, collector-drainage systems, pumping stations, vertical drainage wells; lack of skills among *dehkan* farmers in terms of rational use of natural resources; salinisation and rise of groundwater. To some extent, the decrease in the area of arable land was also influenced by the change in the structure of agricultural land – the area of perennial plantations increased from 99 800 ha in 1991 to 151 000 ha in 2018, a more than 51 percent increase (TajStat, 2019a). During the 1991–2017 period, the total population of the country grew from 5.5 million to 8.9 million people, meaning that on average the area of arable land per person dropped from 0.15 ha to 0.07 ha (or by 53.3 percent). For agricultural land, this parameter decreased from 0.77 ha to 0.41 ha per person (or by 46.7 percent). Such trends could lead to a serious food crisis in future (Umarov, 2019).

<sup>4</sup>Working age is defined for men as those aged 15 to 62, for women from 15 to 57. Thus, younger than working age is 0 to 14 years old, while older than the working age for men is 63 years and older, and for women 58 years and older.

Table 3. Structure of agricultural land in Tajikistan (ha thousands)

	1991	1995	2000	2005	2010	2015	2016	2017
Total land fund	14 254.5	14 254.5	14 255.4	14 255.4	14 255.4	14 137.7	14 137.7	14 137.7
Agricultural land, of which	4 232.7	4 280.0	4 126.5	3 864.6	3 746	3 611.9	3 638.5	3 658.2
Pastures	3 286.5	3 338.9	3 258.4	3 012.5	2 909.8	2 771.5	2 797.5	2 809.6
Arable land	805.6	796.2	730.1	709.0	673.1	653.2	650.6	657.3
Perennial plantings	99.8	107.7	98.1	97.4	115.7	140.4	144.4	148.2
Hayfields	21.7	18.7	18.8	17.0	17.7	17.6	17.4	15.8
Fallow	19.1	18.5	21.0	28.7	29.7	29.3	28.5	27.1

Source: Umarov, 2019.

The agricultural sector in Tajikistan is primarily based on crops and livestock production. In 2019, plant production amounted to 69.1 percent of gross agricultural production, while livestock made up 30.9 percent (TajStat, 2021). The main crops produced include cereals and legumes, cotton, potatoes and cucurbit crops, as well as feed crops (FAO, 2020b). There are many traditional crops (local varieties) as well as their wild relatives. For example, wild fruit, such as pistachios, apricots, pears, apples, almonds, walnuts, figs, and pomegranates, grow in the mountain forests. The gene pool of cereals, leguminous plants and oilseeds includes about 3 000 varieties, of which there are 510 varieties of wheat, 500 varieties of barley, 500 varieties of chickpeas, 234 varieties of maize, 115 varieties of rye, 80 varieties of lentils, 60 varieties of oats, 46 varieties of soy, and eight varieties of peanuts. Such diversity of available varieties provides a good foundation for cultivation of crops with higher yields, better adapted to a changing climate, more tolerant to abiotic factors, and resistant to diseases and pests (Muminjanov, 2008).

Over the past few decades, the sown area has decreased by 64 600 ha, or more than 7 percent (Table 4). In terms of cultivated areas, around 45 percent is occupied by grain crops. The sown areas under cotton significantly decreased, from 255 000 ha in 2007 to 185 000 ha in 2018, which is a decline of 36 percent. At the same time, the area under potato cultivation increased from almost 29 700 ha (2007) to 49 600 ha in 2018 (a 67 percent rise).

Table 4. Dynamics of structure of sown areas by different types of crops, 2007–2018

Years	Total		Including:									
			Cereals		Cotton		Potatoes		Livestock fodder crops		Other crops	
	ha (000s)	%	ha (000s)	%	ha (000s)	%	ha (000s)	%	ha (000s)	%	ha (000s)	%
2007	891.3	100	396.9	44.5	254.8	28.6	29.7	3.3	130.3	14.6	79.6	8.9
2010	839.5	100	459.9	54.8	162.4	19.3	31.8	3.8	87.7	10.4	97.7	11.6
2015	830.6	100	422.9	50.9	159.6	19.2	39.8	4.8	102.4	12.3	105.9	12.7
2016	837.3	100	423.5	50.6	162.6	19.4	41.6	5.0	103.3	12.3	106.3	12.7
2017	837.2	100	411.6	49.2	174.0	20.8	40.6	4.8	101.5	12.1	109.5	13.1
2018	826.7	100	375.0	45.4	185.8	22.5	49.6	6.0	99.1	12.0	117.1	14.1

Source: TajStat, 2019a, TajStat, 2020b.

The main form of governance of agricultural land in Tajikistan is *dehkan* farms. In accordance with the Law on *dehkan* farms, land plots for the creation of a *dehkan* farm are provided with the right of life-long inheritable use with the right of alienation or without the right of alienation, based on an application by a citizen and the decision of local executive bodies of state power of districts (cities). The *dehkan* farm independently determines the structure, direction of its activities, production volumes, storage, processing and sale of products, as well as other issues related to farm management. Land relations are regulated by the Land Code of the Republic of Tajikistan, adopted in 1996. The 2012 amendments to this code included a clause on ensuring equal access for women and men to land plots.

According to the State Committee for Land Management and Geodesy of the Republic of Tajikistan, in 2018 around 70 percent of the total area of agricultural land was used by *dehkan* (private) farms (including 7.4 percent of household plots of the population), with the remaining 30 percent used by agricultural enterprises (collective *dehkan* farms 2.7 percent, state farms 14.4 percent, inter-farm 1.8 percent, and other agricultural enterprises

10.7 percent). Of the total arable land area (659 000 ha), *dehkan* (private) farms accounted for 81.4 percent (including household plots of the population, 27.4 percent), and agricultural enterprises for the remaining 18.6 percent. Of the total arable land in 2018, only 70 percent was irrigated (TajStat, 2019a).

Most agricultural products are produced in private subsidiary farms and *dehkan* farms. In 2017, these two types of farms together were responsible for more than 95 percent of the total volume of agricultural production (58.7 percent from private subsidiary farms, and 36.5 percent from *dehkan* farms). The remaining 5 percent was produced by commercial organizations. Eggs is the only agricultural product that *dehkan* and private subsidiary farms do not dominate. It is important to mention that private subsidiary farms dominate the livestock sector (accounting for 94 percent of it in 2016, in terms of volume), while *dehkan* farms do not play a significant role (accounting for around 3 percent). In terms of crop production, the share of two types of farms are quite similar – in 2016, *dehkan* farms produced 51.4 percent, while private subsidiary farms produced 42.7 percent (TajStat, 2018b). *Dehkan* farms are more market-oriented, while private subsidiary farms produce for own consumption as well as for sale. These two types of farms produce a significant share of agricultural products and make a significant contribution to ensuring the country's food security. Agricultural products produced by these farms are consumed almost entirely within Tajikistan (FAO, 2020b).

As of 2016, around 5.177 million ha of land (37 percent of the total land fund) was assigned to *dehkan* farms, of which 2.591 million ha of agricultural land was allocated for agricultural production – more than 70 percent of all agricultural land in the country (FAO, 2020b; TajStat, 2018b). In 2017, there were 164 631 *dehkan* farms, a seven-times increase compared with 2005 (TajStat, 2018b). The cultivated area of agricultural crops also has increased, from 407 800 ha in 2005 to 545 100 ha in 2016, perhaps as a result of activities diversification (FAO, 2020b). In 2018, on average, one *dehkan* farm accounted for 15 ha of agricultural land, including 3.1 ha of arable land, 0.7 ha of perennial plantations, and 11 ha of pastures. More than half of *dehkan* farms are smallholders and family farms, owning not more than 2 ha of land (FAO, 2020b).

Table 5 gives an overview of the number of *dehkan* farms, the sown area and average size of these farms managed by women and men in Tajikistan in 2017. At the same time, the number of private subsidiary farms also increased, though not so significantly – from 839 300 in 2005 to 1.07 million in 2016, mostly due to the growing population in rural areas. The area of land per farm depends on the region (mainly due to the relief), as well as on the sex of the head of the household. The area made up of private subsidiary farms is rather small (only 272 200 ha, or less than 2 percent of the country's total land in 2016), especially compared to *dehkan* farms (which occupy 36.6 percent of total land). The average plot size of a private subsidiary farm is around 0.25 ha. At the same time, private subsidiary farms provide almost 59 percent of agricultural production, including 93 percent of livestock products and 39 percent of crop products (TajStat, 2019a). This high phenomenon is explained by the fact that such farms mainly focus on livestock that does not require large areas; they have more freedom in the selection of crops to grow compared to *dehkan* farms; and much higher productivity of vineyards and orchards (FAO, 2020b).

Table 5. Number and average size of *dehkan* farms in Tajikistan in 2017, disaggregated by sex

	Number of <i>dehkan</i> farms	% of <i>dehkan</i> farms	Sown area (ha)	% of sown area	The average size of farm (ha)
Managed by men	133 016	80.8	515 511	91.4	3.9
Managed by women	31 615	19.2	48 593	8.6	1.5
Total	164 631	100.0	564 104	100.0	3.4
<b>By region</b>					
GBAO	15 471	100.0	8 546	100.0	0.6
<i>Managed by women</i>	25	0.2	82	0.1	0.3
Sughd region	61 591	100.0	193 608	100.0	3.1
<i>Managed by women</i>	16 170	26.3	17 246	8.9	1.1
Khatlon region	57 609	100.0	28 1424	100.0	4.8
<i>Managed by women</i>	9 997	17.4	23 665	8.4	2.4
DRS	29 960	100.0	80 520	100.0	2.7
<i>Managed by women</i>	5 423	18.1	7 600	9.4	1.4

Source: TajStat, 2018b.

As of 2018, there were 1 570 000 ha of potentially irrigable land in Tajikistan, out of which 758 000 ha were irrigated (5.4 percent of the total land fund, or 20.7 percent of all agricultural land) (ALRI, 2018). The relief of the country poses the main issue in the development of new irrigated land in Tajikistan (more than 93 percent of the territory is mountainous). The development of new land requires large financial costs, for instance due to the need for pumping stations. In recent years, the government has adopted a number of programmes for the development of new land, including the State Programme on development of new irrigated land and rehabilitation of land withdrawn from agricultural turnover in the Republic of Tajikistan for the period 2012–2020.

Irrigation by furrows is the dominant method of irrigation of crops, used on 98 percent of the total irrigated area, while 84 percent of arable land relies on an irrigation system developed before independence, which is in need of capital repair (FAO, 2020b). It is estimated that approximately 90 percent of agricultural products are produced on irrigated land (Pulatov, 2017). In 2014, the agricultural sector consumed around 81.8 percent of the total water use, including water for irrigation (approximately 77 percent of the total water use). The average annual water intake for agricultural and irrigation needs during the 2009–2014 period was 6.68 km<sup>3</sup> (UNECE, 2017). At the same time, around 20 percent of irrigated land is experiencing water scarcity (Pulatov, 2017). The growing number of water users in agriculture is complicating access to irrigation water (FAO, 2020b).

Tajikistan's agriculture may be significantly affected by climate change, because the arid nature of the climate contributes to land degradation and the development of desertification processes. Longer dry periods against the background of high spring and summer air temperatures may increase the risk of desertification processes in the southern and central regions of the country. It is expected that in the future, more water may be needed for the economy, especially for irrigated agriculture. Irrigation rates for main crops may increase by between 20 percent and 30 percent (M. Ergashev, personal communication, 2019).

In animal husbandry, natural pastures of alpine ecosystems, including high-mountainous, are used for livestock feeding. Most pastures are located in the Khatlon region and in Districts of Republican Subordination. Most livestock is privately owned and about 96 percent of animal products, including dairy products, are produced by private farmers. Over the past two decades, the livestock population has increased more or less constantly, from 3.36 million heads in 2000, to in excess of 6 million in 2008, and reaching more than 8 million heads in 2018 (TajStat, 2020c), therefore doubling in numbers (an increase of 139 percent since 2000). At the same time, in the 1991–2018 period, the total area of pastures decreased by 14.6 percent. For the period from 2011 to 2018, the density of livestock per hectare of arable land increased from 0.94 to 1.14 livestock units. Such trends, and limited pasture management, results in an excessive burden on pastures (TajStat, 2019a).

Fish farming plays a minor role in Tajikistan. According to the Agency on Statistics, as of 31 December 2020, there were 353 fish farms in the country, including 270 *dehkan* fish farms and 83 public commercial farms. During this year, these farms produced 2 701.1 tonnes of fish, mainly from fishing in ponds and lakes (TajStat, 2020d). The main cultivated species are silver carp, carp, trout, grass carp, and pike perch (TajStat, 2020d). Around 90 km<sup>3</sup> to 100 million km<sup>3</sup> of water is used per year on fish ponds – which is 0.8 percent to 1.5 percent of total water consumption in the country (UNECE, 2017). Production volumes in the fish farming sector decreased from 4 000 tonnes in 1991 to 1 682 tonnes (4.62 million cultivated fish) in 2014. Of the total volume of fish production in 2014, 1 015 tonnes were raised in *dehkan* farms (1.98 million fish), and 667 tonnes in private subsidiary farms (2.64 million fish) (TajStat, 2018b). Since 2015, fish production in Tajikistan has been growing every year, reaching 2 749 tonnes in 2019 (TajStat, 2020d). To support the normal physiological needs of the population in Tajikistan, the provision of fish products has to reach at least 15 000 tonnes per year. At the same time, this sector has the potential to play a more important role in the development of rural communities and as a contributor to the national economy, since the country has the potential to produce around 200 000 tonnes of fish per year (FAO, 2020b).

Verifiable information on the quantitative and qualitative data on forests and their present state is currently lacking, due to significant changes that were undertaken after the collapse of the USSR in the forests that belonged to collective and state firms, as well as in the use of pastures. The quantitative data on forest resources available in published sources might slightly vary. According to the statistical yearbook on Environmental Protection in the Republic of Tajikistan (2019), the total area of forest land in 1991 was 408 500 ha, while at least since 2014 until 2018 it was 421 800 ha (constant throughout these years). According to the Global Forest Resources Assessment (FAO, 2020d), in 2020 the total forested area in the country was around 424 000 ha. At the same time, Tajikistan was reported as one of the top five countries in terms of share of primary forest

of total forested area (70 percent) (FAO, 2020d). The area of the State Forest Fund was estimated to be around 1.8 million ha for the period from 1991 to 2014. However, this value fluctuated from 1.34 million ha in 2015 to 1.77 million ha in 2016, and back to 1.3 million ha in 2017–2018 (TajStat, 2019b).

Tajikistan is a food-deficit country that imports a significant portion of its food and is highly dependent on imports of fuel and consumer goods. In 2018, about 55 percent of the country's domestic grain needs and 70 percent of total food for consumption were imported (TajStat, 2019c). It is estimated that the country imports half of the wheat the population consumes, which accounts for 70 percent of the average daily calories needed (FAO, 2020c). Tajikistan's dependence on food imports will likely to continue due to the limited availability of arable land, current trend of arable area reduction, and high rates of population growth. In 2019, the share of food products of the total volume of imports (in tonnes) came to 20.5 percent (TajStat, 2020a). In dollar terms, it was around 20 percent of all imported commodities in 2019, or USD 618.5 million (FAO, 2020c). Tajikistan imports mainly wheat and flour, sugar and pastry, vegetable oil, flour products, vegetables, fruits, potato, eggs, as shown in Table 6 (TajStat, 2020a). Over 2010–2019, the total volume of imported products didn't change significantly; however, it increased for most main products (for some substantially, for instance fresh vegetables, fruit and vegetable juices, eggs, and wheat), while for others it dropped (canned vegetables, potatoes, flour) (Table 7). The volume of imported wheat increased from 443 000 tonnes in 2010 to 1 090 000 tonnes in 2019, while the import of flour dropped from 370 000 tonnes in 2010 to 86 000 tonnes in 2019 (TajStat, 2012; TajStat, 2020a). Increasing food imports can impose additional risks in the event of an increase in world prices and exchange-rate fluctuations.

The main agricultural imports to Tajikistan were coming from Kazakhstan, the Russian Federation, and Turkey (FAO, 2020c). In 2016, Tajikistan imported fertilizers worth USD 33.7 million, compared with USD 12.7 million in 2005. Over this period of time the application of fertilizers to crops was decreasing, but the costs of purchase increased due to a growing price on the world market (FAO, 2020b).

Table 6. Overview of imports of basic foods and share of total imports, 2010–2019 (tonnes thousands, unless specified)

Products	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>Basic food products</i>	1 853	1 269	1 689	1 445	1 636	1 614	1 565	1586	1 624	1 850
Wheat	443	443	758	640	775	859	1 034	1 015	1 019	1 090
Flour	370	346	360	243	189	140	89	55	47	86
Sugar and pastry	111	119	119	107	125	149	104	125	117	163
Pasta	12	16	31	43	36	17	13	14	13	17
Vegetable oil	75	75	66	65	73	84	87	97	81	100
Milk and dairy products	7	9	10	12	15	12	10	9	8	8
Eggs	6	4	8	8	6	3	4	11	34	40
Tea	6	7	5	4	6	5	7	5	5	6
Potato	26	13	33	43	29	51	6	17	32	4
Fresh vegetables	1	4	14	5	28	16	2	5	40	11
Fresh fruit and berries	18	19	23	43	47	35	24	19	28	27
Fruit and vegetable juices	1	1	1	1	2	1	1	1	5	7
Canned food	2	2	2	1.8	0.2	0	0.9	0.7	0.3	0.2
<i>Share of food imports as part of total imports, %</i>	18.5	20.2	20.5	19.4	20.5	23.1	21.5	23.0	19.6	20.5

Source: TajStat, 2012; TajStat, 2013; TajStat, 2015; TajStat, 2017b; TajStat, 2019c; TajStat, 2020a.

Cotton is the main export product for Tajikistan, accounting for 86 percent of all agricultural exports in 2018 (FAO, 2020c). The country also exports some food products, primarily fresh vegetables, fruit and berries. However, the share in the total volume of exports (in tonnes) is relatively small and was decreasing over the past ten years – from 5.3 percent in 2010 (TajStat, 2012) to 2.8 percent in 2019 (TajStat, 2020a). In dollar terms, the share of agricultural products of total exports is more significant – in 2018 it was around 18 percent (USD 192.6 million) (FAO, 2020c). Comparing data on exports of basic food products (in tonnes) in 2010 and 2019, it halved over this period of time (Table 7). The main destinations of agricultural exports from

Tajikistan are the Russian Federation (poultry meat, eggs, flour, wheat, oils of vegetable and animal origin), China (poultry meat, tea and almost all product groups), and Kazakhstan (wheat, oil of vegetable and animal origin) (FAO, 2020c).

Table 7. Exports and imports of basic foods in 2010 and 2019 (tonnes thousands)

	Export		2019 in % to 2010	Import		2019 in % to 2010
	2010	2019		2010	2019	
<i>Food products</i>	269.0	131.8	49	1 853.0	1 849.6	99.8
of which:						
Wheat	0.1	–	–	442.8	1 090.2	246.2
Flour	0.8	–	–	370.3	85.8	23.2
Sugar and pastry	–	0.05	–	110.8	162.6	146.8
Pasta	–	–	–	12.3	174	141.5
Vegetable oil	–	–	–	75.0	100.5	134.0
Milk and dairy products	–	0.02	–	74	8.3	112.2
Eggs	–	–	–	6.1	40.3	660.7
Tea	–	0.1	–	6.2	5.8	93.5
Potatoes	0.2	0.03	15.0	25.7	3.7	14.4
Fresh vegetables	151.6	84.5	55.7	0.8	10.9	1 362.5
Fresh fruit and berries	11.6	18.5	159.5	17.6	27.3	155.1
Fruit and vegetable juices	3.8	–	–	0.7	6.9	985.7
Canned vegetables, tomatoes	1.4	0.03	2.1	2.0	0.2	10.0
Share of food products in total volume, %	5.3	2.8	52.8	18.5	20.5	110.8

Source: TajStat, 2012; TajStat, 2020a.

# Nutritional status of the population

Despite quite significant improvements over the past decade, Tajikistan's poverty rate remains high – it dropped from 53.5 percent in 2007 to 27.4 percent in 2018, and for extreme poverty from 17.1 percent in 2007 to 11.8 percent in 2018. The gap between the urban and rural population remains significant – in 2015, 35.2 percent of the rural population lived in poverty, compared to 23.2 percent of the urban population (TajStat, 2020a; FAO, 2020b). Households across the country spend more than 50 percent of their expenditure on food – in 2019, this reached 53.4 percent, with a minor difference between the urban and rural population (TajStat, 2020a).

The country remains the poorest of the Commonwealth of Independent States (CIS) and has significant food shortages. Along with internal challenges, the country is exposed to external shocks and stresses, primarily due to the strong dependence on remittances from migrant workers. For rural households, remittances play an important role as a source of income – in 2011, remittances matched income from agricultural activities (FAO, 2020b). The poorest households heavily rely on remittances in financing their yearly consumption, both rural (up to 80 percent through remittances) and urban (up to 50 percent) (Danzer, Dietz and Gatskova, 2013). The main reasons for migration are poverty, low incomes, and unemployment, particularly among young people, aggravated by high population growth rates. Labour migration is a predominantly male phenomenon (87 percent of all Tajik migrants in 2009). More than a million Tajik citizens work abroad, with around 90 percent of those in the Russian Federation – and more than half of those in Moscow (Danzer, Dietz and Gatskova, 2013).

For a long time, Tajikistan ranked first among CIS countries in terms of the share of remittances as a portion of GDP. According to the World Bank (2018), the share of Tajik migrant remittances in 2013 amounted to 40 percent of GDP. However, around 2015, the economic crisis in the Russian Federation led to a reduction in remittances from Tajik emigrants. At that time, the country's GDP growth rate declined from 6.7 percent to 4.2 percent. Over the past few years, the share of remittances in Tajikistan's GDP dropped to around 30 percent, which remains one of the highest in the world (World Bank, 2018).

According to the Central Bank of the Russian Federation, the volume of remittances from the Russian Federation, which make up 90 percent of all transactions to Tajikistan, amounted to almost USD 2.96 billion in 2019. However, this figure is not complete as it does not take into account the significant amount of funds exported in cash (Bank of Russia, 2020). This dependence on remittances, along with a 2 percent increase in population, creates additional pressure on the country's economic development and the pace of poverty reduction. It is also important to mention that the COVID-19 pandemic, at the beginning of 2020, led to a significant drop in remittances. Many migrant workers were not able to send money to their families in Tajikistan due to the quarantine measures introduced in the Russian Federation, aggravating existing problems in the area of food security and rural poverty (UNICEF, 2020).

Tajikistan faces a challenging food security situation. Limited access to high-quality food, as a result of the adverse impacts of natural and biological hazards on agriculture, contributes to food and nutrition insecurity. According to the Global Hunger Index, Tajikistan has the highest rate of malnutrition among former USSR countries (GHI, 2021). At present, the nutritional indicators in Tajikistan are the worst of all Central Asian countries. No data was available on the prevalence of undernourishment in the country over the past few decades. Tajikistan also showed one of the highest rates of food insecurity in the ECA region – on average over the 2016–2018 period, 9.6 percent of the population experienced a severe level of insecurity, and 30 percent a moderate or severe level (FAO, 2019). According to the 2018 Fill the Nutrient Gap analysis, an estimated 30 percent to 56 percent of households – depending on the region – cannot afford a nutritious diet. Individuals that have a greater nutrient requirement (for example pregnant and lactating women and girls) are among the most affected (WFP and MoH, 2018). The COVID-19 pandemic is expected to decrease household income, especially for the poorest, and increase rates of acute malnutrition.

The latest data from the 2017 National Demographic and Health Survey suggests that 26 percent of children under five are stunted and 10 percent are underweight (TajStat, MoH and ICF, 2018). However, over recent

decades there has been quite a significant reduction in the prevalence of stunting, wasting and overweight among children younger than five years of age (FAO, 2019). Some of the main factors causing malnutrition are inadequate breastfeeding practices and inadequate intake of food by young children, of whom only 20 percent receive a regular and balanced diet. The lack of nutrients significantly affects the health of children and future generations – currently, 53 percent of schoolchildren suffer from iodine deficiency, and 28 percent of children aged six to 59 months have anaemia (WFP, 2017). In 2016, 30.5 percent of women of reproductive age had anaemia (FAO, 2019). Although the rate of malnutrition has decreased in the past decade, the number of those undernourished has remained stagnant.<sup>5</sup> Malnutrition is a significant health problem, and more prevalent in remote areas. Local capacities are inadequate to implement effective and integrated food security and nutrition policies and programmes (MoH, 2019).

Tajikistan's vulnerability to climate change further threatens the country's food security. Adverse climate conditions can affect people's livelihoods and can lead to a negative impact on agricultural productivity, which may result in a reduction in yields. More frequent drought, flooding, and landslides have reduced agricultural productivity, increased losses, and damaged farming livelihoods. Small agricultural plots limit household production and income, while climate change, manifested in rain variability and increasing temperatures, compounded by limited livelihood diversification, hampers smallholder productivity and incomes. Simulations based on household data show that a 20 percent decline in agricultural productivity can increase the national poverty rate by 13 percent, and the poverty gap by 24 percent. In addition, it can also result in an increase in relative food prices. A 20 percent increase in relative food prices can increase the poverty rate by 16 percent and the poverty gap by 25 percent (ADB, 2016). All of these adverse effects will likely have a stronger impact on people residing in rural, rather than in urban, areas as the former has a larger concentration of the population living on the poverty line. Thus, even a modest decline in income or purchasing power will likely have a significant impact on rural poverty (Heltberg, Reva and Zaidi, 2012). Overall, insufficient resources are being deployed for climate-change adaptation and emergency response.

At the same time, food availability is affected by low agricultural production and reliance on food imports. Tajikistan is highly dependent on food imports – half of all wheat is imported, and imported retail food products account for 60 percent of the total (Government of the Republic of Tajikistan and WFP, 2018).

Food product price increases is greatly affected by disruptions and is a key factor in income poverty. The COVID-19 pandemic has demonstrated the sensitivity of local food prices. The retail prices of key staple foods in Tajikistan have risen sharply following the outbreak of the pandemic. With over 40 percent of household expenditure on food, a significant price increase in staple food in 2020 has further undermined affordability for thousands of low-income households. The COVID-19 crisis has negatively affected transportation, storage, sales, and access to finance. Farmers have also reported difficulties in procuring seeds and fertilizers, feed, medicines, and other veterinary products for livestock (FAO, 2020a).

In 2019, Tajikistan adopted the Programme for the Prevention of Obesity and the Formation of a Healthy Diet for 2019–2024. According to a study by the Ministry of Health and Social Protection of Population (MoH) of Tajikistan (2019), 17 percent of the population are overweight, and 11.3 percent are obese. In addition, obesity was detected in almost 5 percent of school-age children (Government of the Republic of Tajikistan, 2019b). While this parameter is relatively low compared to countries in the ECA region, the prevalence of obesity is growing at a fast pace – a 4.7 percent growth rate for the 2010–2016 period (FAO, 2019). The Tajik Statistics Agency claims that Tajiks often overeat, consuming 2 617 calories per household member in the country. This is slightly above the norm recommended by the World Health Organization (WHO). The relationship between food and nutrition insecurity and poverty is clear, as households with lower incomes spend less on quality products, select cheaper and less nutritious foods. A high dependence on remittances and food imports, as well as low export diversification, are among the factors that affect the country's food system at various levels, as well as people's food and nutrition security status.

<sup>5</sup>According to the 2017 Demographic and Health Survey, stunting among children under five years of age fell from 27 percent in 2012 to 17 percent in 2017. With an annual population growth rate of 2.5 percent, however, the current decline rate is insufficient to meet the 2025 target of a 40 percent reduction in the number of stunted children under five years of age.

# Regulatory framework of disaster risk reduction system for agriculture

## Legal framework in support of DRR, EWS and agrometeorology services

The legislation of Tajikistan regulates the issue of disaster risk management in the country. It defines the organizational and legal provisions for the protection of the population, property, land, water, environment, industry, flora and fauna, as well as other natural resources from disasters.

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### International conventions

Tajikistan is party to the following international treaties and conventions on disaster risk management, climate change, and food security:

- United Nations Framework Convention on Climate Change (UNFCCC);
- Kyoto Protocol of the UNFCCC;
- Hyogo Framework for Action 2005–2015;
- Sendai Framework for Disaster Risk Reduction 2015–2030;
- Transforming our world: the 2030 Agenda for Sustainable Development;
- Paris Agreement;
- United Nations Convention to Combat Desertification;
- Convention on Biological Diversity;
- Nagoya Protocol on Access and Benefit-sharing to the Convention on Biological Diversity;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity;
- Stockholm Convention on Persistent Organic Pollutants;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal;
- Vienna Convention for the Protection of the Ozone Layer;
- Montreal Protocol on Ozone Depleting Substances.

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### Legislation on disaster risk reduction

Law on civil defence (No.6, 28 February 2004, latest amendments in 2019) defines the goals and legal basis for the organization and implementation of civil defence activities on the territory of Tajikistan. Civil defence is understood as a system of national defence and protective mechanisms aimed at protecting the population, economy, and territory of the country before and in the event of hostilities. This law acknowledges that civil

defence forces can act not only in case of war, but also in peacetime during disasters caused by natural hazards, epidemics, epizootics, epiphytotics, major accidents, and catastrophes that endanger the health of the population and require rescue and other urgent work. It does not directly mention the agricultural sector.

The main law defining the DRR and management system in the country is the Law on protection of the population and territories from natural and technological emergencies (No. 53, of 15 July 2004). It focuses on natural and technological hazards, which can lead to the loss of human life, damage to human health, environment, and so on. This law is aimed primarily at protecting the population and territories from emergency situations, focusing on prevention of the occurrence and development of emergency situations, reduction of damage and losses, and ensuring timely warning to the population. It also defines the responsibilities of state and public organizations involved in DRR, particularly prevention. In addition, a separate chapter is devoted to the issues of preparing the population and territories, including agricultural land, for emergency situations. The law states that natural hazards have a natural and climatic character. However, there are no references to international agreements on climate change and DRR included in this law. It does not directly address the agricultural sector.

The Decree on classification of emergency situations (No. 367, of 1 August 2006) classifies emergency situations by their scale (local, territorial, regional, national and cross-border) and defines the responsibilities of various actors for managing disaster response at each administrative level. It clarifies that such activities should be carried out following the directions of relevant emergency commissions, as well as involving the forces and divisions of the national Committee of Emergency Situations and Civil Defence under the Government of the Republic of Tajikistan (CoES). Neither this classification, nor the law on protection of the population and territories from natural and technological emergencies, include a clear list or definitions of types of natural hazards that are covered by these regulations. This decree does not directly mention the agricultural sector.

The Decree on State Commission of the Government of the Republic of Tajikistan on Emergency Situations (No. 799, of 30 December 2015) defines the purpose, responsibilities, and members of the commission. This decree establishes emergency commissions in ministries and agencies, local executive bodies, self-government bodies of settlements and villages, and in organizations. This State Commission is recognised as the coordinating body of the Unified State System for the Prevention and Elimination of Emergency Situations in the country. The aim of this commission is to formulate and implement unified state policy in the field of protection of the population and territories from natural and man-made emergencies, as well as to improve the readiness of governmental bodies to provide timely and effective response to disasters. A National Platform for Disaster Risk Reduction is formed under this Commission, using the existing coordination mechanism. The platform plays the role of a consultative and advisory body. The agricultural sector is in a way addressed in the structure of the commission – its members include the minister of agriculture of Tajikistan and the head of the Department of Agriculture and Environmental Protection of the Executive Office of the president.

The Decree on the formation of the National Platform of the Republic of Tajikistan for Disaster Risk Reduction (No. 98, of 1 March 2012, latest amendments in 2014) establishes the National Platform for DRR in the country and approved its regulations and structure. The platform was created under the State Commission on Emergency Situations to shape and coordinate activities related to the reduction of risks of natural and man-made disasters, as well as to the reduction of human and socioeconomic losses. The platform's another aim is to provide consultations on the integration of DRR into development strategies, plans and programmes.

The Decree on Committee of Emergency Situations and Civil Defence under the Government of the Republic of Tajikistan (No. 547, of 29 November 2017, latest amendments in 2019) defines the regulations, structure of central office, management framework and the list of involved organizations. The main priority of the committee is to ensure protection of the population, national wealth, and the territory of the country.

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## Legislation on hydrometeorology

The Law on hydrometeorological activities (No. 86, of 2 December 2002, latest amendments in 2016) establishes the legal basis for activities in the field of hydrometeorology. It aims at addressing the needs of the government and population in hydrometeorological information and in information on the state of the natural environment. This law covers observations of climate, meteorological and hydrological conditions, and changes in the natural

environment as a result of natural and anthropogenic factors. Among meteorological activities, this law mentions studying the influence of meteorological conditions on the development of agricultural crops and crop yields (through carrying out agrometeorological observations).

In Tajikistan, the Agency for Hydrometeorology of the Committee of Environmental Protection under the Government of Tajikistan is by law responsible for the collection and processing of weather data from meteorological and agrometeorological stations that are spread out across the country. The agency is also responsible for the operation and maintenance of the weather stations. Some of the main directions of state regulations in the hydrometeorological field include:

- organizing and ensuring operation and protection of the state monitoring network;
- providing government, the army, and population with information on the actual and projected state of the natural environment, including information on emergencies;
- defining requirements for information products;
- organization of state information resources in the field of hydrometeorology, creation and maintenance of a unified state fund of environmental data;
- international cooperation in the field of hydrometeorology.

Article 16 of this law focuses on hydrometeorological activities in “special conditions” – meaning disasters primarily caused by natural hazards, accidents and other emergencies. Operation in such conditions is described as an integral part of the state system for preventing and eliminating the consequences of natural and man-made emergencies. In case such events caused or can cause pollution of the natural environment, additional monitoring of observed changes is carried out. The State Committee of Environmental Protection is the governmental body responsible for hydrometeorological activities in the country, as well as for environmental protection and rational use of natural resources. According to the law, this committee is the coordinating mechanism in addressing issues related to climate change.

Regulations of the Agency for Hydrometeorology were approved by the governmental decree No. 360 of 30 May 2015 (latest amendments in 2018). The agency is part of the Committee of Environmental Protection under the Government of the Republic of Tajikistan, and is responsible for control and monitoring of environmental pollution, and active impacts on meteorological and other geophysical processes in the field of hydrometeorology.

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## Legislation on phytosanitary security and veterinary issues

The Law on veterinary (No. 674, of 29 December 2010, latest amendments in 2016) defines the basis of veterinary activities and aims at ensuring veterinary-sanitary and epizootic welfare, protection of the population from diseases (common to both animals and humans), safety of products and raw materials of animal and plant origin, veterinary medicine, forage and feed additives for animals. This law does not mention climate change, natural disasters, or DRR. At the same time, it does refer to “emergency situations” – stating that authorised governmental bodies can introduce temporary veterinary and sanitary measures. During the organization and implementation of activities related to protection of the population from diseases, common to animals and humans, as well as from food poisoning, veterinary-sanitary and epidemiological services have to be in constant communication and cooperation with the governmental organization responsible for emergency situations and civil defence.

The Law on plant quarantine and protection (No. 1567, dated 2 January 2019) provides the basis for quarantine and protection of plants, on performing quarantine phytosanitary activities, and handling plant protection products. The aim of this law is to preserve agricultural products and protect the health of people, animals and the environment. This law does not mention climate change (or climate at all), natural disasters, or DRR. However, it does briefly refer to “emergency situations” – in the definition of “especially dangerous harmful organisms” (defined as pests and pathogens of plant diseases that can create an emergency situation); and in Article 14 on the system of quarantine and phytosanitary measures (clarifying that the authorised governmental body has the right to introduce temporary quarantine phytosanitary measures in emergency situations).

The Governmental decree No. 595, of 29 December 2017, approved the regulations of the Committee for Food Security under Government of the Republic of Tajikistan. According to this document, the committee acts as

the main executive body in the field of veterinary, phytosanitary and plant quarantine, plant protection, seed production and breeding. The chairman of the committee is appointed and dismissed by the Government of Tajikistan. Regulations mention that in case of epizootics and disasters caused by natural hazards, the committee can give the permission to import veterinary medicine and animal feed additives. The committee is also responsible for the development and approval of action plans for the prevention and control of animal diseases in emergency situations.

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## Legislation on agriculture and food security

Mainstreaming of DRR in sectorial laws is quite limited. The law on state regulation of ensuring fertility of agricultural lands (No. 56, of 15 July 2004, latest amendments in 2016) defines the state policy in relation to ensuring soil fertility, including standards and regulations regarding agro-technical, agrochemical, irrigation and drainage events. Some activities, listed in the section on the conduct of scientific research in terms of ensuring the fertility of farmland, are aimed at reducing the impact of drought and flooding. Article 21 states the necessity to carry out diagnostics of agrochemical properties of soil, salinisation of land, determination of groundwater level, and taking measures to reduce the impact of flooding and drought. The law defines the process of control and management of the use of pesticides. The law states that organic fertilizers should be widely used, and that it is necessary to comply with the standards and rules for conducting agro-technical, agrochemical, ameliorative phytosanitary and anti-erosion activities. The law does not include specific mulching measures, but at the same time, it mentions the development of targeted programmes to improve soil fertility, conduct research, develop environmental requirements for soil fertility, and prepare and improve skills in this area.

The Law on soil protection (No. 555, of 16 October 2009) includes requirements for soil protection during project design and construction activities, as well as during the operation phase of business activities. The law obliges land users to take measures to restore soil fertility, prevent soil desiccation, and restore degraded soils. There is no special section on disasters and climate change. It was noted that when considering issues of improving soil fertility, it is necessary to proceed from the climatic conditions (zoning) of a specific area to the use of guidelines for the assessment of soil and the economic assessment of land. The law calls for the monitoring of soil conditions as part of state environmental monitoring.

Tajikistan's Law on food security (No. 671, of 29 December 2010, latest amendments in 2019) includes the promotion of the efficient use of irrigation facilities, development of seed production and storage. However, these measures are not mentioned within the context of climate change or natural/biological hazards, nor in relation to the importance of DRR. The law pays special attention to the allocation of state support funds on a competitive basis among national producers of agricultural products within the framework of state policy on ensuring food security. Climate change and natural hazards are not mentioned. The law includes support for agricultural producers in the development of the material base, taking into account the efficiency of land reclamation and irrigation facilities, through the leasing of agricultural machinery and equipment.

The Law on food safety (No. 89, of 1 August 2012) regulates public relations in the field of food provision in Tajikistan, with the aim of protecting human life and health, consumer interests, protecting flora and fauna, and the environment. Climate change and natural hazards are not mentioned. The law covers state veterinary-sanitary and phytosanitary supervision and control at animal husbandry facilities, unprocessed food products of animal and plant origin and circulation of agricultural products, and addresses issues on relevant veterinary and phytosanitary safety certifications. The law introduces and supervises the implementation of veterinary and phytosanitary activities in terms of compliance with the requirements of laws and other regulatory legal acts of Tajikistan that regulate the protection of flora and fauna, as well as protection of humans from animal-transmitted diseases. The Veterinary Service carries out state sanitary and veterinary control of food production at enterprises that use unprocessed food products of animal origin as raw materials for primary processing.

The Law on *dehkan* farm (No. 1289, of 15 March 2016) provides the legislative basis for the creation of private *dehkan* farms and their activities. The law allows *dehkan* farms to receive the status of legal entities and also takes into account and enshrines the rights of members of *dehkan* farms as land users. The law improves the management of *dehkan* farms and defines the rights and obligations of their members. It requires *dehkan* farms to take measures to improve soil fertility and improve the ecological condition of the land, make timely payments

for the use of water and electricity, and provide statistical information. The law does not address the impact of natural hazards or climate change on soils. Article 29 of the law includes issues related to the obligations of members of *dehkan* farms regarding the rational use of land resources. Based on this article, members of *dehkan* farms are obliged to:

- not allow agroecological, ameliorative and sanitary-hygienic condition of the land to deteriorate as a result of economic activity;
- use agricultural production methods to prevent the spread of diseases, insects and pests of plants and livestock;
- allocate funds at the expense of the *dehkan* farm to restore and improve the fertility of the land based on the decisions by members of the farm, to carry out scientifically based agrochemical, ecological and biological activities.

The Law on pasture (No. 1618, of 20 June 2019) aims to protect pastures and the environment from overgrazing by cattle and small livestock. The law does not establish a link between the adverse impact of natural hazards and climate change and further aggravation of already degraded pastures. It defines the basic principles of pasture use, including protection of pastures and the environment, as well as attracting investments for more efficient use and protection of pastures. The law prohibits the implementation of a number of activities on pastures, such as cutting down trees or shrubs, building roads, misuse of pasture land, environmental pollution by waste, and overgrazing of livestock (against the established norms). The law does not address natural hazards or related disasters (apart from a very brief mentioning of reservoirs and pastures for sanitary and anti-epizootic activities). There is no direct section on climate change in this law, although it notes its potential effect on yields and that it has to be taken into account during the development of regulations for the improvement of the state of pastures. Most of the country's pastures are on the verge of destruction and extinction, particularly those located near settlements, since some of them are turning into deserts, due to overgrazing as a result of the substantial increase in the number of cattle and small livestock. The law requires users to ensure effective pasture use, including the protection of pastures from degradation and pollution. It calls for conducting geobotanical studies on pastures to assess the potential productivity of natural forage land.

For the development of fisheries, the Decree of 2 July 2008 No. 306, creating the Programme for the development of the fish farming industry in the Republic of Tajikistan for the period 2009–2015, was adopted. This programme is designed to preserve, increase the number, improve the genetic, productive qualities of fish, as well as provide the population with food and create new jobs. It was also aimed at restoring existing fish farms and creating new fish farms, regardless of ownership. The main law governing the legal framework for fishing activities is the Law of the Republic of Tajikistan on fish farming, fishing and protection of fish resources, adopted on 19 September 2013 under No. 1021. The fishing industry is currently exempt from all types of taxes, except social tax and contributions to the pension fund, which also contributes to the development of the sector.

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## Legislation related to disaster risk insurance in agriculture

The Law on protection of the population and territories from natural and technological emergencies (No. 53, of 15 July 2004) states that disaster response and recovery should be primarily financed by local government and agencies in the area where the disaster occurred. In case local recourses are exhausted, funds from higher-level organizations (regional or national) can be used, particularly from the Contingency Fund. National and local governments are responsible for creating necessary material and financial reserves to be able to provide timely response to disasters. The law also declares that the population has a right to receive compensation for losses after disasters caused by natural hazards. The size of this compensation should be defined according to the relevant law (however, no specific law is referenced in the text).

The Law on national finances of the Republic of Tajikistan (No. 723, of 28 June 2011, latest amendments in 2018) defines the legal framework for public financial management in the country, addresses systematization of the budget, and defines the use of the national budget. It includes a provision indicating that the expenses for the disaster response and recovery activities are financed exclusively from the national budget. At the same time, it also indicates that both national and local budgets jointly can finance activities on disaster prevention and response.

The Law on insurance (No. 1349, of 23 July 2016) defines the framework for the insurance business in the country and establishes the legal, economic and organizational basis of insurance activity. It aims to ensure the protection of the property interests of individuals and legal entities in the event of insured events. This law mentions natural hazards in its definitions of “insurance against other financial losses” and “accidents”. There are currently no provisions on disaster insurance, the law does not address agricultural insurance specifically, or for any other sector. Nevertheless, the Decree on the approval of rules of post-disaster financing (No. 699, of 30 December 2009) states that all people and property must be insured against disasters. During the World Bank workshop on disaster risk finance held in Tajikistan in September 2017, it was reported that the government often mandates the public insurance company to pay even uninsured people affected by a disaster (Takeuchi *et al.*, 2019). Agricultural insurance is mentioned more clearly in the Law on dehqan farm (No. 1289, of 15 March 2016), which states that such farms have the right to insure their property (including crops, livestock, fixed assets and other property) on a voluntary basis.

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## Legislation on management of natural resources

The Land Code of the Republic of Tajikistan (No. 326, of 13 December 1996, latest amendments in 2016) regulates land relations and is aimed at supporting rational use and protection of land, reproduction of soil fertility, and preservation and improvement of the natural environment. It does not directly address climate change, natural hazards or emergencies in general. The only section related to this topic covers the use of lands that belong to the state water fund – the code specifies that such lands can be used for the construction of bank protection structures, flood control dikes and dams, which prevent or eliminate the harmful effects of water-related hazards (flooding, inundation, water logging, salinisation of land, soil erosion, formation of ravines, landslides, mud flows). These lands can also be used for the construction and reconstruction of hydrotechnical structures for irrigation of farmland, and used for agricultural purposes (for gardens and plots) on the coastal strips. One of the main principles of land legislation is to provide state support to increase the fertility of farmland, improve the quality of the reclaimed land, and protect land resources. Article 23 of the Land Code describes the provision of land for agricultural needs, while Chapter 11 focuses on the regulations related to farmland.

The Law on environmental protection (No. 760, of 2 August 2011, latest amendments in 2017) aims at ensuring sustainable social and economic development, protecting the human right to a healthy and safe environment, strengthening the rule of law, preventing negative impacts of economic or other activities on the environment, organizing sustainable use of natural resources and ensuring environmental safety. The Committee of Environmental Protection is the governmental body responsible for this field. The law does not mention climate change, but it does address natural hazards and other types of emergencies in general. Article 29 covers norms for the use of fertilizers, pesticides and other chemicals in agriculture, forestry and other sectors of the economy. Article 45 specifically focuses on environmental requirements in agriculture and forestry, and article 46 on environmental requirements in planning, design and performing land reclamation activities.

The Forest Code of the Republic of Tajikistan (No. 761, of 2 August 2011) states that the purpose of forest management and reforestation is to preserve and improve the state of forests, preserve their biological diversity, and help reduce the effects of global warming and other natural phenomena. The code acknowledges climate-regulating, environmental, soil protective, water protective and other protective functions of forests. The document mentions that forests are insured against natural hazards, fires, harmful insects, other pests and diseases. Chapter 3 of the code addresses preservation and protection of forests. Article 18 focuses specifically on the protection of forests from harmful insects and diseases.

The Water Code of the Republic of Tajikistan (No. 1688, of 2 April 2020) regulates public relations related to ownership, use and management of water and water bodies. It aims at the protection and rational use of water resources, as well as the legal protection of water users. The code states that the authorised governmental body in the field of environmental protection (Committee of Environmental Protection), is responsible for the implementation of state policy in the field of water resources protection, hydrometeorology, biodiversity and climate change. The Government of Tajikistan is responsible for the development, adoption and implementation of forecasts, concepts, strategies, programmes, projects and activities related to the prevention, reduction and elimination of consequences of water-related emergencies, protection of territories from the harmful effects of water, and major accidents. The government is also responsible for declaring a special water use regime within areas affected by an emergency.

Local government is responsible for carrying out activities to preserve and improve the state of water bodies; to prevent and eliminate harmful effects and water pollution; to restore infrastructure damaged as a result of accidents, flooding, mudslides and other natural hazards. In case of disasters caused by natural hazards, accidents, water shortage and other exceptional circumstances, local government has the right to reduce or prohibit the intake of drinking water from the municipal network for industrial purposes. It can also temporarily restrict water intake from institutional water supply systems, to prioritize the population's needs in drinking and household water. Monitoring of water bodies on the national level is carried out for observation, evaluation and forecasting of changes in the state of water bodies. Data and information collected through this monitoring is included in the national water information system and the Unified State System of the Republic of Tajikistan for the Prevention and Elimination of Emergency Situations. Use of water resources for emergency response, as well as for irrigation and forestry, carried out by state bodies, is free of charge. Article 67 of the water code focuses specifically on the use of water for agricultural purposes.

# National disaster risk reduction and sectoral policies, plans and strategies

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## National Strategy on Disaster Risk Reduction for 2019–2030

The National Strategy on Disaster Risk Reduction for 2019–2030 was approved by the Government of Tajikistan by Decree No. 602 of 29 December 2018. The goal of the strategy is to prevent and reduce existing and new disaster risks by building up national capacity for managing these risks (Government of the Republic of Tajikistan, 2018). Four key tasks will be directed towards the realisation of this goal:

1. First, to reduce by 2030 the number of dead and injured people, and volume of damage caused by disasters, compared to 2005–2015.
2. Second, to ensure that all interested parties have access to information about the risk of disasters.
3. Third, to integrate disaster risk management measures into the development process.
4. Fourth, to improve disaster preparedness and response mechanisms.

The strategy was developed taking into account compliance with international agreements with regard to DRR set forth in the Sendai Framework for Disaster Risk Reduction 2015–2030, climate change in the Paris Agreement and sustainable development in the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (SDGs).

Agriculture and food security are mentioned in the strategy, as one of its strategic objectives to ensure food security and access of the population to quality nutrition, based on the development of agriculture. The sector is one of the priority sectors of the country's economy. Climate change is linked to extreme weather conditions as well as the dependence of the agricultural sector on the availability of water for its rainfed crops as well as for irrigation, as discussed in Chapter 3 of the strategy. It states that drought is anticipated to happen more frequently as a result of rising temperatures, which will lead to increased water loss due to evaporation and reduced snow cover. In addition, it is expected that in the future, drought will periodically affect rainfed crops, including the main food crops and the income sources of the rural population, with the adverse impact of hailstorms possibly damaging and destroying crops.

Successful coping with disasters, which may be the result of the expected climatic changes that will likely take place, including rising temperatures and drought, requires the improvement of EWS and existing risk reduction and management measures, as well as the development of new approaches to mitigate and adapt to these phenomena. Unfortunately, the national DRR strategy lacks concrete measures, because at present, a medium-term programme is being developed and the budget for activities is not yet determined. Some actions to reduce the impact of disasters are defined in the Medium-Term Development Programme of the Republic of Tajikistan for 2016–2020, outlined below. In 2021, in accordance with the Medium-Term Development Programme for 2021–2025, a Mid-Term DRR Programme, a monitoring system and an action matrix were envisaged.

## National Development Strategy of the Republic of Tajikistan until 2030

The National Development Strategy (NDS) was approved by parliament on 1 December 2016 and envisages the integration of measures aimed at reducing the risk of disasters on the development of the economy and other activity areas (Government of the Republic of Tajikistan, 2016). In terms of food security and public access to quality nutrition, the following tasks were set:

- promoting agrarian and water reforms;
- ensuring the economic and physical accessibility of food based on the stable growth of the agro-industrial sector;
- diversifying agricultural production, including innovation, taking into account the minimum impact on the environment and the quality of land. The NDS sets strategic directions, including on issues of innovation and reducing greenhouse gas emissions within the context of the Paris Agreement;
- increasing the availability of improved seeds and fertilizers on the domestic market, increasing agricultural production by promoting the use of new agricultural methods and technologies. Within the context of DRR measures for agriculture, the promotion of drought-resistant crop varieties as well as flood reduction practices, which are included in the programme of agricultural reform for 2012–2020;
- creating an effective risk management and monitoring system for food security and nutrition in order to support the production and import of vital food products as well as the establishment of a monitoring system for food, effective functioning of EWS and set up and maintenance of emergency reserves. The strategy outlines the responsibilities of the various sectorial ministries and departments with regard to the establishment of this risk management system for food security and nutrition. For example, the Ministry of Labour, Migration and Employment of Population in collaboration with the Ministry of Health and Social Protection of Population, is developing a minimum food basket. The monitoring of the strategy, including food security, is carried out by the Ministry of Economic Development and Trade, together with the Agency of Statistics under the President of the Republic of Tajikistan (TajStat). Moreover, TajStat publishes a quarterly statistical bulletin on food security and poverty;<sup>6</sup>
- promoting an effective multi-sectorial approach to improve nutrition through the coordination of policies in agriculture, health care, social protection and raising awareness of nutritional values and effective financing policies;
- establishing a land and water management system based on the equitable and sustainable distribution for the cultivation of valuable crops;
- ensuring the sustainable functioning of the maintenance and operational systems for irrigation and drainage-related infrastructure, as a basis for sustainable irrigated farming, food security, rural employment and poverty reduction;
- improving the market for agricultural products so that producers have direct access to it.

The NDS identifies Tajikistan's high risk and vulnerability to natural hazards and climate change as one of the main challenges for the development of the country. The strategy includes as main areas DRR, within the context of climate change, the building of the national institutional capacity for disaster prevention, mitigation and preparedness. A special chapter in the strategy is devoted to the adoption of specific measures for disaster prevention.

Agriculture is mainstreamed in the strategy and some issues are mentioned in relation to climate risks, such as the adverse impacts of climate change on the sector, as well as the low level of environmental sustainability of agricultural development associated with increased degradation of land and water, erosion, pollution, salinisation, waterlogging, rising groundwater levels, and deforestation due to the conversion of forest areas to farmland. As a result, some of the priority areas for the sector include ensuring the availability and sufficiency of food, their quality and safety through the introduction of innovative and environmentally friendly technologies, reconstruction and restoration of existing irrigation infrastructure, as well as the introduction of modern technologies for energy-efficient irrigation.

<sup>6</sup>One example of such a bulletin is TajStat, 2020a.

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## National Strategy for Adaptation to Climate Change until 2030

On 2 October 2019 through decree No. 482, the government adopted the National Strategy for Adaptation to Climate Change for the period until 2030 (Government of the Republic of Tajikistan, 2019a). In this strategy, agriculture is selected as one of the priority sectors which is at risk to be adversely impacted by climate change. The main risks for agriculture identified include an increase in average temperature, more frequent extreme temperatures, extreme precipitation, drought, seasonal changes in river flows and runoffs, the potential disappearance of glaciers and a decrease in water flows, increased weather variability, changes in time scales, distribution of rain and precipitation, cycles of frost and thaws, dust storms, water shortages, changes in the population and outbreaks of plant pest and diseases, and seasonal shifts in temperature.

The main adaptation measures related to climate change in agriculture include: promoting improvement of soil conditions and protection from erosion, as well as managing water resources and drainage systems, promoting the development of pasture management schemes, introducing crop diversity and increasing knowledge on plant breeding, creating community seed banks, especially for drought and disease-resistant crops, improving community storage systems for crop storage and reduce food losses, distributing drought-resistant seeds, implementing good practices and enhancing knowledge on how to protect plants from frost and developing insurance options for crops from drought.

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## Medium-Term Development Programme for 2016–2020

In order to implement the NDS, the government developed the Medium-Term Development Programme for 2016–2020. This programme describes specific activities, including certain indicators for DRR, such as:

- development and implementation of a “roadmap of action” to adapt the priorities of the Sendai Framework for Disaster Risk Reduction 2015–2030 into the national disaster management system;
- adoption of a national action plan on the establishment of a national system for monitoring and forecasting emergency situations;
- ensuring the preparation of an atlas and conducting disaster risk mapping for all the country’s regions and ensuring inter-agency coordination and accessibility to information;
- development and implementation of mechanisms to reduce social vulnerability as a result of disasters.

The programme also identifies the following DRR-related activities:

- establishment of a system or action package to ensure support to disseminate information about disaster risks, provide training and undertake thematic events at local communities, ensuring that a gender perspective is included;
- development, approval and implementation of a roadmap to strengthen the resources of the disaster response system, including establishment of the information database, training and attracting investments;
- conducting a gender analysis of the results of the 2013 agricultural census and the development of gender sensitive recommendations for agrarian reform;
- development of a climate change and DRR system to mainstream DRR in strategic regional policy and planning documents and to strengthen the local risk and emergency management capacity to natural hazards.

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## Medium-Term Development Programme for 2021–2025

In order to further implement the NDS, the Resolution of the Government of the Republic of Tajikistan (No. 168, dated 30 April 2021) adopted an updated Medium-Term Development Programme for 2021–2025. A distinctive feature of the updated programme is that it takes into account the negative impact of the crisis in the global economy, provoked by the COVID-19 pandemic. One of the strategic tasks of the updated programme

is to ensure food security and access of the population to quality food. In order to ensure this, it includes the following opportunities and priorities:

- conduct an inventory of land of all categories in order to introduce a land cadastre in the country and support further targeted and efficient use of land resources;
- improve the structure of seed farms and increase their capacity and efficiency;
- develop and stimulate fish farming in order to increase fish production in the country;
- support food security measures in the country by obtaining two to three harvests of agricultural products through improving land management, expanding the mechanism of public–private partnership in this area, and increasing the area of modern greenhouses;
- by 2025, achieve food self-sufficiency by 70 percent, and for basic foods (wheat, potatoes, vegetable oil, rice) achieve 80 percent self-sufficiency;
- increase food security and improve food quality through the application of principles of organic agriculture and principles of green trade;
- rehabilitation of irrigation and drainage systems to improve the reclamation of saline lands and wetlands.

To achieve the set goals and objectives, the following activities have been identified:

- strengthen the implementation of forecasting policy taking into account climate change and the structure of the consumer market, to prevent crop losses;
- improve normative legal acts regulating the list of chemicals used in agricultural production in Tajikistan;
- develop a national crop insurance system for *dehkan* farms;
- search for effective ways to export agricultural products abroad by creating a structure for the export of agricultural products and the possibility of state support for activities in the field of taxation, transport benefits and other organizational and economic issues;
- create a unified information system for informing agricultural producers about forecasts of hydrometeorological conditions;
- develop action plans for adaptation to climate change in the agricultural sector at all levels, taking into account different agroecological conditions in Tajikistan.

A dedicated section of the Medium-Term Development Programme for 2021–2025 covers objectives and goals focused on environmental protection, climate change and disaster risk management. The main goals (priorities) of this section are:

- ensure the development of the national system of adaptation to climate change;
- strengthen and develop national capacities to reduce and prevent new natural disasters.

To achieve these goals, the following activities have been identified:

- increase the capacity of authorised government bodies and civil society in adaptation to climate change and disaster risk management;
- improve the institutional and legal framework of disaster risk management systems;
- support and increase investment in DRR measures aimed at strengthening the country's capacities.

The main measures to achieve the set goals and objectives include:

- strengthen the role of the National Platform for Coordination of DRR Activities implemented by government agencies together with the international community;
- develop a system for monitoring and evaluation of progress in disaster risk management, taking into account the issues of adaptation to climate change;
- define a system of target indicators, including gender-sensitive indicators, to achieve national, sectoral and regional adaptation goals and approve methodological recommendations for assessing climate risks, develop sectoral and regional plans for adaptation to climate change;
- develop an adaptation plan and proactive mitigation of climate change and disaster risks in key sectors of the economy to attract investment from development partners and the private sector;

- strengthen natural disasters warning system based on the use of information and communication technologies, adaptation to climate change and other vital aspects;
- develop a national action plan for DRR for 2022–2026;
- create an enabling environment for the introduction of new technologies to reduce the impact of climate change and support disaster risk management;
- develop mechanisms and procedures for assessing natural disasters in accordance with international best practices and ensure their implementation by government authorities.

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## Agriculture Reform Programme of the Republic of Tajikistan for 2012–2020

This programme links some of the issues related to agricultural development to natural hazards and climate change, thereby indicating that the latter will further aggravate these issues. For instance, the effects of many years of intensive use of fertilizers and chemicals lead to salinisation and soil erosion, along with illegal and intensive logging of trees and shrubs across the country, resulting in deforestation, desertification and degradation of the soil. This is exacerbated by the impact of climate change and natural hazards such as drought, flooding and landslides.

The role of the Ministry of Agriculture is highlighted to urgently address these issues, through research and introduction of alternative crops, like drought-resistant varieties. Furthermore, the following other DRR and climate-change adaptation measures are mentioned:

- The widespread use of successful practices based on the principle of joint pasture management and forestry with an emphasis on the rehabilitation and protection of natural resources as well as recycling (re-use).
- The testing of sustainable land practices, for example minimum or zero tillage, transverse tillage on slopes, contour terracing, use of cover crops, greater application of organic fertilizer to reduce the impact of chemicals and mineral fertilizers so as to improve soil fertility.
- Dissemination of low-cost water-saving and conservation technologies, such as rainwater harvesting at the household and *dehkan* farm level, use of drip irrigation, application of mulching, and so on.
- Transition from monoculture to diversification and agri-biodiversification and the introduction of alternative and adaptive agricultural technologies, such as drought-resistant, disease and pest-resistant crops, to reduce the impact of climate change.
- Development and establishment of information management systems that allow *jamoat* villages and local authorities to efficiently collect, record and analyse information that is accurate and reliable on the impact of natural hazards and climate change.

An action plan for the implementation of the Medium-Term Development Programme for 2021–2025 has a section dedicated to the improvement of the agricultural management policy of the country. In this section, it indicates that it is planned to adopt a number of programmes, including: a mid-term programme until 2025 on interdepartmental coordination to strengthen the institutional framework for agricultural development; a mid-term programme until 2025 to prevent degradation of water, land and pastures; a mid-term action plan to improve household nutrition; develop a programme until 2025 to introduce modern agroecological technologies based on international experience and traditional methods.

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## Pasture Development Programme of the Republic of Tajikistan for 2016–2020

The Pasture Development Programme was established by the government through decree No. 724, on 28 November 2015. At present, this programme (as well as the previous programme for 2009–2015) aim to increase the volume of pasture forage, enhance the number of livestock, and the production of meat and dairy products. The 2009–2015 programme envisaged activities such as cleaning pasture sites from stones and shrubs, purchase of sown grass seeds, use of machinery and equipment for sowing, purchase of fuel and lubricants, protection of pasture plots and building bridges and repairing roads for pasture use that were previously not used. The 2016–2020 programme focuses additionally on the provision for the purchase of mineral fertilizers and improvement of pasture status through primary and surface treatment. Specific DRR and climate-change adaptation measures are, however, not included in either programme. The new Pasture Development Programme (after 2020) will

most likely be formulated only after the adoption of the Medium-Term Development Programme for 2021–2025. The medium-term programme covers various areas and directions, and more specific sectoral programmes are normally developed based on this guiding document.

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## National Action Programme to Combat Desertification in the Republic of Tajikistan

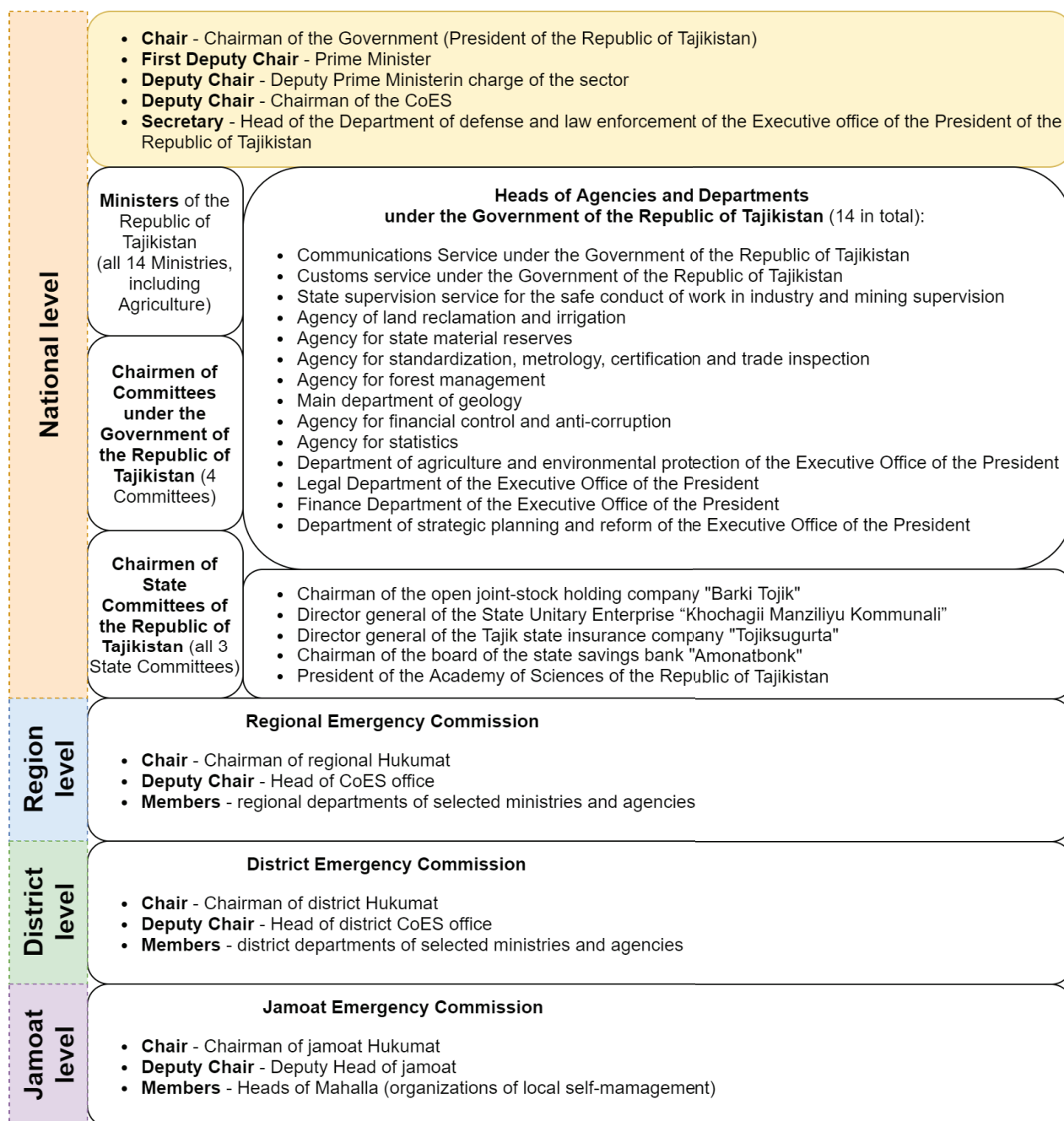
The National Action Program to Combat Desertification was approved by the government through decree No. 598 on 30 December 2001. It aims to combat desertification. There is no section on climate change in the programme; however, the link between desertification and natural hazards is established. It is expected that an increase in temperatures will have a noticeable effect on grassy vegetation. In high mountain pastures and alpine meadows, this effect is likely to be favourable, while the state of winter pastures and hayfields, through a decrease in precipitation and an increase in temperature, may worsen. The final section of the programme includes an action strategy to combat desertification, including the creation of an information system with regard to the country's desertification issues, the monitoring of areas in terms of the extent of soil degradation, improvement of anti-erosion methods to combat soil degradation, and the implementation of environmental management-related activities.

# Institutional structure of the disaster risk reduction system for agriculture

## State Commission of Emergency Situations

The State Commission of Emergency Situations is the governmental body responsible for formulation and implementation of the unified state policy in the field of protection from natural and man-made emergencies and coordinates the Unified State System for the Prevention and Elimination of Emergency Situations in the country. Apart from the national level commission, similar emergency commissions are established in ministries, agencies, local executive bodies, in settlements and villages, and organizations. The structure of the emergency commissions at different levels is presented in Figure 5. The commission also manages the National Platform for Disaster Risk Reduction, which was established based on the existing coordination mechanisms.

Figure 5. Structure of emergency commissions at different levels



Source: Governmental decree on State Commission of the Government of the Republic of Tajikistan on Emergency Situations (No. 799, of 30 December 2015); Preventionweb, 2008.

## National Platform for Disaster Risk Reduction

The National Platform for DRR was established in 2012, as part of the Commission of Emergency Situations. The platform serves as a consultative and advisory body for coordination of governmental agencies and international organizations involved in DRR and management activities in Tajikistan. It aims at creating mechanisms to ensure political and legal commitment towards disaster risk management and reduction; understanding and strengthening scientific knowledge of disaster risk governance and reduction principles by the public and government; mainstreaming DRR issues into the operation of the state, the private sector, as well as international investment and grant projects. The Main Department for Protection of Population and Territories of the Committee of Emergency Situations and Civil Defence (CoES) acts as the Secretariat

of the platform. Members of the platform include government authorities, ministries and agencies, local and international non-governmental organizations, the private sector and civil society. The platform is headed by the deputy prime minister of Tajikistan, who is responsible for emergency management. The chairman of the CoES is the first deputy of the platform; the head of the Department of Defence and law enforcement of the Executive Office of the President is the deputy of the platform; while the head of the Main Department for Protection of Population and Territories of the CoES is the secretary of the platform (National Platform for DRR, 2018). Other members of the platform include:

- deputy ministers of the selected ministries (Ministry of Justice, Ministry of Agriculture, Ministry of Education and Science, Ministry of Energy and Water Resources, Ministry of Finance, Ministry of Transport, Ministry of Health and Social Protection of the Population, Ministry of Industries and New Technologies);
- deputy chairs of the selected committees (Committee of Land Management and Geodesy, Committee of Investments and Management of State Property, Committee of Environmental Protection, Committee of Television and Radio);
- deputy director of the Agency for Land Reclamation and Irrigation under the Government of Tajikistan;
- deputy head of the Main Department of Geology under the Government of Tajikistan;
- vice-president of the Academy of Sciences of the Republic of Tajikistan;
- director of the Institute of Geology, Seismic Resistant Construction and Seismology of the Academy of Sciences of the Republic of Tajikistan;
- deputy of general secretary of the National Red Crescent Society, Tajikistan.

Observers of the National Platform for DRR are: the World Bank; Rapid Emergency Assessment and Coordination Team (REACT); UN agencies (UNDP, FAO, UNDRR, UNICEF, WHO, WFP, UNHCR, UNOCHA); International Federation of Red Cross and Red Crescent Societies; international and other non-government organizations; project coordinators from organizations working in the area of DRR, poverty reduction and economic development. The platform meets as necessary, but not less than once per quarter (National Platform for DRR, 2018). The UNDP in Tajikistan and the Swiss Office for Cooperation are supporting capacity development of the National Platform for DRR.

# Committee of Emergency Situations and Civil Defence

The State Committee of Emergency Situations and Civil Defence under the Government of Tajikistan (CoES) is the central executive body responsible for implementing state policy in the area of emergency management and civil defence in the event of natural and man-made hazards (at the ministry level). It is also responsible for normative legal regulation, provision of public services and management of state property, preparation and protection of the population and economic facilities, as well as coordinating the complex nationwide, legal, defence and other measures. The committee determines priorities in the relevant areas and coordinates the allocation of funds to disaster management activities. The Head Office of the CoES has the following departments: Office of the Chairman; General Directorate of Civil Defence; General Directorate of Protection of Population and Territory; Department of the Armed Forces; Department of Construction and Management of Facilities; Department of Human Resources and Personnel Management; Department of International Cooperation; Department of Financial and Economic Management; Medical Department; Crisis Management Centre; Legal Department; Public Relations Department. The structure of the committee includes the following operational sections (CoES, 2018a):

- Head Office;
- Department of Specialised Search and Rescue Services;
- Department of Logistics, Food Security and Transport;
- Sarez Lake Department;
- Offices of the CoES in Gorno-Badakhshan Autonomous Region (GBAO), other regions of the country and the city of Dushanbe;
- Department of the CoES for the Kulob districts of the Khatlon region;
- City- and district-level departments and offices of the CoES;
- Rapid response rescue teams in GBAO, other regions, Dushanbe, other cities and Districts of Republican Subordination;
- Anti-hail Service;
- Civil defence forces.

The following organizations are also part of the CoES (CoES, 2018a):

- Republican Training Centre;
- Republican Chemical and Radiometric Laboratory;
- Military hospital;
- Republican paramilitary mountain rescue services in the cities of Khujand, Nurek, and Rogun.

The committee supports coordination and cooperation with international, bilateral and local organizations. In 2001, under the leadership of the CoES, with the support from the UNDP Natural Disaster Risk Management Programme, a Rapid Emergency Assessment and Coordination Team (REACT) was created with the aim of enhancing coordination on emergency response. This group consists of more than 70 members representing international and local organizations working in the field of disaster management in the country (J. Kamolov, personal communication, 2019).

# Unified State System for the Prevention and Elimination of Emergency Situations

The Unified State System of the Republic of Tajikistan for the Prevention and Elimination of Emergency Situations was established through the governmental decree No. 833 (of 31 December 2014) that defined its structure and functions. By the decree No. 799 (of 30 December 2015), the coordination of the Unified State System is put in the hands of the State Commission of Emergency Situations. Disaster prevention activities in Tajikistan are carried out within the framework of this Unified State System, which encompasses coordinating bodies that are emergency commissions at the national, regional, city, and district levels, at the level of *jamoats*, (sub-district administrative units), as well as organizations. The structure of these commissions, headed by a senior official at the appropriate level, includes representatives of all relevant government bodies (the members of emergency commissions at different levels were shown on Figure 5). The permanent operating bodies of the Unified State System are:

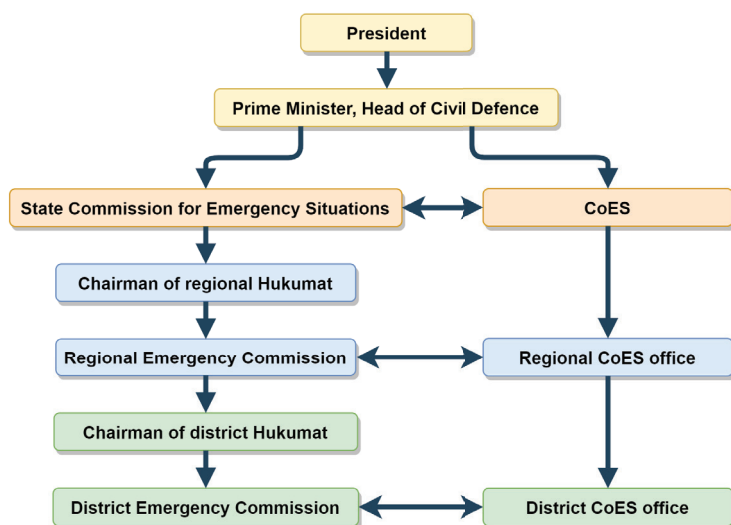
- at the republican/national level – the CoES, divisions of ministries and departments, authorised organizations with functional subsystems of the Unified State System to accomplish tasks in the area of protection of the population and territories from emergency situations and/or civil defence;
- at the regional level – regional bodies of the CoES (offices of the CoES in the regions of the country and in the city of Dushanbe), authorised to accomplish tasks in the area of protection of the population and territories from emergency situations and/or civil defence;
- at the territorial level – territorial bodies of the CoES, city- and district-level departments and offices of the CoES, authorised to accomplish tasks in the area of protection of the population and territories from emergency situations and/or civil defence;
- at the local level - persons authorised to accomplish tasks in the area of protection of the population and territories from emergency situations and/or civil defence at local government bodies;
- at the local level (community) – structural units of individual organizations, authorised to accomplish tasks in the area of protection of the population and territories from emergency situations and/or civil defence.

In more general terms, the national disaster management system of Tajikistan is presented in Figure 6.

These emergency commissions created at various levels (republic, regional, district and facility) are responsible for making decisions and coordinating actions in case of an emergency. The activities of the Unified State System consist of the planning, preparation and implementation of measures to protect the population and territories. Depending on the situation, there are three functioning modes of the system:

- daily activities' mode – the functioning of the system under normal production and industrial, radiation, chemical, biological, seismic and hydrometeorological conditions with the absence of epidemics, epizootics, epiphytotic;

Figure 6. National disaster management system of Tajikistan



Source: based on ADRC, 2020.

- high-preparedness mode – the functioning of the system in case of deterioration of the production and industrial, radiation, chemical, biological, seismic and hydrometeorological conditions, obtaining a forecast of the possibility of emergency situations;
- emergency mode – the functioning of the system in the event of emergency situations (J. Kamolov, personal communication, 2019).

The following 25 ministries and agencies are included in the Unified State System, involved in the prevention and elimination of emergencies:<sup>7</sup>

1. Ministry of Internal Affairs
2. Ministry of Defence
3. Ministry of Agriculture
4. Ministry of Economic Development and Trade
5. Ministry of Health and Social Protection of Population
6. Ministry of Education and Science
7. Ministry of Labour, Migration and Employment
8. Ministry of Energy and Water Resources
9. Ministry of Industry and New Technologies
10. Ministry of Transport
11. Ministry of Finance
12. State Committee for Land Management and Geodesy
13. Committee of Emergency Situations and Civil Defence
14. Committee of Environmental Protection
15. Committee for Architecture and Construction
16. Committee for Television and Radio
17. Agency for State Material Reserves
18. Forestry Agency
19. Agency for Land Reclamation and Irrigation
20. Communication Service of the Republic of Tajikistan
21. Academy of Agriculture Sciences of Tajikistan
22. Service for State Supervision of the Safe Conduct of Work in Industry and Mining Supervision
23. Main Department of Geology
24. State Unitary Enterprise Tojik Sugurta (state/national insurance)
25. State Unitary Enterprise Khojagii manziliyu kommunali (housing and communal services)

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## Commission on Disaster Damage Assessment

The Crisis Management Centre of the Committee for Emergency Situations and its regional and local centres coordinate the activities of the subsystems of the Unified State System. Each subsystem of the Unified System carries out its activities in accordance with its provisions and objectives for the prevention and organization of measures to eliminate the consequences of disasters caused by natural and man-made hazards. The list of subsystems of the Unified State System was approved by the aforementioned governmental decree No. 833 (dated 31 December 2014). These subsystems include the ministries of Defence, Health, Internal Affairs, Agriculture, Finance, Economic Development and Trade, as well as the Academy of Sciences and other interested departments. In the event of a disaster, the appointed representatives from each ministry included in the Unified State System form a Commission on Disaster Damage Assessment. Then they jointly conduct a damage and loss assessment – however, there is no officially approved and precisely described methodology that adequately and comprehensively evaluates damage and losses to the agricultural sector. Thus, at present, there is a lack of damage and loss methodologies to help assess the impact of natural and man-made hazards on agriculture.

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<sup>7</sup>The bodies of the Unified State System meet regularly, three to four times a year. In accordance with the regulation, the members of the state commission meet in case of an emergency.

# Ministry of Agriculture

The Ministry of Agriculture (MoA) is responsible for the elaboration and implementation of the common national agricultural policy, including in the area of crop production, livestock breeding and other subsectors. In the area of DRR, MoA cooperates with other ministries and agencies and participates in meetings of the Unified State System. It is part of the State Commission of Emergency Situations and of the National Platform for DRR. However, the particular role of the ministry is not clearly defined in the related regulations. It has, among its tasks, the risk reduction of locust invasion, and it participates as a member in the commissions on disaster damage assessment at the national, regional and local levels. The Agency for Hydrometeorology provides daily meteorological and decade agrometeorological data to MoA. Based on the data received, MoA takes appropriate measures. In general, MoA is the central executive body that develops and implements a unified state policy with regard to the agricultural sector. At the strategic level, it plays a leading role in the rational use of water resources for agriculture, including fish farming. The ministry is also responsible for interacting with institutions responsible for environmental protection at the national, regional and local levels.

The structure of MoA, which is mandated to reduce disaster risks, consists of the following:

- Department of Seed Production and Breeding Achievements – deals with seed control and breeding activities aimed at reducing the effects of drought and crop pests;
- Plant Production Management – deals with the planning of crop production taking into account agrometeorological data;
- Department of Livestock, Poultry, Fish Farming and Beekeeping – is responsible for the development of pedigree cattle breeding and in case of disasters, determining the extent of damage and losses as well as its work in the area of pasture management;
- Office of Agrarian Policy and Food Security Monitoring – is responsible for the development of agricultural policies and food security, including those related to disasters and the creation of a food fund for major emergencies;
- Department of International Relations, Science and the implementation of Scientific Achievements – works in the area of cooperation with international organizations in the field of agriculture and oversees the activities of research institutes attached to MoA.

Scientific activities of the Ministry of Agriculture are coordinated by the Tajik Academy of Agricultural Sciences, which is comprised of six national research institutes in agriculture, horticulture, soil science, livestock, veterinary medicine, and agricultural economics, besides the Centre for Genetic Resources. The academy is responsible for the development of methods for growing crops and animal breeding, aimed at more efficient production, as well as growing and raising improved varieties and breeds that are able to adapt to climate change.

The State Institution for Plant Protection and Chemicalisation of Agriculture under the Ministry of Agriculture, together with local executive bodies of government, is tasked to strengthen in each region of the country, forecasting the development and spread of the main plant pests and diseases in gardens and vineyards. Protective measures include preventive, mechanical, agro-technical, biological and chemical methods. One of the perspective methods of plant protection includes biological approaches, which is based on the combined use of entomophagous and micro-organisms in order to replace the basic chemical treatments with biological pest control methods. At present, the use of chemical pesticides remains the leading plant protection method in the country. However, the Tajik Academy of Agricultural Sciences and the Tajik Agrarian University have been instructed to develop instructions and recommendations for horticultural and viticulture industries on advanced biological pest and disease control technologies to reduce the use of chemical pesticides (Government of the Republic of Tajikistan, 2010).

In accordance with the new Law on plant protection (No. 817) dated 16 April 2012, the Government of Tajikistan appointed the State Institution for Plant Protection and Chemicalisation of Agriculture under the

Ministry of Agriculture as the authorised body regarding plant protection, which provides permission for the use, transportation, storage and destruction of chemical pesticides. The registration of these pesticides is carried out by the Chemical Safety Commission under the Government of Tajikistan, while the working group of the commission is under the jurisdiction of the Committee of Environmental Protection.

# Committee for Food Security under Government of the Republic of Tajikistan

The Committee for Food Security is a central executive body of state power in the field of veterinary medicine, phytosanitary and plant quarantine, plant protection, seed production and breeding. It performs special executive, monitoring, licensing and other functions. In accordance with the governmental decree No. 595 (of 29 December 2017), the committee has the following powers in the sphere of veterinary activity:

- elaboration of standards, rules and regulations;
- protection of the territory of the country against the introduction of animal diseases that require quarantine;
- control and prevention of spreading of diseases common to animals and human beings;
- veterinary and sanitary expertise and certification of veterinary drugs, biological agents, as well as of products of animal origin, and foods;
- control of veterinary and sanitary condition of animal trade points at markets, fairs, auctions and animal exhibitions;
- control over import, export, production, use, processing, storage, purchase and sale, transit of products and raw materials of animal origin;
- introduction of scientific and technical innovations in the field of veterinary medicine;
- international cooperation;
- providing relevant instructions to organizations and citizens on the elimination of detected cases of violation of veterinary legislation;
- providing permission to import veterinary medicine and animal feed additives in case of epizootics and disasters caused by natural hazards;
- monitoring and evaluation of planned activities;
- proposing the introduction or cancellation of veterinary and other restrictions (including quarantine) on the territory of the country;
- development and implementation of comprehensive state programmes, special measures to prevent and eliminate the threat;
- organization and implementation of necessary tests, examinations, analyses and assessments, as well as scientific research;
- development and approval of an action plan for the prevention of animal diseases during emergencies;
- preparation and publication of monthly and annual bulletins on the forecast and threat of dangerous animal diseases, timely development of instructions and recommendations in the field of animal health protection;
- organization of training and capacity-development activities of veterinary workers.

The committee has the following powers in the sphere of phytosanitary and plant quarantine:

- quarantine inspection and expertise of import and export materials of plant origin;
- timely detection and identification of plant pests, diseases and weeds;
- control surveys of farmland, forest and other lands, places of storage and processing of plant products;
- establishment of quarantine zones on the territory of the country;
- review and approval of the list of pests, plant diseases and weeds that require quarantine;
- formulation and adoption of rules and regulations related to plant quarantine;
- identification of sources and zones of infection for declaring quarantine;
- protection from the import of pests and insects from other countries and their spread (quarantine and non-quarantine pests);
- procurement and purchase of fumigants and other pesticides, as needed;

- development and implementation of comprehensive state programmes, special measures to prevent and eliminate threats;
- organization and implementation of necessary tests, examinations, analyses and assessments, as well as scientific research;
- preparation and publication of monthly and annual bulletins on the forecast of the threat of spread of harmful quarantine and non-quarantine organisms affecting agricultural crops.

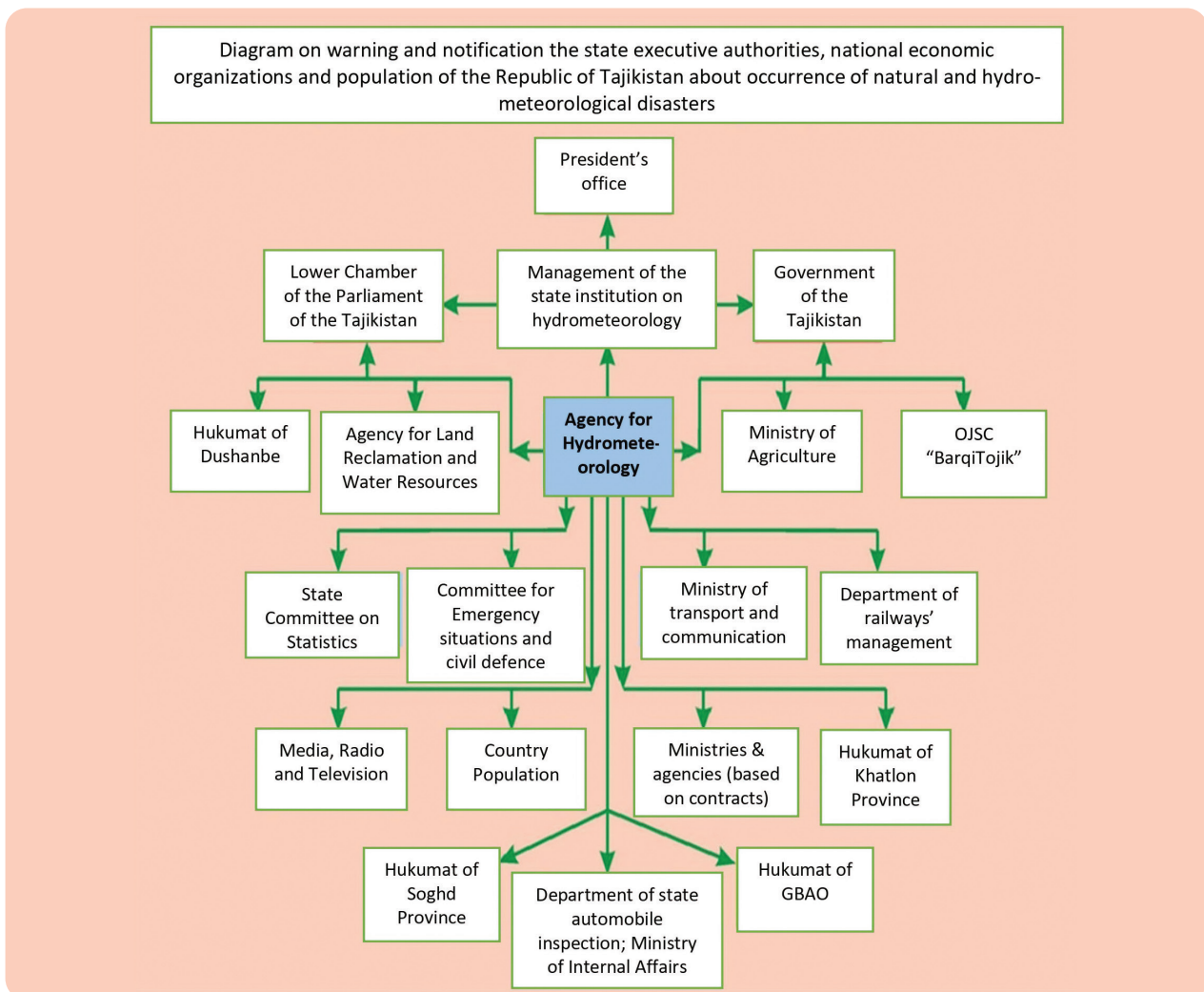
The central office of the Committee for Food Security has a Department of Veterinary and Breeding Inspection, and a Department of Phytosanitary, Quarantine of Plants and Seeds Inspection. Apart from the central office, the committee has offices in all regions of the country (GBAO, Sughd region, Khatlon region), an office for the city of Dushanbe and Districts of Republican Subordination, as well as an office responsible for the state border and transport. The following entities are also part of the committee's organizational system:

- food security centres in cities and districts;
- national centre for food safety diagnostics;
- republican anti-epizootic centre;
- food safety checkpoints at the border and on transport;
- republican fumigation service;
- state unitary enterprise Tajikzoovetservice;
- state institution Food Security magazine.

# Agency for Hydrometeorology

The Agency for Hydrometeorology is the main government agency responsible for monitoring, collecting, processing, and analysing information on hydrometeorological processes, and forecasting and preventing hydrometeorological-related disasters in the country by disseminating these weather forecasts and warning information to government agencies, business entities and the public for appropriate action. Information on the expected occurrence of natural hazards such as mud flows, avalanches, heavy rain, hail, strong winds, flooding, is provided through the information department of the meteorological centre of the Agency for Hydrometeorology to the Office of the President of the Republic of Tajikistan, including the Committee of Emergency Situations and Civil Defence. In addition, it disseminates information to the relevant ministries and agencies, the *hukumat* of Dushanbe city,<sup>8</sup> regional *hukumats*, State Automobile Service, and to the public, which is informed through the mass media and the agency’s website.<sup>9</sup> Figure 7 shows the coordination mechanisms for providing disaster warning information at the various levels.

Figure 7. Coordination mechanisms for dissemination of information on the occurrence of natural and hydrometeorological hazards



Source: based on Baidulloeva, 2015.

<sup>8</sup>Hukumat means government.

<sup>9</sup>The Agency for Hydrometeorology’s agrometeorology bulletins can be found on its website, [www.meteo.tj](http://www.meteo.tj)

## Other organizations

The Forestry Agency is responsible for the formulation and implementation of state policy and legal regulation in the areas of forestry, forest resources, including specially protected areas, hunting, flora and fauna. The organizational structure of the Forestry Agency includes the State Forest and Hunting Inspectorate, the State Forest Research Institute, the state forest departments at local level, which lead the forest management activities of the State Forest Fund and the State Institution of Special Protected Areas.

The Ministry of Energy and Water Resources is responsible for the development and implementation of national water and energy policies. Among other matters, it monitors the use and protection of the country's water resources, maintains and updates its water databases and information systems, and consolidates information on water resources.

The Committee of Environmental Protection is responsible for the implementation of public policy in the area of environmental conservation and protection in general, as well as hydrometeorology. The functions of the committee that are the most relevant for the agricultural sector include conducting inspections on the use and protection of natural resources, forests, land and biodiversity as well as the issuing of certain licenses and permits and conducting environmental monitoring, studying the state of the environment, weather, glaciers, lakes and reservoirs, including analysing phenomena and processes related to natural hazards and climate change.

The governmental Agency for Land Reclamation and Irrigation is responsible for the country's national policy and legal regulation with regard to reclamation of land, use and conservation of water facilities and water resources, including managing on-farm irrigation, drainage facilities and supplying water to Water User Associations (WUAs), which manage on-farm irrigation and drainage systems, and support other WUAs.

Since the agricultural sector is an important area of the economy, the Ministry of Economic Development and Trade, through its Department of Agricultural Development and Ecology, in cooperation with MoA, develops state policy measures in the area of agriculture and food security.

The State Committee for Land Management and Geodesy is responsible for the formulation and implementation of national policy in the area of state land management, including the privatization of land, the ownership of land, the registration of land use rights and certificates for land use rights, cadastral registration of land, land surveying, mapping and the control over land use and conservation.

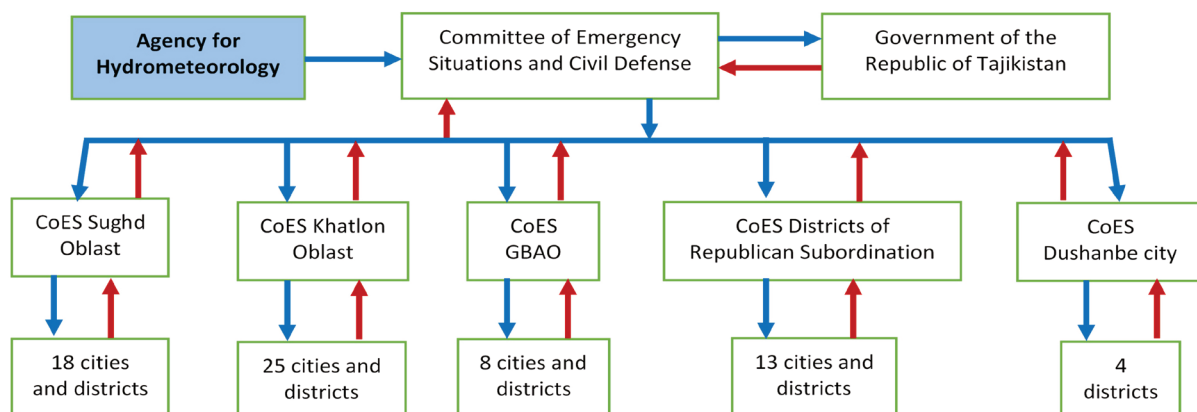
Some of the challenges of the current institutional framework include:

- weak potential agricultural policy and food security monitoring in case of emergency;
- insufficient control of seeds and breeding activities aimed at reducing the effects of drought, crop pests;
- insufficient coordination in the management of outbreaks of animal pests and diseases that can be transmitted from humans to animals or vice versa;
- insufficient use of agrometeorological data and forecasts in planning the development of crop production;
- weak coordination on pasture management.

# Early warning systems

One of the main tasks of the Agency for Hydrometeorology is to provide analytical information on the prevailing and expected weather conditions, forecasts of the occurrence of natural phenomena associated with meteorological and hydrological processes. Weather forecasts are compiled on the basis of synoptic maps using regional and global models. Currently, the COSMO model (international Consortium for Small-scale Atmospheric Modelling) (<https://meteoinfo.ru/cosmo13-maps>) is used to forecast hazardous phenomena. The ground-based information on temperature, humidity, wind, changes in atmospheric pressure, and other hydrometeorological parameters measured at hydrometeorological stations, are used in preparation of the forecasts of weather and natural hazards. Early warning mechanisms have been put in place for meteorological events such as heavy rain, fog, prolonged cold weather, and high-water levels in rivers. The Agency for Hydrometeorology prepares four-day forecasts, which are sent to all government agencies, while hazards forecasts are promptly provided to the CoES. The CoES then disseminates this information among its structures at the regional, district and local levels, as shown in Figure 8. From time to time, the CoES also prepares its own forecasts and issues alerts. Environmental considerations in specific sectors/areas between the Agency for Hydrometeorology and the CoES are reportedly well established, although the forecasts and alerts of the two institutions are not always consistent.

Figure 8. Overview of information dissemination by structures at various levels on weather forecasting



Source: J. Kamolov, personal communication, 2019.

Meteorological alerts are transmitted to local governments through the CoES and its territorial bodies. Farmers receive alerts through MoA and its regional and district bodies as well as through agricultural associations. Currently, in most regions of Tajikistan, mobile cellular communication is used as the main means of communication in emergency situations. In areas without mobile cellular communication, rescue services are provided with walkie-talkies. In some cases, regular telephone services or a telefax system are used. It was proposed to create automatic EWS via mobile networks; however, this proposal did not find support among the parties involved.

Annually, from January to March, the regional and district bodies of the CoES conduct visual observations in areas with a high level of risk of flooding and landslides. This information is then transmitted to the relevant authorities or institutions for further analysis and evaluation; for instance in the event of landslides, it is the Main Directorate for Geology. All hydroelectric power stations have EWS, from which information flows to the central dispatching company Barqi Tajik. Similarly, irrigation facilities have dispatched personnel/centres that notify the central authorities in the event of an accident. The CoES and its regional and local authorities carry out simulation exercises and undertake modelling, and provide training on disaster management.

Local authorities have significant responsibility in disaster preparedness, for example in terms of flood risk management, by strengthening riverbanks and canals. Water users are required to take measures to prevent and eliminate the consequences of water-related accidents, such as erosion of riverbanks, waterlogging, and flooding. While decentralization is an important step in linking local measures to risk management, local governments generally do not have the financial resources to manage and mitigate risks.

The CoES is the main body that provides information on the potential occurrence of natural hazards and the prevention of emergency situations in the country. The territorial bodies of the CoES at the regional, city and district levels take appropriate action based on the received information. Tajikistan has made some progress in developing communications and EWS with the help of international organizations and donors. However, for the agricultural sector and farm management, a dedicated EWS currently does not exist (J. Kamolov, personal communication, 2019). The Agency for Hydrometeorology publishes weekly hydrometeorological bulletins on weather forecasts and emergency situations, shared with relevant ministries and departments, as well as local authorities, which should provide this information to *jamoats*. However, it is difficult to assess how much of this information actually reaches the farmers. The Agency for Hydrometeorology is currently preparing a strategy on the provision of hydrometeorological services, including to agricultural consumers, within the framework of the Institutional Development of the State Agency for Hydrometeorology of Tajikistan project, funded by the Asian Development Bank and Green Climate Fund.

# Public warning systems

To inform the public about the approaching threats, the CoES uses all means of wire, radio and television communications, as well as satellite and mobile communication. It cooperates with all mobile communications providers in the country to provide early warning about weather conditions and accessibility of highways. As of 2017, the CoES has installed a number of EWS, such as the Sarez Lake Early Warning System, which provides for warning the population from the GBAO Rushan district to the Khatlon region Hamadoni district. An EWS was also established in the Khatlon region in the Yakhsu river basin (radio communication). The creation of local EWS is underway, to provide timely warning of the population about mud flows, avalanches, accidents on hydroelectric installations, and other similar events. In the future, the CoES plans to create an integrated public warning and information system that will cover the entire territory of Tajikistan (CoES, 2018b).

To support populations living in flood-prone zones, as part of the Lake Sarez Risk Mitigation Project (2000–2006), the CoES installed a state-of-the-art monitoring and EWS on the Usoy dam (a natural landslide dam) on Sarez lake. Financial support was provided by the World Bank, Swiss State Secretariat for Economic Affairs (SECO), USAID, the Aga Khan Agency for Habitat (AKAH), and the Government of Japan. The goal of this project was to protect the population living in settlements along the Bartang and Panj rivers up to the Hamadoni district of the Khatlon region, which can be flooded by the water from Sarez lake in the event of a dam break. Three types of communication systems (high frequency, very high frequency, as well as satellite communication) were installed in a number of settlements from various districts, including the cities of Dushanbe and Khorog. To expand the EWS, the CoES plans to install a radio link to Shahrituz district in Khatlon region. Hydrogeological and seismological observations at the Usoy dam and along Sarez lake are carried out. Information in real time is transmitted to the Usoy Dam Information Collection Centre. All incoming monitoring information is processed at the Supervisory Control and Data Acquisition (SCADA) Sarez Information Collection Centre and then transmitted via satellite and radio to SCADA Dushanbe. Annual workshops and training seminars are held jointly with the Aga Khan international development organization Habitat, to prepare the Bartang valley population for emergency situations (CoES, 2018b).

In 2018, the CoES installed an EWS for the population living in the mud flow-prone areas in Lakhsh, Rasht, Tojikobod, Nurobod districts of the Rasht valley and in the Rudaki village of the town of Panjakent. This system is based on IT-70 GSM equipment. Financial support for this project was provided by international organizations, with technical assistance from the mobile operator, Megafon Tajikistan. These systems are designed to warn the population at risk through transmission of audio signals using the horns located in the centre of settlements and at places of mass gathering. At the same time, heads of districts, *jamoats*, chairmen of village councils, the CoES officers and heads of district offices are notified through SMS messages. The CoES is working with donors to expand the coverage area of these systems and maximise the coverage of the hazard-prone territories (CoES, 2019).

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## Single emergency number 112

The National Crisis Management Centre of the CoES has Emergency Response, Communications, and Information Analytical departments. The centre analyses all information coming from all regions, cities and districts. It can process all kinds of information in real time using global navigation systems and global remote sensing-based monitoring technologies. Coordination and interaction are among the priorities of the centre, including information sharing with ministries, departments and relevant agencies. To support more efficient exchange of information between emergency services, better coordination of activities and timely response, the Governmental decree No. 214 (of 28 April 2017) introduced a single short emergency number – 112. The main goals of the 112 system were to (CoES, 2018b):

- further strengthen interaction between emergency and response services in emergency situations;
- increase the effectiveness of civil defence and population protection actions in emergency situations;

- create a common information and communication space;
- receive emergency calls within the 112 system about emergency situations and incidents;
- ensure prompt arrival of response services to an emergency incident spot;
- provide remote psychological support to individuals;
- analyse incoming information on emergency situations and incidents;
- collect, exchange and provide information using information and communication technologies;
- cross transmit civil defence system control and notification signals;
- create a unified information system and monitoring of activities.

The 112 system operator personnel receives and processes information about emergencies and incidents and sends notifications to duty and dispatch services of the relevant emergency and rapid response teams. As of 2018, the 112 system was operational only in the city of Dushanbe, but since the beginning of 2019 this system has covered the entire territory of Tajikistan (CoES, 2018b).

At the regular meeting of the Rapid Emergency Assessment and Coordination Team (REACT) in June 2017, the chair of the CoES expressed the need to strengthen the technical capacity of the information and analytical department of the National Crisis Management Centre. It was also mentioned that the database for collection, storage and exchange of information must be improved to ensure timely forecasting, response to and mitigation of the consequences of emergency situations. To accomplish this, in 2017, WFP and the United Nations High Commissioner for Refugees (UNHCR) office in Tajikistan provided technical support that significantly improved the collection, analysis and storage of information, preparation of summary reports, and monitoring in the field of prevention of natural disasters and adverse weather events. At the same time, the Office for Coordination of Humanitarian Affairs (OCHA) organized a workshop on the development of operational maps in emergency situations using GIS technologies (CoES, 2018b).

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## Challenges

Some of the challenges facing Tajikistan's emergency management system include:

- weak coordination of decision makers on an integrated warning system through appropriate technologies;
- lack of clear responsibility and management structure, planning procedures and coordination of assistance for effective recovery measures within the existing system of preparedness and response to disasters at all levels in the agricultural sector;
- the weakness or lack of coordination between the Agency for Hydrometeorology under the Committee of Environmental Protection and the Ministry of Agriculture in the field of agrometeorological monitoring and forecasting of crop development and yield;
- need to improve disaster preparedness at the local and regional levels, and to ensure participation of all relevant partners, in particular agriculture, taking into account the special needs of women and children, the elderly and other vulnerable groups;
- insufficient information on the list of services available for farmers, water user associations in the field of weather and natural hazards related directly to agriculture;
- lack of an adequate national and local disaster database that combines disaster data from previous years, including risk assessment results, data from warning systems and information on relief and recovery operations;
- the weakness or lack of a system for forecasting the phase of plant development and crop yields, and prevention of emergency situations, based on the use of modern information and communication technologies, aimed at reduction of the negative impact of natural disasters and preservation of the harvests of agricultural producers.

# Market information systems

Tajikistan's Living Standards Improvement Strategy for 2013–2015 clearly stated that the lack of market information is one of the key constraints for the development of the agricultural sector (Government of the Republic of Tajikistan, 2012). The National Development Strategy of the Republic of Tajikistan until 2030 (passed in 2016) had among its priorities the need to ensure a high standard of living and well-being of the population. It also listed among its activities the development of the market for agricultural products, and overcoming barriers in providing direct access to the market for agricultural producers (Government of the Republic of Tajikistan, 2016). While the country's Agency on Statistics collects and publishes such market information, access to it remains problematic, as does the timeliness of such reports. Partners could greatly benefit from equal and predictable access to information on product markets and prices. However, access, analysis and dissemination of market information remains challenging in the agricultural sector in Tajikistan. Research conducted by the World Bank (Broka *et al.*, 2016) identified two main gaps in the area of market information and intelligence:

- reliable and consistent market datasets available for further analysis;
- relevant international market intelligence on end markets and competing global production.

The same report proposes a number of solutions to address these gaps, including measures at the:

- national level (develop an inventory of market information datasets; improve coordination among involved agencies through selecting one responsible entity; timely and regular publication of collected market information);
- community level (improve access to market and information datasets through associations and industry); and
- individual/household level (capacity development and training in the application of market intelligence products; providing wider access to available market information through regular publications, internet, phone/SMS).

Better market information systems could support primary producers and processors' planning and risk management activities through the provision of price forecasts. However, it would require continued investment in market-related initiatives (Broka *et al.*, 2016).

In 2011, the Agricultural Information Marketing System in Tajikistan (AgroInform.Tj) was officially launched, and as of 2021 is still operational. It was developed by the non-profit NGO Neksigol Mushovir through the Local Market Development project of the Swiss development organization Helvetas, the Inter-Church Organisation for Development Cooperation ICCO (Netherlands), and Aid for Trade project of UNDP and the Government of Finland. AgroInform.Tj is a system that provides various information and services to agricultural-sector partners through their internet portal, both for free and for a fee. The free services include (AgroInform.Tj, 2020):

- monitoring the retail market prices changes for various agricultural products as well as for means of production (seeds, plant protection products, fertilizers, and so on);
- publishing ads on the online trade platform (to purchase and sell agricultural products and services);
- using interactive maps for making rational and effective decisions (location of agricultural facilities, production area for specific crops, gross production, soil analysis, border transition posts);
- using calculators to count the required amount of seeds, fertilizers, and water to produce a specific crop on a specific field size;
- downloading and using all mobile apps – multilingual (Tajik, Russian, English) online handbooks for various types of crops, livestock, beekeeping, information on market prices, online consultations;
- publishing and downloading educational, informational, and reference materials from the e-library;
- watching training video material for the production and processing of agricultural products.

AgroInform.Tj also publishes a monthly agricultural newspaper (in Tajik language, 4 000 copies) with prices for more than 50 agricultural products in major country markets and other useful information on crop production and livestock care, pest and disease control, treatment of livestock, and so on. The newspaper is distributed in all the *jamoats* of Sughd and Khatlon regions through specialised shops, agricultural consultants, district departments of agriculture, rural kiosks, and sales agents in villages. Paid services provided via the AgroInform.Tj website include publishing information about a company and specific advertising in mobile apps (on seeds, plant protection products, fertilizers); advertising on the web platform; performing soil analysis; delivery of agricultural products; and SMS packages. AgroInform.Tj provides four different types of SMS packages (AgroInform.Tj, 2020):

1. Tariff Weather Forecast – every three days provides district weather forecast for the next three days, monthly subscriber fee: TJS 5 (USD 50c).
2. Tariff Market prices – once per week provides market prices for one agricultural product from three selected markets, monthly subscriber fee: TJS 3 (USD 30c).
3. Tariff Cotton Index – every day provides quotation of Cotlook cotton index from the Liverpool Stock Exchange, monthly subscriber fee: TJS 15 (USD 1.50).
4. Tariff Complex – subscriber receives information and advice on the crop (in specific climatic conditions where it is cultivated); what seeds are better and where to buy them; how to use fertilizer and where to find them; how to protect the crop from frost, hail, diseases and pests; how to tackle weeds; where, to whom and at what price to sell products, seasonal (one growing season) subscriber fee: TJS 15 (USD 1.50).

In 2020, COVID-19 brought great disruption to existing food production systems in Tajikistan, which had to be addressed immediately. At the same time, the virus also created new opportunities for the wider application of digital tools in the country, by government, businesses, and civil society. The monitoring of food production and stocks plays a key part in improving access to affordable inputs, value chains, and marketing channels. In this regard, the Agricultural Market Information System (AMIS), Global Information Early Warning System (GIEWS), and the Crop and Food Security Assessment Missions (CFSAMs), can be used to provide analysis of prices and commodities and support the government (UNSDG, 2020). At the same time, limited access to the internet, and the relative technological illiteracy of the rural population, remain a challenge for the wider application of such systems.

# Agrometeorology services

The Agency for Hydrometeorology performs the functions of the national hydrometeorological service of Tajikistan. The hydrometeorological monitoring network of the agency consists of 57 hydrometeorological stations. Agrometeorological observations, such as temperature and air humidity, atmospheric precipitation and other parameters, soil moisture, conditions and productivity of agricultural facilities, river regime, and environmental monitoring, are carried out at 20 hydrometeorological stations in parallel with meteorological observations. The agency can also provide information on snow cover, wind speed, air quality, air humidity, cloud cover, water chemistry, radiation and solar radiation levels. In 2019, a pilot agrometeorological network was established with the support of the European Union and FAO, including three automatic agrometeorological stations installed in Hisor region (for table grapes), Khatlon (for cotton) and Sugd (in an apricot orchard). The aim was to increase awareness about the relevance and potential of climate services for agriculture. Besides measuring weather parameters, these stations calculate other parameters such as potential evapotranspiration, and the sum of growing-degree days and chilling hours. The pilot activities established the framework for an agrometeorological network to support farmers in Tajikistan. However, this network is not adequate for agrometeorological monitoring throughout the country and the Agency for Hydrometeorology has requested support for additional agrometeorological stations to cover other agricultural regions (K. Abdualimov, personal communication, 2019).

There is a need to produce real-time data from the automatic stations, scaled up across the country, and shared between institutions and disseminated to farmers. The dialogue between the Agency for Hydrometeorology, MoA and national NGOs about the need for formal agreements for data sharing and production of tailored services paved the way forward for scaling up the system across the country. It is estimated that Tajikistan would ideally require 116 stations in future in order to cover its farmland. However, if we consider a coverage radius of 10 km, the monitored area would be 300 km<sup>2</sup>, and in this case the minimum number of agrometeorological stations is 30. As a result, the implementation of a network composed of 30 weather stations is proposed to cover the entire cultivated area of Tajikistan.

One of the main tasks of the Agency for Hydrometeorology is to provide agricultural producers and other agrarian entities with analytical information about the prevailing and expected weather conditions, their possible impact on agricultural production facilities, and the expected productivity of crops. According to the plan of the agency, agrometeorological bulletins or advisory forecasts are compiled every ten days on maximum and minimum air temperatures, the amount of precipitation, relative air humidity, duration of solar radiation, wind regime, the phases of development of agricultural crops (cotton, fruit crops, mulberries, and potatoes), as well as conditions of field work in agricultural fields, including the state of winter and spring grain crops. A review of conditions of pasture plants and grazing conditions in summer and winter pastures is also presented and available on the Agency of Hydrometeorology website.<sup>10</sup>

The agrometeorology department of the Agency for Hydrometeorology uses the software ARM AGROMETEOROLOG (automated workstation of an agrometeorologist) for the compilation of agrometeorological review and agrometeorological forecasting. There are six staff in the agrometeorology department, including three engineers and three service technicians. The reviews and advisory forecasts are provided to MoA for its use. The types of forecasts provided include: soil moisture in spring; flowering period of *Medicago Sativa* and natural grasses; ripening period of grain crops; average yield of cereals and legumes; on harvesting of crops; soil moisture before sowing (Hydromet, 2020). Television, radio and the agency's website are the most common means of communication to deliver agrometeorological information to agricultural users. Existing services for farmers include: onset rainy season, offset rainy season, dry spells, cumulative growing degree days, soil moisture information, precipitation and temperature forecast, hail forecasts, winds forecasts. Information on water resource availability, potential heat-stress zones, and potential extreme weather events are available for the livestock sector.

<sup>10</sup>The Agency of Hydrometeorology's agrometeorology bulletins can be found on its website, see [www.meteo.tj](http://www.meteo.tj)

The presented surveys and agrometeorological advisory forecasts do not cover the level of farmers and *dehkan* farms, due to the lack of agrometeorological observation points on farmland (especially on the determination of soil moisture at various depths), insufficient human resources, and the lack of a marketing system in the consumer market of agrometeorological information. The agrometeorological bulletins and advisory forecasts cover very useful information; however, they do not include any information or data on natural hazards and the practices that can be implemented to reduce the adverse impacts on the crops, in particular on the development phase of the plant. In addition, it seems apparent that the main users of the existing bulletins that are produced at national level are government officials and not farmers. Farmers usually receive weather-related information from television or radio channels, but may not always be able to receive this information in a timely manner to be able to make risk-informed decisions.

Within this context, sending SMS alerts and messages to farmers may be helpful so that they can undertake action based on weather forecasts. Consultations in the field found that many farmers alternatively receive information and advisory services through NGOs such as Neksigol and Sarob, which rely heavily on international data sources and weather information, rather than information from the national agencies. Sarob communicates with farmers through Viber platform, through which farmers can share photos and receive feedback on cultivation. A key challenge for many farmers in Tajikistan is pest and disease control. Early warning systems (EWS) may have the role of guiding farmers and growers on the outbreak of diseases to take timely preventive measures. It is proposed to extend the existing agrometeorological network to cover apple and potato in Rasht Valley and Lakhsh as a step forward within the collaboration of agrometeorological services.

Climate information at the level of the agricultural sector is based on agroclimatic reference books and agroclimatic zoning of the country. These reference books were developed during the Soviet period. At present, updating of agroclimatic zoning is the responsibility of the system of agroclimatic services of the Agency for Hydrometeorology and MoA. However, agroclimatic zoning requires classification as well as improvement. In addition, the hazard identification of agricultural characteristics based on the GIS system has not been conducted yet.

At present, the plant protection and chemicalisation department under the Ministry of Agriculture issues bi-monthly bulletins. However, they do not receive the weather data from the Agency for Hydrometeorology, but rather use information from internet sources. In this respect, enhanced collaboration between these two agencies is highly important and the signing of a memorandum of understanding or contract is considered highly desirable. The NGO Neksigol Mushovir, which has a regional office in Kulob city, Khatlon region, has developed software that is widely used by farmers (AgroInform.Tj). Most of the mobile applications that have been developed can be freely installed on smart phones. At the moment, Neksigol Mushovir covers around 8 percent of the total number of farmers in the country and has started to collaborate with MoA with regard to this application. In addition, it produces a newspaper, which is also useful for farmers, but does not reach all beneficiaries. One of the outcomes of the workshop organized by the Ministry of Agriculture and FAO on 22–24 November 2019 on strengthening climate services for farmers in Tajikistan, was the establishment of a dialogue between key partners such as MoA, the Agency for Hydrometeorology, and national NGOs, which are involved in the production and dissemination of climate services, through solidifying formal agreements for data sharing.

A survey conducted by FAO among farmers identified the following most urgent agrometeorological services in the crop sector – precipitation forecasts, temperature forecasts, pest and disease forecast, optimal sowing date, and hail forecast. Within the livestock sector, the most requested services included forage availability, potential diseases occurrence zones, water resource availability, transhumance corridors. After conducting interviews and the analysis by the author, it was revealed that the main problems and limitations of the Agency for Hydrometeorology include a lack of highly qualified specialists, low salaries, and a lack of modern agrometeorological technical equipment. To support them, FAO delivered piloting agrometeorological stations funded by the European Union under the Strengthening Institutions and Capacity of the Ministry of Agriculture and State Veterinary Inspection Service for Policy Formulation project for 2016–2020, to improve its methodology for crop forecasting and yield assessment. Additionally, capacity-development activities were conducted, covering topics related to the use of agrometeorological equipment, data and applications, simulation models to forecast cotton production and assessment of yields. Such trainings were attended by experts from the Agency of Hydrometeorology, MoA, and Tajik Agrarian University. The opportunity to supply additional agrometeorological stations is currently being explored.

Under the pilot activities, the priority for farmer to receive early warnings and alerts regarding new pest and disease outbreaks was highlighted. The training and workshops brought together key partners including the Agency for Hydrometeorology, MoA, and Tajik Agrarian University for training on how data from the agrometeorological stations can be used in pest and disease models to forecast outbreaks and alert farmers. Consultations highlighted that the main diseases on orchards include black cancer, apple scab, insect's aphids and apple moth. For potato, root rot and Colorado beetle are among the inspected hazards.

The Agricultural Department in Rasht District provides technical assistance to potato farmers mainly with respect to early-in-season sowing dates in April, and late-in-season sowing in June. Potato is the main field crop in the region and farmers use early mature varieties (a single growing season is 90 days from sowing to harvest), as well as late mature varieties (which need 120 days to reach maturity). Consultations highlighted that many of the traditional timings and impacts on agriculture in this region have changed as a result of climate change, and temperatures are increasing at a fast rate.

As a result of the restructuring of agricultural production and changes in the organizational and legal foundations of the former collective farms and state farms, problems have arisen with the legal status of the organization of agrometeorological observations of industrial crops of private or corporate owners. In addition, changes in the structure of farmland have led to a violation of the spatial contiguity of meteorological observations at stationary meteorological sites and agrometeorological observations of industrial crops. As a result of this, as well as various other reasons, determining the need for structural reorganization and development of the agrometeorological support system based on the use of established and available information technologies, and the use of modern instruments to improve observations, can enhance informed decision making to help reduce the adverse impacts of climate variability and change on agriculture.

# Disaster risk reduction in the agricultural sector

Disaster risk management activities in the agricultural sector in Tajikistan are primarily focused on mitigation. Nevertheless, within the framework of the Unified State System for the Prevention and Elimination of Emergency Situations, the Committee of Emergency Situations and Civil Defence, together with the Agency of Hydrometeorology and other authorised bodies, is responsible for carrying out forecasting of emergencies; collection, processing and exchange of information; development and implementation of technical programmes for the prevention of emergencies; organization of education and training of the population, awareness raising; creation of reserves of material resources for the elimination of emergency situations; introduction and monitoring of insurance mechanisms; carrying out preparations for evacuation and recovery; provision of statistical reports; and investigation of the causes of accidents and disasters. A comprehensive transformation of these preparedness commitments into various roles, responsibilities, legal mechanisms and guidelines has yet to be implemented.

The Main Directorate of Active Impacts on Meteorological Processes of the Committee of Emergency Situations and Civil Defence is responsible for the protection of agricultural crops from hail and reduction of its impact. To organize timely and effective work on protection of the population and territories from emergencies associated with landslides, flooding, mud flows and avalanches, the Committee for Emergency Situations and Civil Defence (CoES), together with the Agency of Hydrometeorology, systematically conducts aerial reconnaissance of mountainous and foothill regions of the country. The CoES carries out information work with local authorities on an ongoing basis. It should be noted that the Agency for Hydrometeorology is mostly engaged in forecasting natural disasters.

The Government of Tajikistan promotes pasture management and agricultural practices, such as no tillage, cross tillage on slopes, contour terracing, cover crops, usage of more organic fertilizer, as well as carrying out rangeland rehabilitation. With the support of development partners, the government is boosting the diffusion of low-cost, climate-resilient agricultural technologies. Despite these concerted efforts, Tajikistan's agricultural productivity is declining. It is anticipated that climate change and the increase in the frequency and severity of extreme weather events, if not carefully managed, will only deepen this decline.

Several gaps and needs currently hinder the agricultural sector's successful adaptation efforts. Agricultural reform needs to focus on removing constraints that tie farmers to cotton cultivation, creating incentives for efficient water management and ensuring secure land titles (Heltberg, Reva and Zaidi, 2012).

The improvement of agriculture extension services is also long overdue, delaying the diffusion of sustainable land management techniques and diversification towards less water-dependent crops. Farm-level adaptation has also been slow, because of the lack of access to climate-resilient seeds, adaptation technologies, and financial resources.

The decline in productivity as a result of global warming and drought is mainly observed in rainfed areas, where there is a sufficient lack of moisture, due to the lack of rain and snow. A way for farmers to adapt to climate change is the introduction of drip irrigation. However, only a small number of farmers in Tajikistan use it. This is due to the fact that *dehkan* farms are relatively small; thus for many farmers, this method is expensive, and they are often hesitant to apply various innovations, including irrigation methods (S. Sangakov, personal communication, 2019). Moreover, other challenges remain, such as the lack of funds for the operation and maintenance of these irrigated systems, while at the same time, there are potential water resources that at present remain unused (S. Safarov, personal communications, 2019).

The impacts of natural hazards such as drought, flooding, and landslides may be further affected by the long-term intensive use of fertilizers and chemicals, which leads to salinisation and soil erosion, along with illegal and intensive logging of trees and shrubs throughout the country. These issues need to be urgently addressed through research and the introduction of alternative crops – for example drought-tolerant crops – as well as issues associated with salinity in order to avoid the loss of more arable land (S. Safarov, personal communications, 2019).

The assessment identified that progress in integrating DRR into the agricultural sector is limited. Tajikistan has a National Platform for DRR, disaster risk reduction legislation and policies, but only a few institutions are involved in agriculture, food security and nutrition through specific sectoral DRR policies and goals. For instance, MoA, the department of agriculture and environmental protection of the Executive Office of the President, and the Agency of Land Reclamation and Irrigation, are members of the State Commission on Emergency Situations. Representatives of MoA participate in the commissions on disaster damage assessment, which are organized in case of a disaster (on a national, regional, and district level). However, at the moment no official methodology for conducting such damage and loss assessment in agriculture is available in the country. The National Strategy on DRR for 2019–2030 mentions agriculture very briefly, in one of the actions to address the strategy's priorities – “use existing, and develop new, financial mechanisms to ensure protection of population, communities and agricultural land, and the rehabilitation and operation of bank protection works”. The document also mentions drought as an increasingly serious threat due to the changing climate, that can have a particularly noticeable impact on rainfed crops, food staples, and livelihood of the rural population (Government of the Republic of Tajikistan, 2018). Mitigating risks and increasing resilience in agriculture requires a political environment conducive to the full integration of DRR measures in the sector.

# Disaster risk assessment and related task allocation

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## Disaster risk assessment

The National Strategy on Disaster Risk Reduction for 2019–2030 states that according to the existing regulatory framework, no government agency is directly responsible for disaster risk assessment and DRR. Even though the National Platform for DRR was established to coordinate organizations involved in disaster risk management, in reality the mainstreaming of DRR into sectoral policies has remained weak and no adequate sector-specific DRR strategies have been developed (including in the agricultural sector). Kelly (2013) has suggested that the CoES could lead the development of disaster risk assessment.

The national strategy also discussed issues related to the lack of clarity in the disaster risk assessment process. Local authorities often do not have access to information on recent characteristics of their land, hazards frequency and related risks, flood mapping or land use data. This does not allow authorities to make well-informed decisions and explain risks to potential land users. It can lead to, for instance, incautious use of mountain slopes for agriculture which in the end leads to landslides due to deforestation (Government of the Republic of Tajikistan, 2018). The National Platform for DRR would be key in addressing existing issues. Its activities can focus not only on coordination between involved entities, but also on allocation of necessary funds to risk reduction and risk assessment activities, potentially securing external financing. It would also be important to ensure the participation of the private sector to support DRR and management at the local level (Government of the Republic of Tajikistan, 2018).

In January 2021, UNDP and the CoES launched Tajikistan's first online countrywide Multi-Hazard Risk Assessment Platform (<http://tajirisk.ait.ac.th/> – access required login at the time of the report publication). This web platform is designed to serve as a risk analysis tool to support various partners and decision makers. It visualises a series of maps developed using GIS technologies, high-resolution satellite images, specialised data provided by partners, and open-source data. The platform uses the results of the multi-hazard risk assessment conducted in 2018–2020, which covered 58 districts of the country and focused on seven most common disasters (flooding, mud flow, earthquake, drought, windstorms, landslides, and snow avalanche). This web platform is an essential contributor to building a national disaster information database, which should be used by various sectors, including agriculture. The Asian Institute of Technology (AIT) and University of Twente (Faculty ITC) were responsible for implementing the project, while funding was provided by the Government of Japan, and Swiss Agency for Development and Cooperation (UNDP Tajikistan, 2021).

The National Strategy on DRR proposed a number of activities related to disaster risk assessment that would support the achievement of its main objectives (Government of the Republic of Tajikistan, 2018):

- Conduct regular review of major drivers causing the loss of human lives and economic damage due to natural disasters.
- Implement regular disaster risk assessments, including assessment of vulnerability and capacity of population, hazard characteristics and their potential impact (risk profiling) as well as available management resources.
- Establish national and local-level databases to exchange information on natural disasters, which would include historical data, results of disaster risk assessment, vulnerability of the population, warnings, information on disaster impacts, relief and recovery operations (the database should be accessible by governmental officials, as well as by affected populations and all partners).
- Based on the risk assessment, formulate appropriate disaster risk preparedness and response measures for different types of hazard.

- Strengthen the role of the National Platform for DRR as a coordination mechanism for implementation of DRR-related activities (by national government, as well as by international organizations).

The assessment of natural hazard-related risks, the review of the risk-analysis findings and the use the data generated, should be organized in a way that involves all relevant government authorities, including in the agricultural sector. The country system divides governmental entities involved in disaster risk assessment activities into three groups:

I) Authorities, organizations and institutions tasked with research and analysis of natural conditions in Tajikistan, including those responsible for the prediction of natural hazards and assessment of impacts of disasters:

1. Main Directorate of Geology, responsible for the analysis and study of geological hazards (specifically, high potential impacting exogenic geological processes).
2. Agency of Hydrometeorology, responsible for the analysis of hydrometeorological hazards (high potential impacting meteorological phenomena and natural hazards, including avalanches, etc.).
3. Institute of Geology, Seismic Construction and Seismology, Academy of Sciences of the Republic of Tajikistan, responsible for the analysis and study of geological hazards (particularly seismic hazards).

II) Authorities responsible for the regulation of socioeconomic development, industrial and agricultural production, uniformity of technical specifications and regulations. This group provides data on social, industrial and agricultural facilities, populated areas, territories that can potentially become risk receptors, and are the end users of risk assessment data with reference to their core functions, for example approval of licenses for certain types of economic activities (within the scope of their competence). This group includes the:

1. Ministry of Health and Social Protection of the Populations
2. Ministry of Agriculture
3. Ministry of Transport
4. Ministry of Energy and Water Resource
5. State Committee for Land Management, Geodesy and Cartography
6. Committee of Emergency Situations and Civil Defence
7. Committee of Environmental Protection
8. Agency for Irrigation and Melioration
9. Agency for Construction and Architecture
10. Statistical Agency under the President of the Republic of Tajikistan.

III) Authorities responsible for the development and enforcement of government policy and regulations regarding short-term, mid-term and long-term strategies, programmes and forecasts of socioeconomic development for the country and internal regions, including DRR programmes. This group includes the:

1. Ministry of Finance
2. Ministry of Economic Development and Trade
3. State committee on Investments and State Property.

In order to better understand Tajikistan's risks and impacts of natural hazards on its economy and on agriculture in particular, it is highly important to adequately and accurately collect damage and loss data from past disasters. Within this context, it is also essential to establish a national disaster information database, which can also contribute to inform disaster risk assessments by comparing the data from past impacts (G. Sharifov, personal communication, 2019).

Tajikistan is the most vulnerable to climate change of all the countries in Central Asia and Eastern Europe, and, therefore, the threat to food security is mainly associated with increased drought, flooding and landslides, which can lead to reduced agricultural productivity, increased losses and worse living conditions for farmers. Conducting hazard mapping and implementing a GIS system is an important element in determining vulnerability and risks in the agricultural sector. However, at the moment, this type of assessment it is not actually implemented at the national level.

# Preparedness and response

As noted earlier, a Unified State System of the Republic of Tajikistan for the Prevention and Elimination of Emergency Situations is designed to prevent and combat the effects of natural hazards, ensure public safety and reduce potential economic damage. Within this system, the CoES has a leading role in disaster preparedness and response, supporting emergency commissions which provide coordination at the national, provincial, city and district levels and at the level of *jamoats* and organizations. The Unified State System also includes representatives of MoA. However, at the moment, there is no separate comprehensive preparedness plan for the agricultural sector.

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## Preparedness plans

Overall, Tajikistan has a rather well-defined preparedness system of plans and regular exercises and emergency drills. At the same time, no assessment was made to determine to what extent existing plans contributed to the mitigation of disaster risks, or how they worked out in case of actual disasters. In accordance with the governmental decree No. 833 (of 31 December 2014) on the Unified State System for the Prevention and Elimination of Emergency Situations, such plans should be critically analysed, down to community level, so that they can be improved (Government of the Republic of Tajikistan, 2018). One of the main objectives of the National Strategy on DRR for 2019–2030 is to improve disaster preparedness and response mechanisms, which should be supported by various activities (Government of the Republic of Tajikistan, 2018):

- upgrade of the existing preparedness and response system at all levels by defining responsibilities as well as through streamlining planning procedures and coordination of relief and recovery measures;
- development of disaster preparedness plans at local and regional levels, involving all relevant partners and by addressing needs of women, children, elderly persons, people with disabilities, and other vulnerable groups of people;
- establish an integrated EWS for public officials, local populations and other parties using appropriate technologies supported by training for the recipients of such warning alerts.

One of the expected outcomes of the National Development Strategy for the period up to 2030 also addresses the need to develop a unified state system for emergency prevention and a national disaster preparedness and response plan (Government of the Republic of Tajikistan, 2016). Still, at the moment there are no sector-specific preparedness plans in place (including for agriculture). This lack of a preparedness plan and methodology for determining damage in agriculture is often mentioned as among the main problems in the sector. This issue is often addressed at roundtables and seminars held in Tajikistan. On 14 February 2020, a seminar was held in Dushanbe on the presentation of the National Strategy for Adaptation to Climate Change. At this seminar, the FAO representatives noted that FAO is currently working on the preparation of a preparedness plan and methodology for damage assessment in agriculture.

# Emergency action plans

As mentioned, the CoES has a lead role in disaster response, while emergency commissions coordinate the activities of involved organizations. The National Strategy on DRR stressed that to improve planning and disaster response it is essential for every organization to have emergency plan in place (Government of the Republic of Tajikistan, 2018). The functions of MoA in the Unified State System for the Prevention and Elimination of Emergency Situations, related to preparedness and response, include:

- participation in the development and implementation of targeted scientific and technical programmes for the prevention and monitoring of animal pests and diseases;
- managing required reserves of biological and medical preparations, disinfectants and material and technical resources necessary to prevent the occurrence and elimination of infectious animal pests and diseases;
- implementation of veterinary measures to control and manage the outbreak of animal pests and diseases that can be transmitted between humans and animals;
- use of DRR measures to protect livestock from animal pests and diseases;
- implementation of measures to prevent, reduce and manage the introduction and spread of plant pests and diseases from neighbouring countries, including phytosanitary control to mitigate the outbreak of plant pests and diseases that can adversely impact crop production;
- creation of financial reserves and material resources by MoA and other organizations to control and manage the spread of plant pests and diseases;
- establishment of a contingency fund to ensure food security in emergency-prone areas.

# Post-disaster needs assessment in the agricultural sector and food systems

According to the governmental decree No. 833 (of 31 December 2014), post-disaster needs assessment (PDNA) activities in Tajikistan are carried out by the emergency commissions within the framework of the Unified State System of Tajikistan. At the same time, National Strategy on DRR for 2019–2030 noted that there are still a number of challenges in the field of disaster response. Uncertainty remains regarding which government agencies are responsible for relief and recovery efforts. It is critical to identify the roles of the national authorities, the affected population, and the international community. The strategy stressed the importance of addressing the needs of both genders, as well as of people with disabilities, and the elderly. The updated system of post-disaster recovery, rehabilitation and development interventions, should consider the various needs of different groups of the affected population (Government of the Republic of Tajikistan, 2018).

In 2013, Disaster Recovery Guidelines for Tajikistan were drafted as part of the UNDP's Disaster Risk Management Programme. This document was based on the related governmental laws and regulations, REACT Recovery Framework, as well as international good practices and norms. The guidelines were reviewed by the National Platform for DRR, representatives of the government, and other relevant national and international partners. The document also described major steps of PDNA (Kelly, 2013). These guidelines were distributed to all relevant ministries and departments. The Disaster Recovery Guidelines had two objectives:

- identify policies and responsibilities during disaster recovery by the government and others; and
- provide government partners with guidance on how responsibilities and tasks will be planned and implemented during recovery.

The guidelines were drafted not to replace existing governmental laws but to support the activities of the entities involved in recovery activities. They were to be updated as the Government of Tajikistan gained additional experience in DRR. The guidelines described the structure and tasks of the Recovery Coordination Centre to be established under the Commission of Emergency Situations within a week of a disaster occurring (and operational as long as deemed necessary by the commission). The guidelines considered the agricultural sector in terms of identifying damage, restoring normal agricultural activities, and ensuring food security (Kelly, 2013). The tasks of MoA include:

- ensuring a minimum food supply for all victims of disasters caused by natural hazards;
- restoration of normal agricultural activity and reconstruction of irrigation and other agricultural infrastructure, as necessary.

# Damage and losses assessment for agriculture and food security

The National Strategy on DRR for 2019–2030 mentions that according to official reports the total damage resulting from disasters caused by natural hazards that occurred from 1997 to 2018 exceeded USD 589 million (Government of the Republic of Tajikistan, 2018). Based on an analysis by region, impact, and frequency of disasters from natural hazards, it was estimated that the cost of national damage per year from climate change (including the damage from disasters caused by natural hazards) will increase from USD 50.4 million per year in 2014 to USD 132.3 million per year in 2030. The increase in temperatures, drought and pasture degradation over time is anticipated to lead to large annual losses between 2014 and 2030. Rising water levels and flooding, agricultural pests, avalanches, landslides and mud flows are expected to collectively cause the most serious increase in annual losses. According to expert data, by 2030, from an increase in temperature as a result of drought, the damage to agricultural production and food security may amount to more than USD 42 million annually – from agricultural pests and insects damage of more than USD 650 000 (ten times more than 2014); dust storms, damage of USD 45 000 (no increase estimated); and damage from pasture degradation, USD 41.3 million (a ten-fold increase) (ADB, 2016).

According to the report of the Regional Environmental Centre for Central Asia (CAREC, 2015), over the past 60 years, the country has experienced eight major drought events, from particularly affecting the southern parts of the country. In 2000–2001, for example, due to drought, a significant portion of the crop yield was lost and half of the country's population was directly affected, mainly in southern Tajikistan. The most affected were smallholders and the poor in rural areas. According to official statistics, in 2001 the rice crop decreased by about 30 percent (from 3 790 kg/ha to 2 610 kg/ha), the production of grain from 550 000 to 494 000 tonnes, rice from 82 000 to 39 000 tonnes, and fruit from 169 000 to 89 000 tonnes in 2003. International sources confirm a yield decline of between 30 percent and 40 percent (Takeuchi *et al.*, 2019).

Drought has a significant impact on food security in the country and it is expected that with climate change, drought and other hydrometeorological hazards will increase in frequency and severity. However, there is limited data available on the damage and losses of these hazards on the agricultural sector and specific subsectors such as crop and livestock, and the full extent of their impact on food security and poverty. Moreover, the impacts on the fisheries and forestry subsectors are also generally underestimated (FAO, 2015). However, quantifying and reporting these agricultural damage and losses is fundamental to understand better the impact on the sector, and to help to design investments that can result in reducing the adverse effects on agriculture.

In case of a disaster, commissions on disaster damage assessment are organized, which include appointed representatives from each ministry participating in the Unified State System. These commissions are responsible for conducting damage and loss assessments. However, there is no officially approved and precisely described methodology that adequately and comprehensively evaluates damage and losses to the agricultural sector. Thus, at present, there is a lack of damage and loss methodologies to help assess the impact of natural and man-made hazards on agriculture. The National Strategy on DRR mentioned that the existing damage assessment process implemented by the authorities does not provide a full range of information and does not comply with the provisions of internationally accepted methodologies. The process does not take full advantage of modern technologies (Government of the Republic of Tajikistan, 2018).

While the Agency on Statistics of Tajikistan regularly collects statistics on both crops and livestock production, it does not conduct agricultural surveys on disaster impact. Reports on agricultural production are collected by the regional statistical agencies and submitted to the main office of the agency, which in turn analyses the data and publishes it in the form of bulletins, statistical books and analytical reports. The agency's source of data on damage and losses from disasters is semi-annual and annual reports on emergency situations submitted by the CoES. While the data on crops, livestock and forestry is collected, fisheries and aquaculture is not currently covered by the existing system.

Overall, three governmental agencies are responsible for disaster data collection, assessment and reporting in agriculture – the CoES, Forestry Agency, and MoA. Cooperation between these entities is exercised through the inter-agency working group on improving statistical reporting in the form of meetings and technical working groups.

Better coordination of activities is needed, as well as, potentially, a centre for data sharing (TajStat, 2019d). A presentation by the representative of the agency at the FAO Training Workshop on the Methodology to Assess Direct Loss Attributed to Disasters in Agriculture, Fisheries and Forestry (2019, in Almaty, Kazakhstan) listed the main obstacles in the field (TajStat, 2019d):

- lack of data collection methodologies;
- lack of assessment methodologies;
- lack of resources;
- lack of technology (tablets, computers, etc.);
- lack of institutional mandates.

# Agricultural insurance

The insurance market in Tajikistan is characterised by several challenges and constraints, which has current implications, as well as for its effective functioning in the future. One of the largest issues revolves around the fact that the state does not want to recognize the insurance industry as a way to strategically support its national economy. This, in turn, does not create positive views with regard to the development of the insurance market in Tajikistan.

Annually, the agricultural sector experiences huge losses from natural hazards such as hail, hurricanes, abnormal temperature fluctuations, heavy rain, spring flooding, and other natural and biological hazards. The main natural hazards that damage agricultural production are the regular occurrence of drought and hail. At the same time, the economic damage resulting from these hazards is tremendous and can set back people and the national economy. The current role of insurance in providing compensation for the incurred losses, due to adverse weather conditions, is minimal. The foreign experience of insuring agricultural risks is of particular importance. It shows that many countries, including those with more favourable climatic conditions than Tajikistan, actively develop and maintain insurance, without neglecting other means of improving the sustainability of agricultural production (Khodjaeva and Dzhabarov, 2019).

From 1968 to 1990, Tajikistan had compulsory insurance of crops and the conditions of this insurance are especially important for the current situation, due to the principles of crop insurance that were laid down. For instance, the close connection of insurance to the yields of agricultural production and thus, the dependence of insurance coverage on the achieved level of yield in each farm, which created conditions for the equal protection of farms, as well as the coverage of all natural hazards that could impact the sector.

Insurance stimulates investment in agricultural production, due to the risk transfer mechanism. Integration processes in agriculture are manifested not only in the change of ownership of agricultural enterprises, the creation of *dehkan* farms, agro-firms and agro-holdings, but also an impressive inflow of investments, often directed towards modern agricultural production technologies. This refers to both small and large agricultural enterprises. Agricultural risk insurance is a high-tech, labour-intensive type of insurance and requires special knowledge in the field of agriculture, animal husbandry, and agricultural economics. Despite the well-known and persuasive evidence of the need to develop and improve the efficiency of agricultural insurance, there are many issues that inhibit and often simply distort it. Among the most important of these are the following:

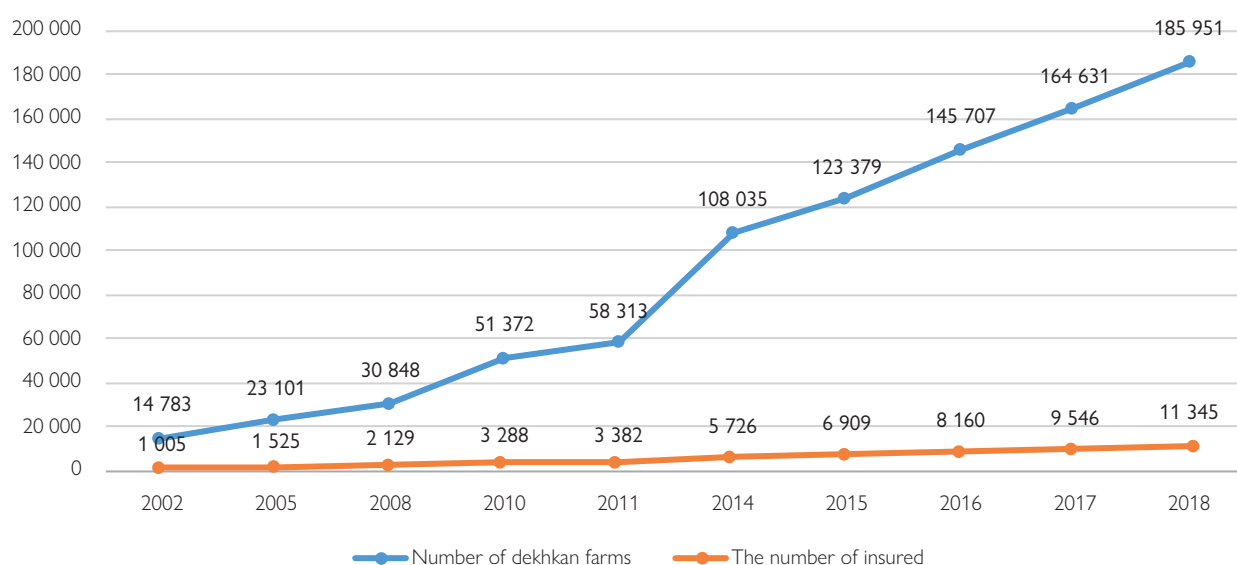
- lack of clear objectives and strategies for the development of agricultural insurance;
- lack of distinction in insurance claims of different types of individuals and legal entities.

With regard to the latter issue, the Parliament of Tajikistan adopted the Law No. 1349 on insurance on 23 July 2016, which establishes the legal, economic and organizational basis of insurance activity, and aims to ensure the protection of the property interests of individuals and legal entities in the event of insured events. In accordance with Article 27 of the Law on *dehkan* farm (No. 1289, of 15 March 2016), *dehkan* farms have the right to insure their property on a voluntary basis (crops, livestock, fixed assets, and other property). The lack of, or limited, financial and economic opportunities hinder the development of agricultural insurance.

Agricultural insurance is currently only theoretically an effective mechanism for the protection of agricultural entities. This is due to the fact that the recognition of voluntary agricultural insurance was not supported. In 2016, the government adopted the law on insurance activities, but it lacks a special chapter on agricultural insurance in case of a disaster. In addition, concepts such as “food for work” or “cash for work” are not covered by any of the country’s legislation.

Between 2002 and 2018, the number of insured *dehkan* farmers (as a proportion of the total) decreased from 6.8 percent in 2002 to 5.3 percent in 2014 and 2015, before reaching 6.1 percent in 2018 (Figure 9) (National Bank of Tajikistan, 2019). Findings from the 2002–2018 period regarding compulsory crop insurance show that there is no broad support at village level (Tojiksugurta, 2019).

Figure 9. Number of insured dehkan farms in relation to the total number



Source: TajStat, 2019a.

Some of the reasons for this decline include the low share of agriculture in the economy, and the high insurance rates offered by the state. Moreover, there is a lack of trust of farm managers in the effectiveness of the existing insurance system, and hence an unwillingness to use the services of insurers. Another issue is the difficult financial situation and low insolvency of enterprises. It is more profitable for insurance companies to enter into insurance contracts in more profitable areas than agriculture. In addition, many zones in the country are zones where farming is risky, due to the likelihood of adverse impacts on the sector as a result of drought, hailstorms, heavy rain, and frost during spring. Moreover, there are economic risks – within the conditions of low government funding, the industry does not take preventive measures and there are many small producers highly vulnerable to the impacts of natural hazards, as well as economic fluctuations. All this increases the level of risk of financing and reduces access to credit sources, especially for smallholders, which makes agriculture or climate risk insurance highly needed. All this makes it difficult to apply insurance to the sector and as a result, the level of insurance of crops and animals is extremely low in Tajikistan. It can be argued that there is a need to develop a law on the insurance of agricultural production, as the introduction of such a law could help to improve the efficiency of agricultural production, provide reliable protection through insurance, reduce the risks of investing, and increase access to financial resources.<sup>11</sup>

<sup>11</sup>This is the opinion of the author based on the analysis of the existing insurance system.

# Projects and programmes related to disaster risk reduction, early warning systems, and agrometeorology services in the agricultural sector

Over the past decade, a number of projects related to agriculture and DRR, EWS and agrometeorology services have been implemented in Tajikistan. Others are currently being implemented, or are in the process of being approved for implementation. Annex II summarises these projects and programmes, which are aimed at, for example, increasing soil fertility through intensive use of natural and sustainable nutrients and diversified crop rotation, soil erosion reduction and improving water use efficiency through the use of minimal tillage and methods of growing cover crops. They are implemented by the government, NGOs, international organizations, and the private sector.

# Conclusions and recommendations

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## Legislation and policy

Tajikistan has laws and decrees that define the regulations in the field of disaster management, and it also has a National Strategy for Disaster Risk Reduction for 2019–2030 in place. However, the mainstreaming of agriculture or climate change in such documents is quite limited at the moment, even though some laws do mention disasters such as epidemics, epizootics, and epiphytotics. A similar situation prevails regarding sectorial legislation, policies, plans and strategies, which rather rarely address DRR and the potential impact of climate change. The existing regulations do not provide a clear list or definitions of different types of natural hazards that can affect the country. The National Strategy for DRR, National Strategy for Adaptation to Climate Change until 2030, as well as National Development Strategy until 2030, all mention food security as a priority. The existing regulations identify the State Committee of Environmental Protection under the Government of the Republic of Tajikistan as the governmental body responsible for hydrometeorological activities, environmental protection and rational use of natural resources, as well as for coordination of activities in the field of climate change. The Agency for Hydrometeorology, which is part of the committee, is responsible for control and monitoring of environmental pollution, and active impacts on meteorological and other geophysical processes in the field of hydrometeorology.

*The main recommendations for improving existing regulations can be summarised as follows:*

- Amend the regulatory legal documents related to agricultural issues in terms of reducing the risk of natural disasters and climate change, including in the Law On state regulation of ensuring the fertility of agricultural lands, to take into account the adoption of new climate-change adaptation measures to ensure effective land use; in the Law On soil protection, to take into account the climatic conditions of agroecological zones, the risks of natural disasters; in the Law On dehkan (private) farms, in terms of the obligation of *dehkan* farms to take into account the risks of climate change and take appropriate adaptation measures to reduce their impact.
- Consider the possibility of the development of an agricultural code.
- Enhance the regulatory framework regarding the dissemination of information on disaster damage and losses.
- Develop a law on the insurance of agricultural production, to help to improve the efficiency of agricultural production, provide reliable protection through insurance, reduce the risks of investing, and increase the level of access to financial resources.
- Explore the experience of other Central Asian countries in the field of agricultural insurance.

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## Institutional framework

Tajikistan has an institutional system in place for DRR and management – the Unified State System for the Prevention and Elimination of Emergency Situations. Commissions for emergency situations at various levels (national, regional, city) act as main coordination bodies of the Unified State System. The State Committee of Emergency Situations and Civil Defence under the Government of the Republic of Tajikistan (CoES) is the central executive body responsible for emergency management and civil defence. Tajikistan also has a National Platform for DRR, which serves as a consultative and advisory body. Agriculture-relevant stakeholders are included and involved in the existing DRR system (as members of the Unified State System, commissions and National Platform), particularly the Ministry of Agriculture (although its role is not prominent). The MoA's

objectives related to DRR include reducing the risk of locust infestations, participating as a member of the Disaster Damage Assessment Commissions, cooperating with other ministries and departments within the framework of the Unified State System. The Committee for Food Security under the Government of Tajikistan is a central executive body in the field of veterinary medicine, phytosanitary and plant quarantine, plant protection, seed production and breeding. Still, there are some challenges in the existing institutional framework of the country, particularly the limited attention to agriculture and food security monitoring; insufficient control of seeds and breeding activities aimed at reducing the effects of drought, and crop pests; insufficient use of agrometeorological data and forecasts in planning of crop production, and weak coordination in pasture management.

*Recommendations for the improvement of the institutional framework and coordination mechanisms include:*

- Identify supervisory and executive bodies for the prevention, reduction and elimination of emergency situations.
- Strengthen the role of the National Platform for Disaster Risk Reduction, in particular in the area of coordination of risk reduction measures implemented by state agencies together with the international community, including the Rapid Emergency Assessment and Coordination Team (REACT).
- Improve the mechanisms for allocating funds to reduce risks and creating monitoring procedures to enhance risk management in agriculture.
- Create a coordination group to be active in case of emergency situations, which would include representatives of key ministries and departments, and would cover the issues of identifying damage in agriculture. For example, the deputy minister of agriculture could be included in this group.
- Enhance the dialogue between government agencies, the private sector, civil society and local communities to support their participation in the disaster risk management process, including strengthening the leadership of women, youth, and persons with disabilities, to develop recovery and development plans after the disaster has occurred, taking into account the interests and needs of various social groups.

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## Early warning systems

Tajikistan has an operational EWS in the country. The Agency for Hydrometeorology is responsible for preparing weather forecasts, and notifying government agencies about potential natural hazards. Information is provided to the CoES which then disseminates it among its territorial bodies. Sometimes, CoES also prepares its own forecasts and issues alerts (particularly related to flooding and landslides). However, the forecasts and alerts of the two mentioned institutions are not always consistent. Farmers receive alerts through MoA and its regional and district bodies, as well as through agricultural associations. It was proposed to create automatic EWS via mobile networks, but this proposal did not find support among the involved agencies. At the moment, no EWS exist for the agricultural sector and farm management. In 2011, an NGO in Tajikistan developed an Agricultural Information Marketing System (AgroInform.Tj). This system provides various types of information and services to agricultural-sector stakeholders through their internet portal (including information on food prices, educational materials, and online trade platform). Still, limited access to internet and the level of technological literacy of the rural population are obstacles for wider application of such systems. Access, analysis and dissemination of market information remains challenging in Tajikistan. Other gaps in the country's EWS are: weak coordination of decision makers; lack of clear responsibility and management structure, planning procedures; insufficient information on the list of relevant services available for farmers and water user associations; lack of an adequate national and local disaster database, which would include data from warning systems, among other things.

*The following recommendations can be proposed to strengthen the existing early warning system:*

- Create an integrated EWS for the government authorities responsible for preventing natural disaster risks (which would include crop monitoring and agricultural forecasts) using the latest technology and increasing its potential.
- The Ministry of Agriculture, together with the CoES and the Agency for Hydrometeorology, to develop a list of services for farmers and water user associations on weather and natural hazards related directly to agriculture, including plant and animal pests and diseases.
- Establish a national and local disaster information exchange database that will integrate disaster data

from previous years, include risk assessment results, data from warning systems and information on the relief and recovery operations, which should be made available to officials of relevant government agencies, as well as at-risk and affected population and all other interested parties.

- Potentially develop a notification system that would send farmers SMS alerts and messages so that they can undertake actions based on weather forecasts.
- Capacity development and improve existing market information systems through inventory of the available market information and forecasting tools and collaboration with regional and global market information systems, and the private sector.
- Design and provide training on the use of market information and market intelligence (including international market food demand, food and trade policies) for producers, the agro-industrial sector, and traders. This activity could be supported through, for instance, FAO's funded regional project on Strengthening Capacity in Price and Market Information Systems and Policy Monitoring in Response to COVID-19 and other Shocks (2020–2022).
- Develop action plans for adaptation to climate change in the agricultural sector at all levels, taking into account different agroecological conditions and natural disaster risks.
- Organize training courses for *dehkan* farms with the purpose of determining the risks of natural disasters.
- Collect and disseminate information on traditional DRR and climate-change adaptation techniques.

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## Agrometeorology services

The existing pilot network of three automatic agrometeorological stations of the Agency for Hydrometeorology is not adequate for effective coverage at a scale relevant for agriculture and agrometeorological monitoring throughout the country. There is a need to produce real-time data from the automatic stations, develop forecasts and models, and scaled-up existing services. One of the main tasks of the agency is to provide farmers with analytical information on the expected weather conditions, their possible impact on agricultural production and expected productivity of crops. Agrometeorological bulletins or advisory forecasts are compiled every ten days – some information on conditions of pasture plants and grazing in summer and winter pastures is also available through the agency's website. However, current agrometeorological forecasts do not cover the level of farmers and *dehkan* farms, due to the lack of agrometeorological observation points, insufficient human resources and the lack of a marketing system. The bulletins do not include any information on natural hazards and the practices that can be implemented to reduce their adverse impacts on crops. In addition, the main users of the bulletins seem to be government agencies and not farmers. Farmers usually receive weather related information from television or radio channels, but may not always be able to get this information in a timely manner. The main challenges and constraints for the agency include the lack of highly qualified specialists, low wages, and the lack of modern agrometeorological technical equipment. There is also insufficient coordination with other agricultural agencies who have closer contact with farming communities and provide advisory support. There is a need to merge agricultural and meteorological expertise to ensure information is sufficiently tailored to the needs of farmers. Bi-monthly bulletins developed by the plant protection and chemicalisation department under MoA does not receive weather data from the Agency for Hydrometeorology, but uses information from internet sources. There are free mobile applications developed by AgroInform.Tj. However, at the moment, only around 8 percent of all farmers in the country use their services. A newspaper, produced by the AgroInform.Tj, is also useful for farmers, but it does not reach all potential beneficiaries.

*Recommendations for the improvement of agrometeorology services include:*

- Improve coordination and the mechanism for providing agrometeorological information at the level of the district administration, *dehkan* farms.
- Improve the system of agrometeorological services provision based on the use of modern information and communication technologies to help reduce the adverse impacts of natural hazards and adapt to climate change.
- Provide comprehensive year-round monitoring of weather and climate parameters and their impact on specific crop production and productivity. Increase the network of automatic agrometeorological stations collecting data in real-time in order to create a larger database of information that is actionable for farming communities and can be used to produce early warnings and advisories.
- Support formal collaborations and agreements between relevant national institutions engaged in the

- development and communication of agrometeorological information to farmers to ensure that skills and resources are shared and used at a national level.
- Determine the agroclimatic effects of climate change on the medium term (3-5 years) and long-term (10-15 years), including global warming, and develop an effective strategy for DRR, climate-change adaptation and sustainable diversification of the agricultural sector and specific subsectors, including crops, livestock, forestry, fisheries, and aquaculture.
  - Assess the adverse impacts of hydrometeorological phenomena on agricultural production in order to minimise economic and environmental damage and losses.
  - Improve the methodology for predicting the flowering of apricots and other early-flowering fruit trees.
  - Distribute agrometeorological information, including short-term products (weekly, monthly agrometeorological bulletins, and so on) to all interested legal entities and individuals, starting from agricultural producers, district and regional structures responsible for reporting to central authorities (via SMS and e-mail notifications).
  - Ensure that agrometeorological information has a sufficient lead time to alert farmers in a timely manner in order to take preventative action, for example on how to treat the foreseen outbreak of a disease in a particular crop. Advisories should provide guidance on how to act based on provided information.
  - Invest in communicating information through channels used by farmers, for example through Viber or mobile applications currently used by farmers in Tajikistan.

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## Disaster risk reduction in the agricultural sector

According to the National Strategy on Disaster Risk Reduction for 2019–2030, no government agency is directly responsible for disaster risk assessment and risk reduction. No adequate sector-specific DRR strategies have been developed so far (including for the agricultural sector). It was suggested that the CoES could lead the development of a disaster risk assessment. The National Platform for DRR would be key not only in supporting the coordination between involved entities, but also in allocation of necessary funds to risk reduction and risk assessment activities. Currently, government entities involved in disaster risk assessment activities can be divided into three groups – responsible for the analysis of natural conditions, socioeconomic situation, and the enforcement of governmental policies and regulations. Overall, Tajikistan has a rather well-defined preparedness system of plans and regular exercises and emergency drills. At the same time, no assessment was made to determine to what extent existing plans contributed to the mitigation of disaster risks. The lack of a preparedness plan and methodology for determining damage in agriculture is often mentioned as among the main problems in the sector. Commissions on disaster damage assessment include representatives of MoA. However, there is no officially approved and precisely described methodology that adequately and comprehensively evaluates damage and losses to the agricultural sector. The existing damage assessment process implemented by the authorities does not provide a full range of information and does not comply with the provisions of the internationally accepted methodologies. This process also does not take full advantage of modern technologies. The current role of insurance in providing compensation for losses due to adverse weather conditions is minimal. The Law on insurance activities does not include provision on agricultural insurance in case of a disaster. Agricultural insurance is voluntary and is not very accepted by the population, mostly due to the lack of trust in the effectiveness of the existing insurance system and hence the unwillingness to use the services of insurance companies.

*The following recommendations are proposed for the improvement of the disaster risk reduction system:*

- Conduct risk assessment, including assessment of hazards, vulnerability, exposure and coping capacities, focusing specifically on the agricultural sector. This assessment would identify hazards, but also determine the vulnerability of the population at risk (including agricultural communities), and taking into account gender, age, disability factors, and develop a set of appropriate measures to help the population be better prepared for and respond to disasters. For example, conduct training and seminars among the most vulnerable segments of the population; appoint persons in the rapid response group responsible for timely evacuation of this group to a safe place; provide groups at risk with the necessary equipment to receive alerts (phone, walkie-talkie); and consider gender balance while creating rapid response groups.

- Carry out measures to assess the risks and protect farm animals in case of natural disasters. When planning preparedness for emergency situations, it is necessary to create an emergency animal protection group at the community level. The task of this group should include: preparation of premises and creation of a forage base; early evacuation of animals from hazardous areas; protection of animals in pastures using the terrain; development of routes along which animals will be evacuated in advance; conduct of zoo technical and veterinary measures.
- Modernize the existing natural hazards preparedness and response system at all levels, which should be based on clearly defined areas of responsibility and management, improvement of planning procedures and coordination of relief, as well as the design and implementation of effective recovery measures. The system should take into account: introduction of new technologies for warning and protection against natural disasters; introduction of a natural disaster forecasting system, including in agriculture; development of a methodology for determining the damage from natural disasters in agriculture. In addition, this should take place within the context of overall enhancement of transparency in the decision-making processes, taking into account the promotion of gender equality and the development of sectors, particularly agriculture, due to its importance for the livelihoods of the majority of the population of Tajikistan.
- Create an enabling environment for the introduction of new technologies to reduce the impact of climate change and manage the risks of natural disasters.
- Prepare an organized and coordinated action plan based on clear definition of the roles and resources of various organizations, information processes and a roadmap for specific partners in case of need, and develop disaster preparedness measures at local and regional levels with the participation of all relevant stakeholders.
- Set up and implement a gender-sensitive system to provide information and support, as well as raise awareness and give training to the population, in particular agricultural communities at risk, regarding early warnings, early actions and preparedness measures to help protect their lives and livelihoods.
- Raise awareness and strengthen technical and institutional capacities, including of agricultural communities at risk, to implement DRR measures, through training, demonstration sites, developing business plans and providing concessional micro loans, while taking into account a gender sensitive perspective.
- Increase the capacity of authorised state bodies and civil society in adaptation to climate change and disaster risk management.
- Strengthen the warning system of natural disasters through the use of information and communication technologies, adaptation to climate change and other vital aspects, including coordination of all stakeholders.
- Improve the existing procedures and mechanisms for assessment of disaster damage and losses, in line with international methodologies. There is a need to establish a definition of damage caused by natural hazards, as well as the establishment of a methodology to adequately and accurately collect and calculate damage and losses in agriculture, including due to drought.
- Develop and establish an information management system that allows communities and local authorities to collect effectively, account for and analyse reliable information about the impact of natural hazards and climate change, which can also contribute to inform disaster risk assessments and comparison of the data from past impacts.
- Develop, demonstrate and implement innovative systemic environmental solutions, including ecosystem-based approaches or nature-based solutions to help reduce and manage the adverse impacts of natural hazards on agriculture and in rural areas, especially in the mountains. These measures could be based on the experience of projects already implemented in Tajikistan and include, for instance, reforestation, sustainable pasture management, and the use of drip irrigation technology, among other initiatives.

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# Annexes

## Annex I. List of people interviewed

	<b>Name</b>	<b>Organization</b>	<b>Position</b>
1	Safarov Sherali Juraevich	Ministry of Agriculture	Scientific Secretary of the Academy of Agricultural Sciences, Tajik Academy of Agricultural Sciences
2	Sharifov Gul Vakhobovich	Ministry of Energy and Water Resources	Deputy Head of the Department of Water Resources
3	Kimsanov Dilshod	Agency on Land Reclamation and Irrigation	Head specialist of Water Users Association Support Department
4	Abdualimov Karimjon	Agency on Hydrometeorology	Deputy Director of the Agency for Hydrometeorology of Tajikistan
5	Kamolov Jamshed	Committee on Emergency Situation and Civil Defence	Head of the Department for the Protection of the Population and Territories
6	Ergashev Murod	Committee on Environmental Protection	Environmental consultant, World Bank project, Sustainable Land Management and Improving Livelihoods in the Rural Area
7	Sangakov Saidkhuja	TajikAgrofond, NGO	Director

## Annex II.

# Projects and programmes related to DRR, EWS and agrometeorology services in the agricultural sector

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Adaptation to climate change in the Pyanj River Basin	<ol style="list-style-type: none"> <li>1. Flood control infrastructure is protected from the effects of climate change in ten jam oats;</li> <li>2. Irrigation system is climate proof in eight jamoats;</li> <li>3. Water infrastructure is protected in seven jamoats;</li> <li>4. Micro credit and micro deposit services to promote climate resilience are provided in the Pyanj river basin. Provided to dehkans (farms), including households for adaptation measures to reduce the impact of climate (drip irrigation, mulching, purchase of drought-resistant varieties of seeds, facilities for reducing disasters).</li> </ol>	21.55	Ministry of Finance, Agency for Land Reclamation and Irrigation, HCS (housing and communal services)	2013–2020	Strategic Fund for Combating Climate Change – ADB	Disasters, drinking water, irrigation system
Capacity building on climate change adaptation	<ol style="list-style-type: none"> <li>1. Establishment of a Climate Change Modelling Centre at the State Hydrometeorology Agency;</li> <li>2. Developing a climate model for predicting climate change (dynamic disaggregation);</li> <li>3. Assessment of the climate change impact on priority sectors of the economy;</li> <li>4. Developing local adaptation plans through a small subsidy mechanism, involving community (public) organizations in five vulnerable areas.</li> </ol>	6	Committee of Environmental Protection, Agency for Hydrometeorology	2013–2018	Strategic Fund for Combating Climate Change – ADB	Hydrometeorology, disasters
Improvement of Locust Management in Afghanistan, Kyrgyzstan and Tajikistan	<ol style="list-style-type: none"> <li>1. Facilitation in regional exchanges to manage locust situations and organization of joint or cross-border surveys;</li> <li>2. Organization of training and visit, development of Practical Guidelines;</li> <li>3. Strengthening operational capacities for locust field survey and developing locust monitoring and analysing systems;</li> <li>4. Strengthening operational capacities for locust control and ensuring management of pesticides delivered within the project;</li> <li>5. Monitoring and mitigating impact of locust control operations on human health and the environment.</li> </ol>	4.85	FAO, Ministry of Agriculture and State Unitary Enterprise Locust Control Expedition	2015–2019	JICA	Disasters, agriculture

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Project for Improvement of Locust Management (Phase 2) (Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan)	Provide substantial support for improving locust management through regional cooperation and strengthening of technical capacities on a wide range of topics, including for the operational use of the locust Geographical Information System (GIS) Caucasus and Central Asia Locust Management System (CCALM).	7.5	FAO, Ministry of Agriculture and State Unitary Enterprise Locust Control Expedition	2020–2025	JICA	Disasters, agriculture
Locust disaster risk reduction in Caucasus and Central Asia (CCA)	The overall objective of the project is to contribute to food security and livelihoods of rural populations in climate-change adaptation by anticipating, preventing and limiting the threat posed by locusts, i.e. reducing occurrence and intensity of locust crises as well as of their potential impacts on crops and rangelands and on human health and the environment in case they occur. The expected outcome of the project is that locust management is improved in climate-change adaptation and more specifically that early warning and reaction are enhanced thanks to appropriate locust monitoring as well as better capacities to respond to locust infestations, with particular attention to human health and environment. ( <a href="http://www.fao.org/3/CA3377EN/ca3377en.pdf">http://www.fao.org/3/CA3377EN/ca3377en.pdf</a> )	0.48	Ministry of Agriculture, State Unitary Enterprise Locust Control Expedition	2018–2021	USAID	Disasters, agriculture
Towards better national and regional locust management in Caucasus and Central Asia	The objective of the project is to contribute to safeguard food security and livelihoods of rural populations in Caucasus and Central Asia by preventing, controlling and limiting the threats posed by locusts to crops and rangelands. The outcome of the project will be the improvement of national capacities as well as the coordination of the overall Programme in six countries for better national and regional locust management. ( <a href="http://www.fao.org/3/BU325en/bu325en.pdf">http://www.fao.org/3/BU325en/bu325en.pdf</a> )	0.6	Ministry of Agriculture	2014–2019	Government of Turkey	Disasters, agriculture
Enhancing locust management and prevention	The project aimed to improve national and regional locust management, to reduce the occurrence and intensity of locust outbreaks; as well as to protect human health and biodiversity through the reduction of risks associated with obsolete and useable pesticides. ( <a href="http://www.fao.org/3/bu326e/bu326e.pdf">http://www.fao.org/3/bu326e/bu326e.pdf</a> )	1.66	Ministry of Agriculture, State Unitary Enterprise Locust Control Expedition	2011–2017	USAID	Disasters, agriculture

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Improvement of hydrometeorological services in the Republic of Tajikistan	<ol style="list-style-type: none"> <li>1. Institutional strengthening of the Agency for Hydrometeorology, including enhancing human resources and financial sustainability models;</li> <li>2. Improvement of hydrometeorological observation networks;</li> <li>3. Improving the system of providing services to the Agency for Hydrometeorology;</li> <li>4. Staff qualification is increased, taking into account technological changes in agency's performance and operations;</li> <li>5. Updated regulatory and methodical base is developed taking into account of institutional and technological changes in the agency's performance and operations;</li> <li>6. Meteorological instruments are installed for more accurate weather forecasts;</li> <li>7. Stream gauges are repaired and telemetry installed for more reliable seasonal river flow forecasts;</li> <li>8. The information transmission to the global telecommunications system is improved;</li> <li>9. Technical conditions for improved assessment of climate changes, including rapid access to information archives and more expedient hydrometeorological service;</li> <li>10. Expanded access of the external and internal users to the observation data and information products, including climate information, is provided.</li> </ol>	13	Agency for Hydrometeorology	2013–2019	Strategic Fund for Combating Climate Change – the World Bank	Disasters, water resources
Project on environmentally sustainable land use and livelihoods in rural areas – ELMARL	<ol style="list-style-type: none"> <li>1. Prevention and reduction of soil erosion;</li> <li>2. Improving the condition of degraded pasture land;</li> <li>3. Improving sustainable pasture management;</li> <li>4. Ensuring the protection of soil resources and moisture conservation;</li> <li>5. Improving water use efficiency;</li> <li>6. Increasing sustainable energy supply from renewable sources.</li> </ol>	19	Committee of Environmental Protection	2013–2018	Global Environment Facility (GEF), the Strategic Fund for Combating Climate Change – the World Bank	Agriculture
Institutional Development of the State Agency for Hydrometeorology of Tajikistan	<ol style="list-style-type: none"> <li>1. Supporting the legal and structural transformation of the Agency for Hydrometeorology;</li> <li>2. Improving climate risk data management through timely and reliable information.</li> </ol> <p>The country's hydromet services, designed to provide climate information for development planning is under severe strain due to weak infrastructure and institutional challenges. This will be addressed by supporting the legal and structural transformation of Tajikistan's Hydromet Agency and developing and implementing a business model in hydromet services. The improvement of climate change will empower communities to make informed decisions in managing risks through timely and robust information.</p>	10 (5 – GCF, 5 – ADB)	Agency for Hydrometeorology	2019–2023	Green Climate Fund (GCF), Asian Development Bank (ADB)	Disasters, water resources

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Improving climate resilience of vulnerable and poor communities through capacity building and diversification of livelihoods in the mountainous regions of Tajikistan	1. Disaster risk management; 2. Protection of health, food and water; 3. The livelihood of people and communities; 4. Ecosystems and ecosystem services. This initiative will introduce adaption measures to address climate change effects leading to declines in agricultural yields, increases in food prices and reduced agricultural wages. It will focus on the most vulnerable and food insecure communities in the Rasht valley, Khatlon and Gorno-Badakhshan Autonomous Region (GBAO) regions. It will include an integrated approach to provide climate information services, capacity development, sustainable water management and resilient agriculture and forestry.	10	World Food Programme	In 2018 approved by the GCF. The timing of the project is under review. Project implementation period four years.	Green Climate Fund (GCF)	Disasters, agriculture, environmental protection
The Climate Change Adaptation and Mitigation Programme for the Aral Sea Basin (CAMP4ASB Phase II) by supporting adaptation measures in Tajikistan and Uzbekistan	1. Livelihood of people and communities. The beneficiaries of the project are national partners working on climate change resilience and sector-based development as well as local communities, including farmers, water user associations, pasture management, villagers, private companies, and others; 2. Ecosystems and ecological services; United Nations 3. Sustainable Development Goals # 11; Sustainable cities and communities.	10	Committee of Environmental Protection	In 2018 approved by the GCF. The timing of the project is under review.	Green Climate Fund (GCF) - World Bank	Disasters, agriculture, environmental protection
Syr Darya River Water Resource Management Project	1. Assisting in the implementation of water sector reform in the Syr Darya river basin in Tajikistan with the aim of strengthening the management of water resources and irrigation at the level of basins, canals and farms; 2. Improving access to water and food security, reducing the risks of disasters associated with water in the sub-basins of the Khoja-Bakirgan and Aksu rivers of the Syr Darya river basin in Tajikistan; 3. Improving livelihoods and increasing socioeconomic indicators in selected rural areas, in the sub-basins of the Khoja-Bakirgan and Aksu rivers, and the Syr Darya river basin in Tajikistan.	7.5	Ministry of Energy and Water Resources of Tajikistan, Agency for Land Reclamation and Irrigation under the Government of the Republic of Tajikistan.	2014–2018	SDC	Water resource and Agriculture
Zarafshon River Basin Management Project and the Irrigation System Rehabilitation	1. Restoration of on-farm irrigation system and support of Water User Associations; 2. Introduction of drip irrigation; 3. Increasing the capacity of farms on the efficient use of water resources, taking into account climate change.	14	Agency for Land Reclamation and Irrigation	2017–2022	European Union Trust Fund – World Bank	Agriculture

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Strengthening critical infrastructure to ensure resilience to natural hazards	<ol style="list-style-type: none"> <li>1. Restoration and modernization of vital bridges in the Gorno-Badakhshan Autonomous Region (GBAO);</li> <li>2. Upgrading the national crisis management centre and emergency communication system, which allows emergency response services quickly access information on hazardous situations;</li> <li>3. Developing a Disaster Risk Management Financing Strategy in Tajikistan to develop effective financing mechanisms for eliminating consequences of natural hazards.</li> </ol>	50	Ministry of Finance and Transport	2017–2022	World Bank	Disasters, environmental protection
Strengthening Institutions and Capacity of the Ministry of Agriculture and State Veterinary Inspection Service for Policy Formulation	<ol style="list-style-type: none"> <li>1. Plans for the institutional reform of MoA are finalised, endorsed and implemented;</li> <li>2. Selected agrarian reform and food security policies and regulations are formulated with active contribution of MoA staff through an inclusive participatory process;</li> <li>3. Capacity of MoA is strengthened for analysis and technical competence;</li> <li>4. The availability of quality agriculture and food security data and information is improved;</li> <li>5. Development of private and public institutional and implementation capacities for delivering animal health services are strengthened.</li> </ol>	5	Ministry of Agriculture	2016–2020	European Union	Institutional reforms of Ministry of Agriculture and piloting reform package to diversify agricultural sector
Tajikistan agriculture commercialization project	<p>The project development objective is to increase the commercialization of farm and agribusiness products and to support micro-, small and medium enterprise (MSME) development in rural areas by providing better access to finance and strengthened capacity of project beneficiaries. Components include:</p> <ol style="list-style-type: none"> <li>1. Improvement of Technical Knowledge and Skills in Support of Commercialization;</li> <li>2. Access to Finance for Agri-Business Enterprises and Small-Scale Commercial Farms;</li> <li>3. Institutional Capacity Building and Project Management;</li> <li>4. Entrepreneurship Training and Business Development Services to MSMEs.</li> </ol>	22 (+15 through additional financing, approved in 2017)	Ministry of Agriculture, Ministry of Finance	2014–2022	World Bank	Agriculture
Tajikistan JSDF (Japan Social Development Fund) Nutrition Grant Scale Up	The grant development objective is to improve health and nutrition status among children less than five years of age and pregnant and lactating mothers in the 14 districts affected by the food price shocks in Khatlon province.	2.8	Ministry of Health & Social Protection	2013–2018	Japan Social Development Fund	Health
Second Public Employment for Sustainable Agriculture and Water Management Project for Tajikistan	<ol style="list-style-type: none"> <li>1. Provide employment to food insecure people through the rehabilitation of irrigation and drainage infrastructure;</li> <li>2. Increase crop production in response to improved irrigation and infrastructure;</li> <li>3. Support the development of improved policies and institutions for water resource management, as a means to improve food availability and food access for low-income people in poor rural areas supported by the project.</li> </ol>	45.9	Project Management Unit of the Ferghana Valley Water Resources Management Project, Agency for Land Reclamation and Irrigation	2013–2020	World Bank, Global Agriculture and Food Security Programme	Agriculture, water management

Name of project	Main components of the project	Project's budget (in USD millions)	Executive body on the part of Tajikistan (ministries and agencies)	Implementation period	Donors (international organizations)	Sector(s)
Community development of improved access to quality seed programme	<ol style="list-style-type: none"> <li>1. Provide a mechanism, skills and support to Tajik poor, rural women to improve their welfare and food security situation.</li> <li>2. Support of institution building of community seed funds for the benefit of and to be run by poor women located in seven pilot rayons of the Khatlon region;</li> <li>3. Beneficiaries to procure quality seeds, maintain a seed bank (with a subsequent sustainability of yields and activity) and market their surplus seeds (creating additional sources of income).</li> </ol>	0.85	Centre for Managing Projects on Cotton Farms Debt Resolution and Sustainable Cotton Sector Development	2010–2014	Japan Social Development Fund	Agriculture
Emergency Food Security and Seed Imports Project	<ol style="list-style-type: none"> <li>1. Increase domestic food production and reduce the loss of livestock to help at least 55 000 of the poorest households;</li> <li>2. Improve the ability of poor households to deal with seed shortages due to poor crops;</li> <li>3. Promote private commercial farming in order to increase food production and diversification.</li> </ol>	6.35	FAO, Centre for Managing Projects on Cotton Farms Debt Resolution and Sustainable Cotton Sector Development	2010–2013	World Bank	Agriculture
Strengthening Regional Collaboration and National Capacities for Management of Wheat Rust Diseases (CAC-Rust)	Regional collaboration, monitoring, surveillance, risk analysis, development of national strategic programme for prevention and management and capacity development.	1.07	FAO	2020–2024	FAO-Turkey Partnership Programme	Agriculture

ISBN 978-92-5-135691-3



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CB8435EN/1/04.22