Agriculture in Central Asia

The highly important agricultural sector of Central Asian economy occupies 70 per cent of the land and provides jobs to a significant number of people—from 15 per cent of those employed in Kazakhstan to 45 per cent in Tajikistan.

Down by 30–40 per cent during the 1990s, Central Asian agricultural production has grown steadily since then. The production of milk almost doubled over the last three decades, while the production of fruit and vegetables more than tripled, and today not only meets the needs of the region but is also becoming a high-value complement and competitor to the traditional exports of water-intensive cotton and grains.

Climate change is becoming an obstacle to further growth and sustainability of Central Asian agriculture. The borders of agroecological zones are projected to shift, and the region overall is projected to become hotter and less suitable for traditional cultivation.

In 2021, the Intergovernmental Panel on Climate Change issued a report that builds on updated global GHG emission scenarios and new ways of synthesizing outputs from dozens of climate models. The report confirms and strengthens evidence about projected climate trends worldwide and across Central Asia. Under the high emissions scenario, average temperature in the Amu Darya basin is projected to increase by 5°C by the end of the century compared to today. Days with maximum temperature above 40°C are projected to grow from about 20 per year now to 60 per year by 2100. Changes in the overall precipitation remain uncertain, but the frequency and intensity of heavy rains will increase.

2021 IPCC projections of climate parameters for the Amu Darya basin

Vulnerability of Central Asia’s agriculture to climate change

Direct climate extremes such as heavy rainfall, hot nights and days, droughts, floods and cold have already affected crop suitability in many areas of Central Asia, as have indirect climate extremes such as the spread of pests and diseases facilitated by the changing climate. Global climate change and extreme weather affect crop yields and nutrient content and threaten food security. The projected changes are expected to have negative effects on livestock, fisheries, aquaculture, and on the suitability of land for agricultural use in some areas.

Kazakhstan’s agricultural sector is dominated by the production of wheat, a major export crop for the largest producer and exporter of wheat in Central Asia. Other important crops include barley, cotton, sugar beets, sunflower and flax. Overall, Kazakhstan’s agriculture is not strongly affected by climate change, and may even experience growth in productivity, but with large regional differences within the country. While Kostanay and North Kazakhstan provinces may see increased productivity, West Kazakhstan, Almaty, Zhambyl, Atyrau, Aktau and Turkestan provinces will see declining productivity, with the southern provinces experiencing greater impacts due to low adaptive capacity and possible land degradation.

Kyrgyzstan’s agriculture sector produces mainly animal fodder, wheat, barley and maize. Minor crops include tobacco, cotton and potatoes. The areas most vulnerable to climate change are Chuy, Issyk-Kul and the eastern part of Jalal-Abad and Osh provinces. Bishkek and Osh provinces could very well experience the eastern part of Jalal-Abad and Osh provinces. Bishkek and Osh provinces could very well experience increased productivity thanks to in combination with heavier precipitation. Livestock is expected to have negative effects on livestock, fisheries, aquaculture, and on the suitability of land for agricultural use in some areas.

Tajikistan’s predominant crop is cotton, and the country imports approximately 70 per cent of its food. Climate change may cause an overall decrease in Tajikistan’s agricultural productivity, although with regional variations. While a decrease is likely in Khatlon province, agriculture in the Fergana Valley may experience a slight rise due to greater precipitation and fewer droughts.

Turkmenistan’s two most important crops are cotton – most of which is produced for export – and domestically consumed wheat. Citrus, dates and fibre crops are grown in oases. Most arable farming is irrigated and reliant upon water supply, and the areas hardest hit by climate change will be Dashogus and Mary provinces due to the extended duration of droughts in combination with heavier precipitation. Livestock is also projected to be significantly affected.

Uzbekistan’s most important crops are wheat and cotton. Other crops include potatoes and various fruits and vegetables. Like elsewhere in the region, the future and productivity of Uzbek agriculture is in particular threatened by the declining availability of water for irrigation: irrigated grain yields 6.5–7.0 tonnes per hectare, while rain-fed grain yields only 500–700 kilograms per hectare. The Surkhondarya, Jizzakh, Syrdarya and Tashkent provinces are expected to be the most affected. The overall decrease of soil productivity already evident in eastern Navoiy, southern Kashkadarya, Surkhondarya, Tashkent and eastern Syrdarya and Fergana provinces may exacerbate climate impacts in those areas.

Horticultural production and yields are strongly influenced by weather and climate. The increasing climate aridity, the scarcity of water and the frequency of extreme weather events – droughts, early frosts, heavy rainfall, sandstorms and cold and heat waves – are affecting all parts of Uzbekistan. Over the last two decades, Uzbekistan has experienced several periods of drought, during which the affected areas lost 50–75 per cent of the agricultural harvest. Cold waves have caused significant damage too, in particular to horticulture. In recent years, night frosts and early flowering of fruit trees followed by snowfall have resulted in 15–30 per cent losses in yield. The most frequent damage to fruit and vegetable plantations from extreme weather during the last decade has occurred in the Tashkent, Jizzakh and Kashkadarya oblasts. Long-term losses related to climate change are expected to reach 50–60 per cent for apples, tomatoes and potatoes depending on the region and the GHG emission scenario.

The fruits and vegetables that have always been a vital part of Uzbek agriculture, serving both domestic and – increasingly – export demand include native species of apples, pears, almonds and pista- chios. Orchards and vineyards occupy nearly 11 per cent of the country’s cultivated (mostly irrigated) land, and a further 7 per cent are used for pota- toes and other vegetables. While horticultural crops are widely produced by dehkan farmers for their own consumption, the commercial production of fruits and vegetables occurs mainly in the Fergana Valley, Tashkent and Samarkand oblasts, which are closer to the main consumption centres and have more suitable soil conditions. Tashkent, Samarkand and Andijan oblasts together produce almost 50 per cent of the country’s vegetables. Uzbekistan’s government is actively supporting the expansion of the horticultural sector, seeking to transition farmers from traditional cotton and wheat production to higher-value fruit and vegetable crops.


A real-life case for adaptation: climate impacts on horticulture in Uzbekistan

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Highland and lowland pastures
- Weather information can assist farmers in managing their livestock and balancing water distribution.
- Forecasts for extreme weather – heat, cold snap or drought – can alert farmers to take precautionary measures.

Irrigated crops
- Hydrological information can assist farmers in managing their irrigation and balancing water distribution.
- Weather information such as snowpack and snowmelt content can guide farmers in deciding when to plant and when to harvest.

Rain-fed crops
- Weather information can guide planting dates and crop succession.

CACIP maintains a wide range of information on the effects of climate change across economic sectors. Maps provide detailed insights into the agriculture sector’s vulnerability in Central Asian countries and potential adaptation options, and aggregated maps can support and facilitate dialogue, decisions and planning for adaptation to climate change both in the individual countries and in Central Asia as a whole.

Climate exposure scores for rain-fed and irrigated agriculture in Kazakhstan by 2050

Projected change in the number of frost nights in Kyrgyzstan by 2050

Projected change in 50-year flood risk in Turkmenistan by 2050

Agriculture as a contributor to climate change

Agricultural emissions as a part of total emissions

The sources of agricultural greenhouse gases are many and varied. Globally, most agricultural emissions come from livestock belching methane. Other methane emissions come from the cultivation of rice. The addition of fertilizers to soils results in releases of nitrous oxide. The burning of crop waste releases carbon dioxide, and ploughing and tilling the land releases gases trapped in the soil. The use of fuel in tractors and other farm equipment results in carbon emissions.

Growers have opportunities to reduce the emissions from their farms and to adapt their farms to the effects of climate change. Using composted manure, for example, improves the soil and reduces emissions compared to simply spreading manure or using chemical fertilizers. Likewise, the use of biological rather than chemical pest controls lowers emissions. And rice growers can apply proven techniques that reduce emissions and require less water while boosting yields. More efficient irrigation reduces the energy needed for pumping while also reducing water losses. Better land use management can increase the carbon sequestration capacity of soils and forests and improve growing conditions.

IPCC emission scenarios

In its 6th Assessment Report, the IPCC uses five new emissions scenarios to project the climate response to a range of greenhouse gas, land use and air pollutant futures:

- Very high GHG emissions (SSP5-8.5) and CO₂ emissions that roughly double from current levels by 2050
- High GHG emissions (SSP3-7.0) and CO₂ emissions that roughly double from current levels by 2100
- Intermediate GHG emissions (SSP2-4.5) and CO₂ emissions remaining around current levels until the middle of the century
- Low GHG emissions (SSP1-2.6) and CO₂ emissions declining to net zero after 2050
- Very low GHG emissions (SSP1-1.9) and CO₂ emissions declining to net zero around 2050


Opportunities for mitigation and adaptation in the food system

M = Mitigation  A = Adaptation

Basic land-use decisions

Crop diversification  Land rehabilitation  Adjustments in planting dates  Crop establishment  Crop-livestock systems  Silvopastoral systems

Crop management

Increased soil organic matter  Improved water management  Precision fertilizer management  Change in crop variety  Off-season vegetable production  Biochar application  No-till residue management

Livestock management

Feed and fodder banks  Drought-resistant livestock  Thermal stress control  Seasonal feed supplementation  Improved animal health  Agroforestry

Adaptation pathways for Central Asian agriculture

Developed through CAREC’s CAMP4ASB project with funding from the World Bank

LOCAL LEVEL

Arable Farming
- Heat-resistant or earlier-ripening crops
- Shifting from annuals to perennial crops
- Adapted and proofed seeds and planting
- Shaded cultivation
- Low-till and no-till ploughing
- Measures to contain pests and deceases

Livestock and pasture management
- Optimizing access to water for livestock
- Securing local drinking water supplies
- Moving from free to rotational pasturing
- Mobile electric fencing and canine herder use
- Use of fodder crops that demand less water
- Providing shade for livestock
- More sustainable mixes of livestock
- Haymaking for emergency fodder supply
- Timely sale of livestock during drought
- Lower quantity and higher quality of livestock
- Migration corridors for migratory herds

Horticulture
- Shaded cultivation
- Drip irrigation
- Use of crops that demand less water and are heat-resistant

REGIONAL LEVEL

Repair, sale, lease, financial and insurance services
- Extension services, education and awareness
- Investment facilities and market support
- Value chains for new breeds and crops
- Insurance and early warning for hazards
- Risk management monitoring and planning
- Processing and storage facilities

NATIONAL LEVEL

Early warning facilities and information freely provided to people
- Investment in hydrometeorological monitoring
- Funding for agriculture adaptation research
- Improved distribution of seeds
- Protection of genetic crop diversity
- Development of new crop varieties
- Help in diversifying smallholders’ income
- New or stronger social security systems
- Weather-based insurance for smallholders
- Improving access to finance
- Improving rights and resources for women
- Transition funds for farmers most affected by climate change
- Assistance to pastoralists
- Facilitating climate-smart decision-making
- Support for adaptation-mitigation synergies
- Land and water conservation at landscape scale

Source: summarized from the Regional Climate Vulnerability, Risk and Adaptation Portal (central asia ADAPT), https://crva.centralasiaclimatemonitor.org/