

Climate change and agriculture in Kyrgyzstan



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Overview of the agricultural sector

- The performance of the agriculture sector in the Kyrgyz Republic during the last 15-20 years demonstrates some capacity for growth, but also its vulnerability to internal and external shocks.
- Agricultural gross domestic product (GDP) grew 34 percent in real terms from 1998 to 2007, then fell 19 percent from 2007 to 2012 in response to a series of shocks, and then it stabilized with some modest growth and recent setbacks.
- Agriculture accounts for 12 percent of GDP and around one-third of employment.
- Crop production accounts for approximately 55 percent of agricultural GDP. 74 percent (1 million hectares) of arable land is irrigated. Small-scale farms absolutely dominate, with an average of 3–5 hectares of arable land. The sector produces approximately 50 percent of the country's wheat requirements and exports vegetables, fruits, and dairy products to the neighboring CA countries, and the Russian Federation.

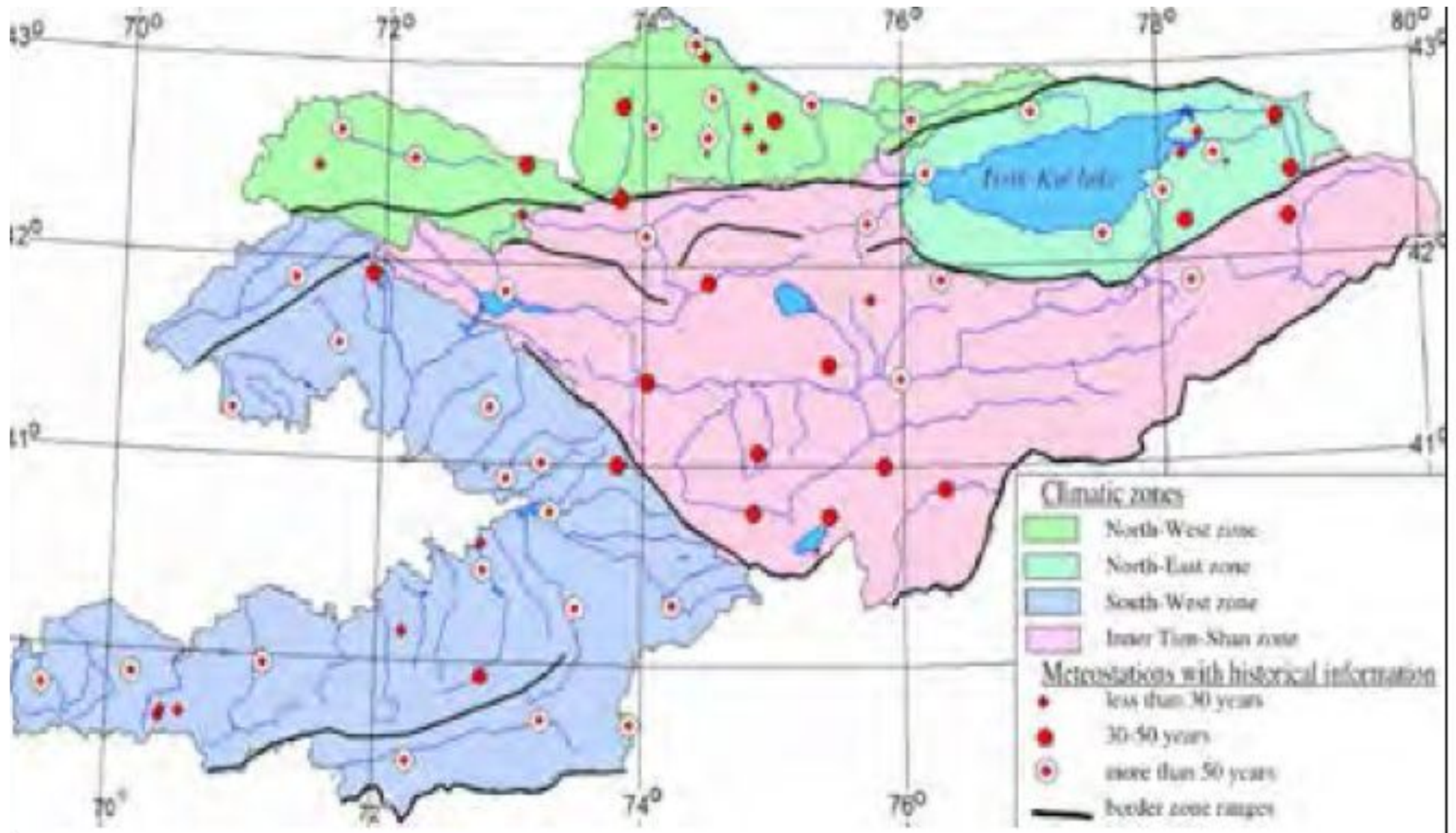
Main agricultural production trends

- Tangible reduction of wheat production (more than 40%): 2006 – 411,800 Ha; 2010 – 376,700 Ha; 2015 – 297,300 Ha, 240,100 Ha.
- Strong increase of barley cultivation (more than 95%): 2006 – 105,100 Ha; 2010 – 125,400 Ha; 2015 – 173,900 Ha, 2019 – 206,400 Ha.
- Steady Increase in production of vegetables: 2006 – 41,200 Ha; 2010 – 41,900 Ha; 2015 – 51,500 Ha, 2019 – 53,400 Ha;
- Significant decrease in production of cotton (more than 45%): 2006 – 45,700 Ha; 2010 – 26,700 Ha; 2015 – 14,300 Ha, 2019 – 24,400 Ha;
- Stable production of potatoes: 2006 – 81,200 Ha; 2010 – 84,300 Ha; 2015 – 84,500 Ha; 2019 – 79,200 Ha;
- Corn production increase: 2006 – 72,200 Ha; 2010 – 73,400 Ha; 2015 – 102,300 Ha, 2019 – 106,400 Ha.
- Cows headcount: 2006 – 584,900; 2010 – 666,500; 2015 – 757,400, 2019 – 835,300;
- Sheep and goats: 2006 – 4.047; mln; 2010 – 5.038 mln; 2015 – 5.930 mln;, 2019 – 6.267 mln

Land resources

- Only about 7 percent of Kyrgyzstan's land surface (around 200,000 sq km) was classified as arable. The remainder is mountains, glaciers, and high- altitude steppe that is used for grazing. About 75 percent of arable land is irrigated;
- Key land use information:
 - a) agricultural land – 55%:
 - b) arable land – 7%;
 - c) permanent pastures – 48%;
 - d) forest: - 5%;
 - e) other: 39.5 % (predominantly mountains and lakes.).
 - f) Irrigated land: 10,210 square kilometers (around 5%) ;
- Pastures and forest areas are owned by state. Farmland is privatized

Major climatic zones



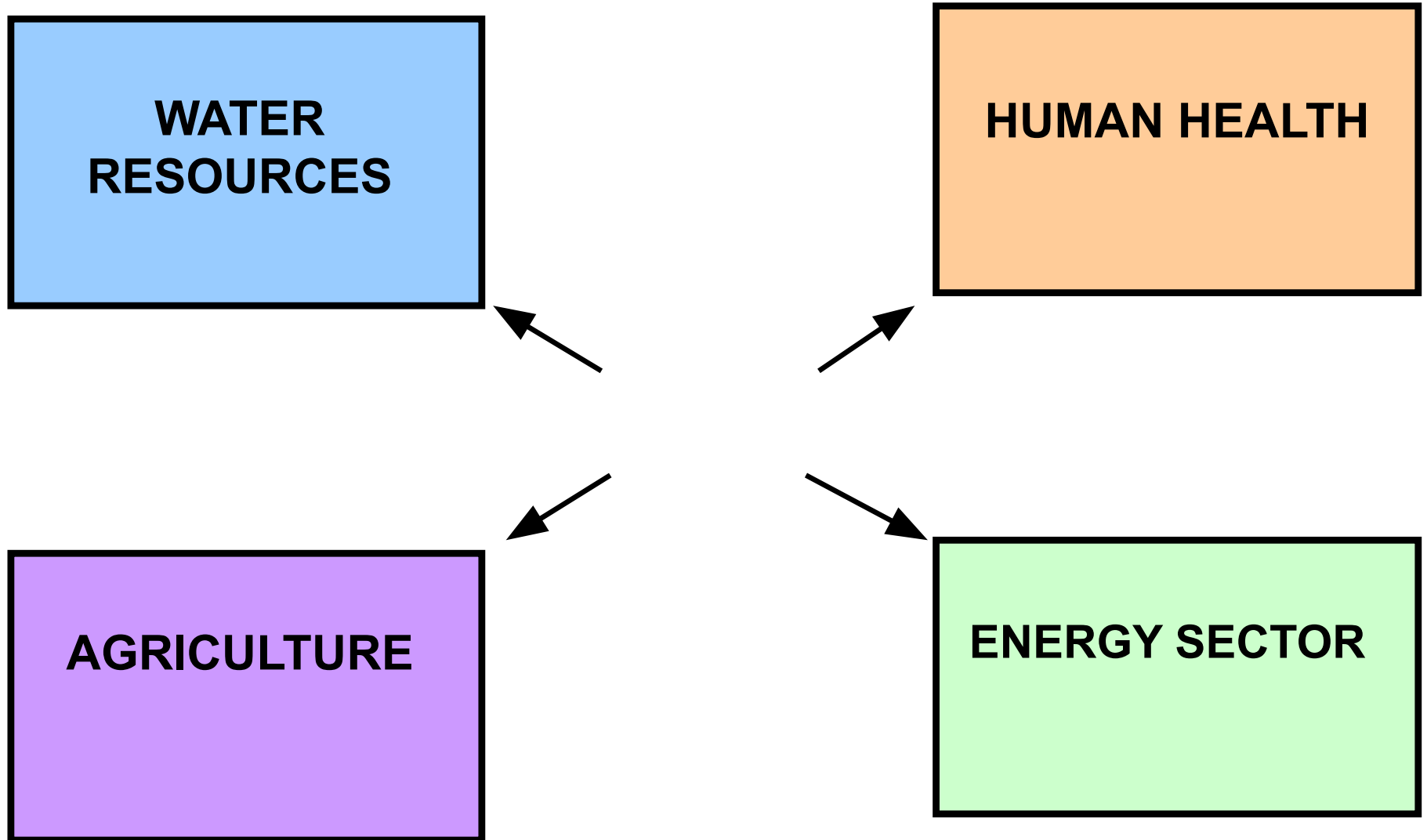
Agro-climatic conditions 1

- A dry continental climate predominates, with considerable variation according to altitude and type of mountain range. At lower elevations, temperatures average 27°C in summer and -5°C in winter, with precipitation of 450 millimeters in the northwest, 520 millimeters in the southwest, and 600 millimeters at the eastern end of Lake Issyk-kul. Frost occurs everywhere, and dry summers bring the risk of drought. Above 3,000 meters, temperatures range from 10°C in summer to -40°C in winter, with precipitation up to 1,000 millimeters.
- Most crop production takes place in the irrigated river valleys in northern and southern parts of the country, where the combination of climate, type of soil, and irrigation is suited to cereal, fruit, and vegetable production. Irrigation is vital given the low average rainfall and its irregularity.
- Dryland production of cereals, potatoes, and livestock is practiced in foothill areas throughout the country.
- Most parts of the country are located at high elevations and are not suitable to grow crops, but higher-elevation pastures support livestock breeding;

Agro-climatic conditions 2

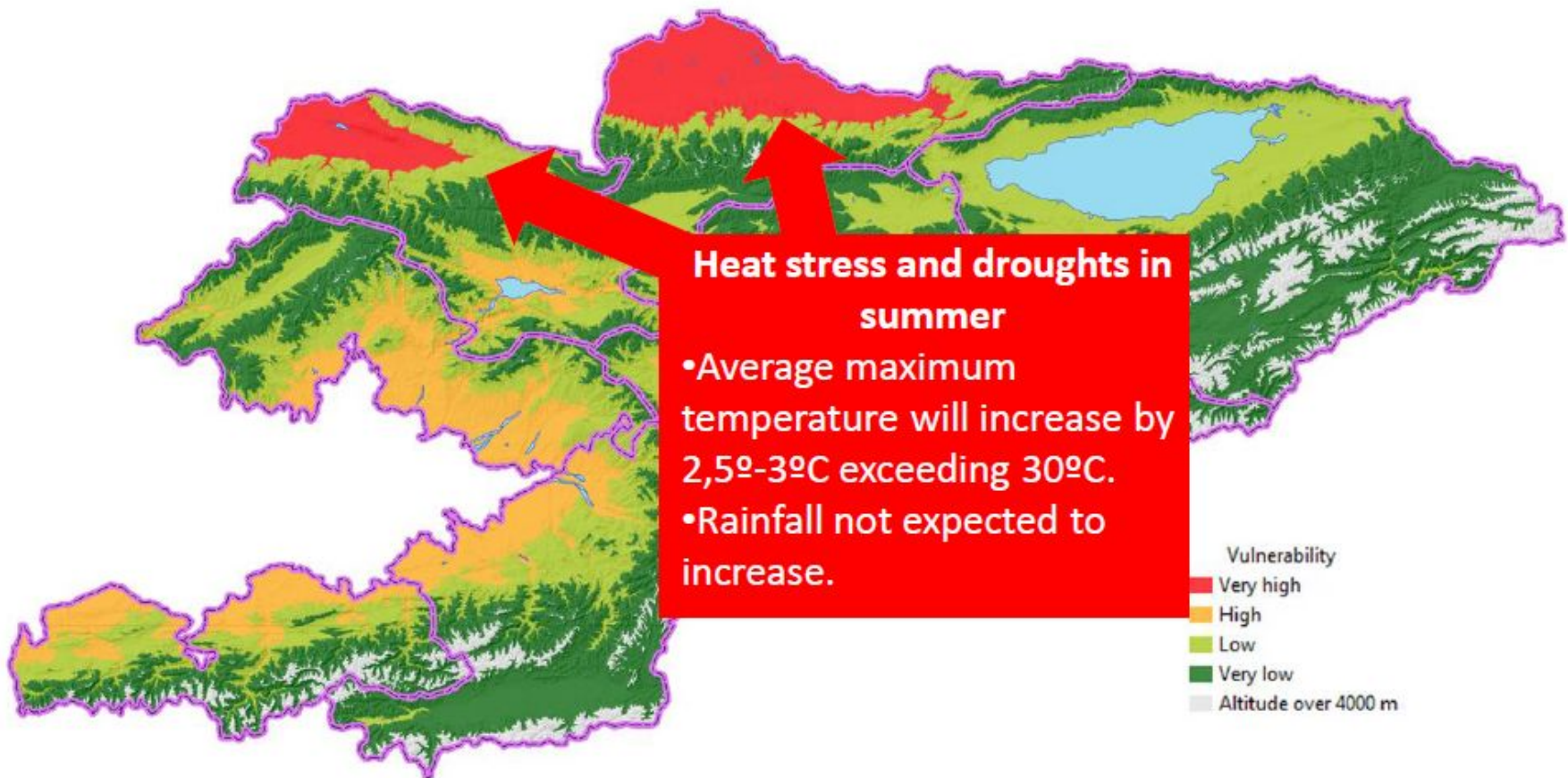
- The Kyrgyz Republic is dominated by the Tien Shan Mountains. Most of the country is above 1,000 meters, with an average altitude of 2,750 meters. There could be singled out three main zones.
- The northern zone includes the Talas and Chu river valleys. This zone also includes a huge upland basin of the Lake Issyk-kul. Much of this zone is irrigated, allowing high-value crop production in the lower areas. Cereal and livestock production predominate in the foothills.
- The central zone, is a vast alpine area of rugged mountains, high river valleys, and alpine and subalpine pastures. Most of the summer grazing areas (above 2,500 meters) are in this zone. Crops are grown in the more sheltered, upland valleys, but conditions are hard and production is low. This zone is best suited to extensive livestock production, especially in areas such as Naryn, where there is good winter grazing in valleys with light winter snowfall. Production risks—in both summer and winter—are highest in this region.
- The southern zone is a fringe of rich agricultural lowlands around the edge of the Ferghana Valley, near Osh and Jalalabad, plus the foothills and lowland areas in Batken. The milder climate, high soil fertility, and higher precipitation in the lowland areas facilitate intensive crop production, although land pressure is very high and farms are small.

Major climate change impacts in Kyrgyzstan



Vulnerability and hazards

Vulnerability to climate change



Climate change impacts

- The current warming trend will continue, with an increase of 2°C in average temperature by 2060 and 4–5°C by 2100. This projected rise in temperature will be higher during the summer months. Winter temperatures will change little. As rainfall is also projected to decline during the summer months, the risk of drought will increase markedly. At the same time, precipitation is projected to rise in winter, increasing the risk of floods and landslides. Rainfall is also likely to become more variable.

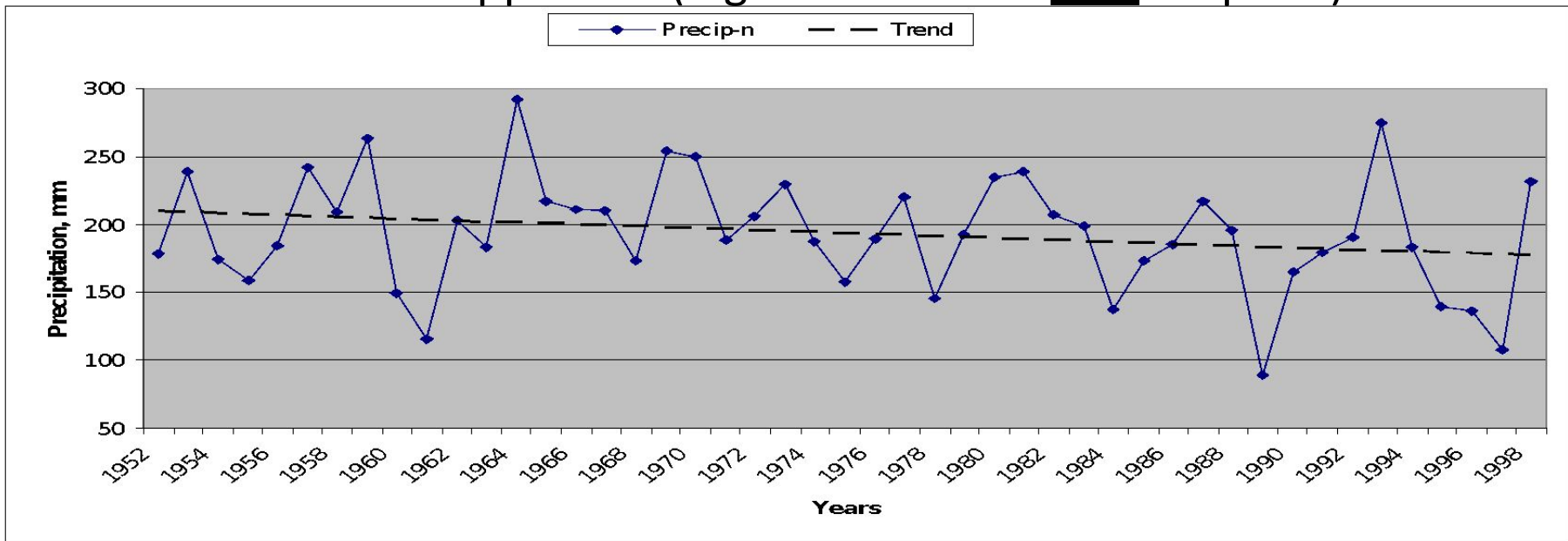
Table 1 Projected Impact of Climate Change on Crop Productivity in the Kyrgyz Republic, 2005–100

<i>Location</i>	<i>Wheat</i>	<i>Maize</i>	<i>Pota- toes</i>	<i>Cotton</i>	<i>Vege- tables</i>	<i>Fruit</i>	<i>Rice</i>	<i>Sugar beets</i>	<i>Melons</i>	<i>Barley</i>	<i>Tobacco</i>	<i>Grapes</i>
Batken		-		+	-	-	+				0	-
Jalalabad	0	-		0	+	+	+		+		+	0
Issyk-Kul	0		0		-	0				0	0	
Naryn	+		+		+						+	
Osh	0	0		0	0	+	0		0		0	0
Talas	-	+			+	+					-	
Chui	-	0	0		0	-		-	+		0	-

Climate predictions for Kyrgyzstan

The majority of available climate projections for Kyrgyzstan unanimously agree in predicting a significant temperature increase (particularly for Chuy, Talas and Fergana valleys) and accelerated frequency of extreme weather events and associated emergencies for Kyrgyzstan in the next few decades.

However, researchers hold different opinions on the likely precipitation patterns in the future. In general, some studies project a moderate decrease in precipitations in the coming decades, while some recent models claim the opposite (e.g. IFAD However, researchers hold different opinions on the likely precipitation patterns in the future. In general, some studies project a moderate decrease in precipitations in the coming decades, while some recent models claim the opposite (e.g. IFAD and ADB reports). Therefore,



Precipitation trend at meteorological station Naryn, Kyrgyzstan

Climate change policy

- In 2013 Kyrgyzstan adopted priority directions for adaptation to climate change until 2017;
- Main state bodies responsible for climate change adaptation are State Committee on Environment and Climate, Ministry of Economy, Coordination Council on Climate Change, Environment and Green Economy (under Prime-Minister);

Main sectors highlighted in Priority Directions document were:

1. Water resources;
2. Agriculture;
3. Energy
4. Emergencies
5. Human health
6. Forests and biodiversity

Adaptation activities – observations

- A broad range of planned adaptation activities are already taking place;
- Strongest focus of the government is on energy and water resources;
- Agriculture is also mentioned in the government strategic document, but not a highest priority;
- Involvement of private sector is very limited so far

Key recommendations

(from FAO report on agriculture)

- Support the introduction of new varieties of crops, new breeds of livestock and new agronomic techniques to increase resistance to environmental problems.
- Decrease water loss and increase the capacity of the irrigation system.
- Provide training for farmers to overcome the volatility of weather conditions.
- Provide training for farmers to improve the sustainability of pasture grazing modality.
- Develop and introduce insurance schemes for the crops and livestock of smallholders and family farms.

AUCA RESEARCH IN SUUSAMYR

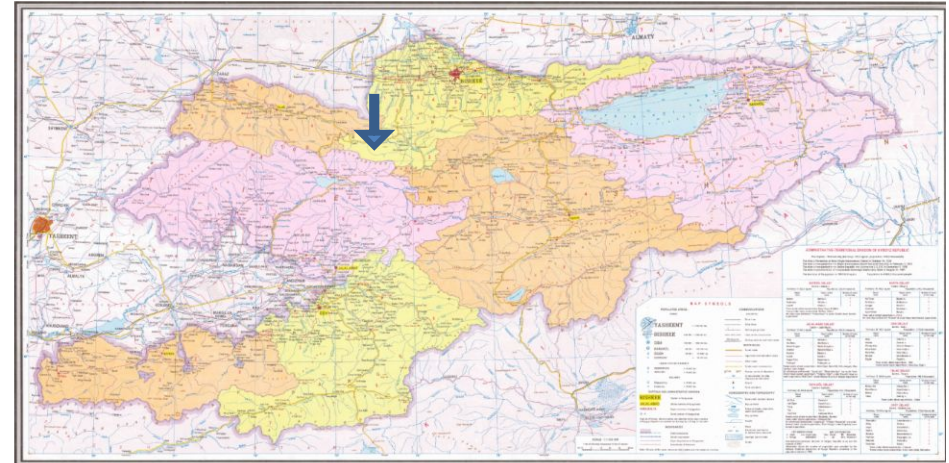
Pastures are the most significant land resource in the Kyrgyz Republic, since they cover more than 9 million hectares (about 46% of the country's territory). Pasture degradation poses a serious threat to food security and the well-being of rural residents in the Kyrgyz Republic. Mountain pastures are vulnerable to a number of natural hazards, such as climate change, landslides, mudflows, the spread of common weeds, etc. A rapidly growing livestock population puts additional pressure on the pastures. Therefore, there is an urgent need for research aimed at assessing the current processes of pasture degradation in the country in order to make informed decisions on sustainable pasture management.

Research area

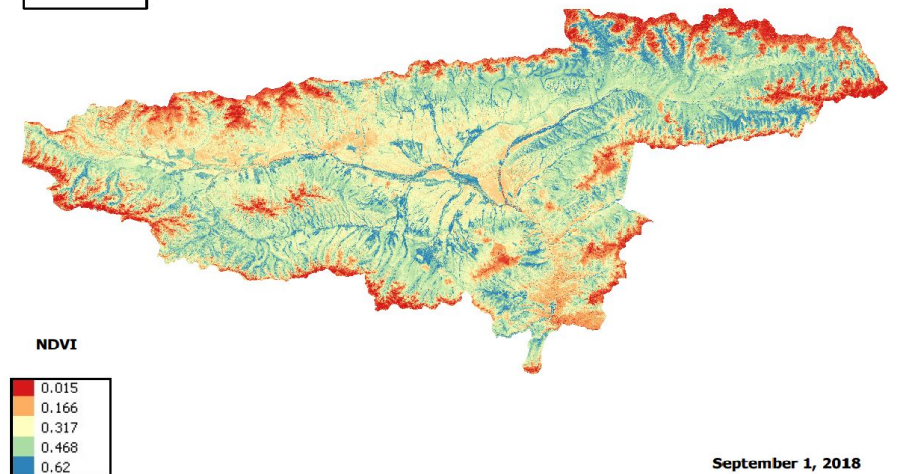
Why Suusamyr?

Suusamyr is one of the biggest and productive pastures in the country with total area around 500,000 Ha.

Due to its highly nutritious and healthy mountain grasses and huge capacity it is attended by herders from several neighboring provinces who come here every summer.



Sentinel 2 Image

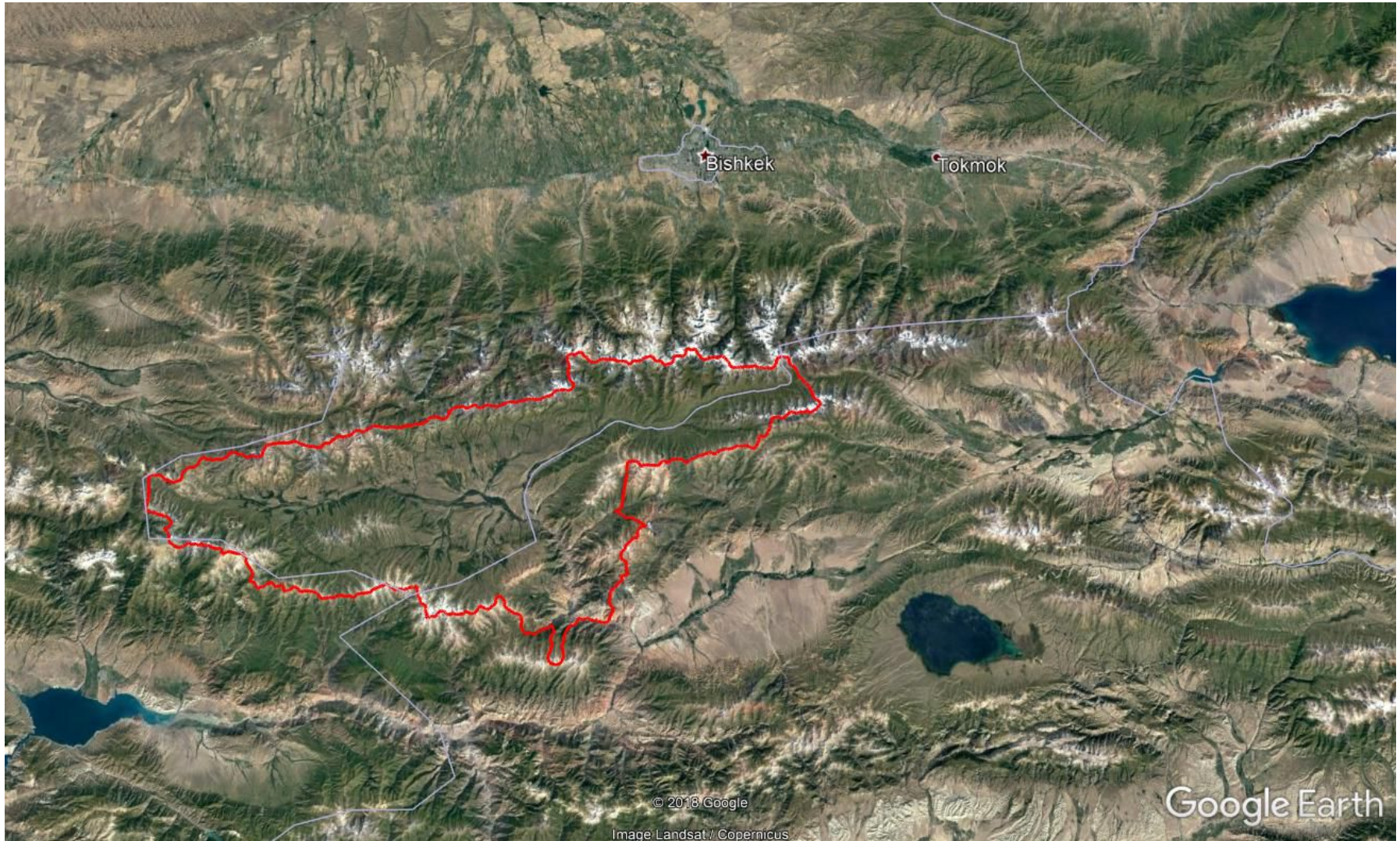


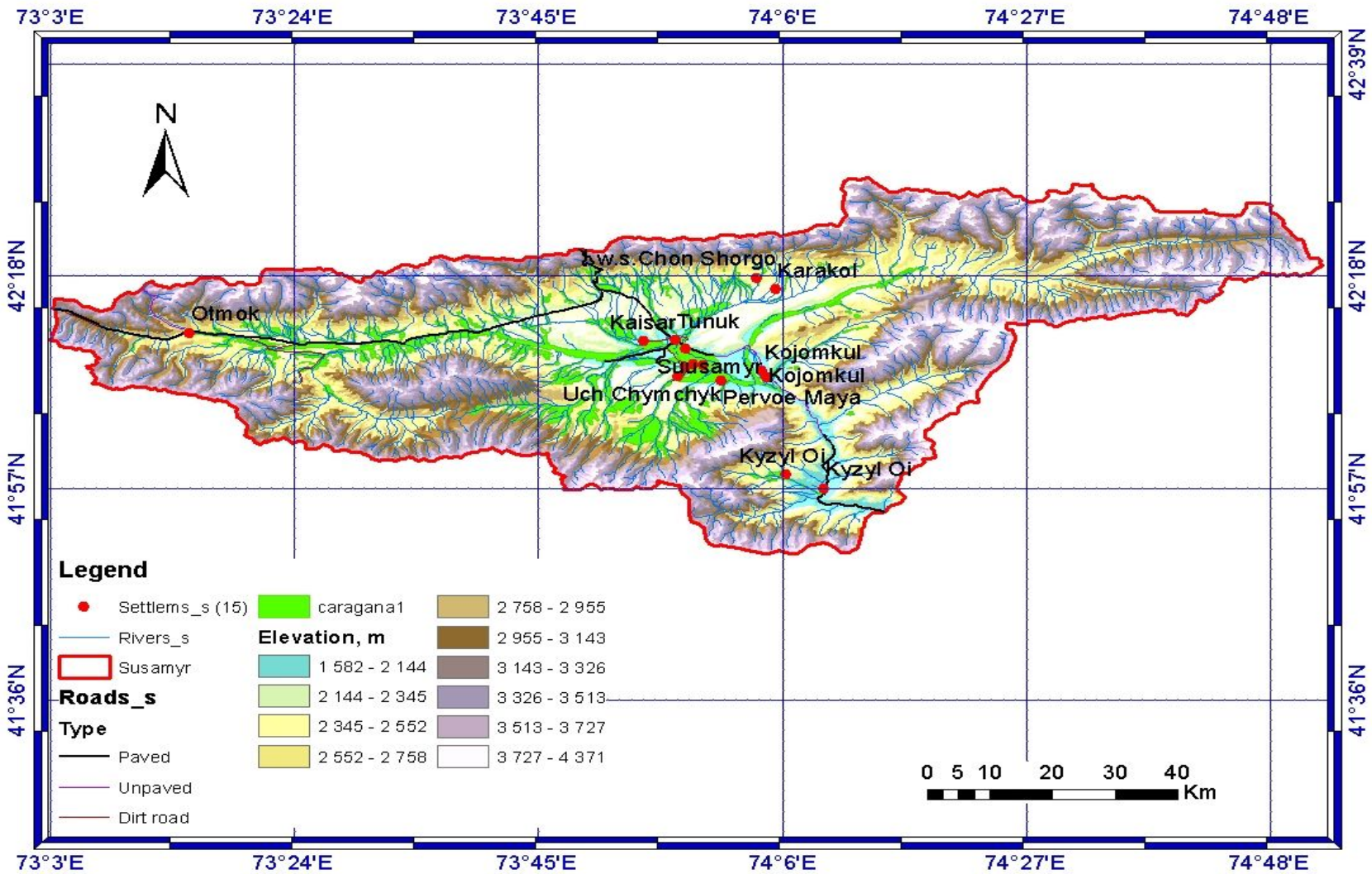
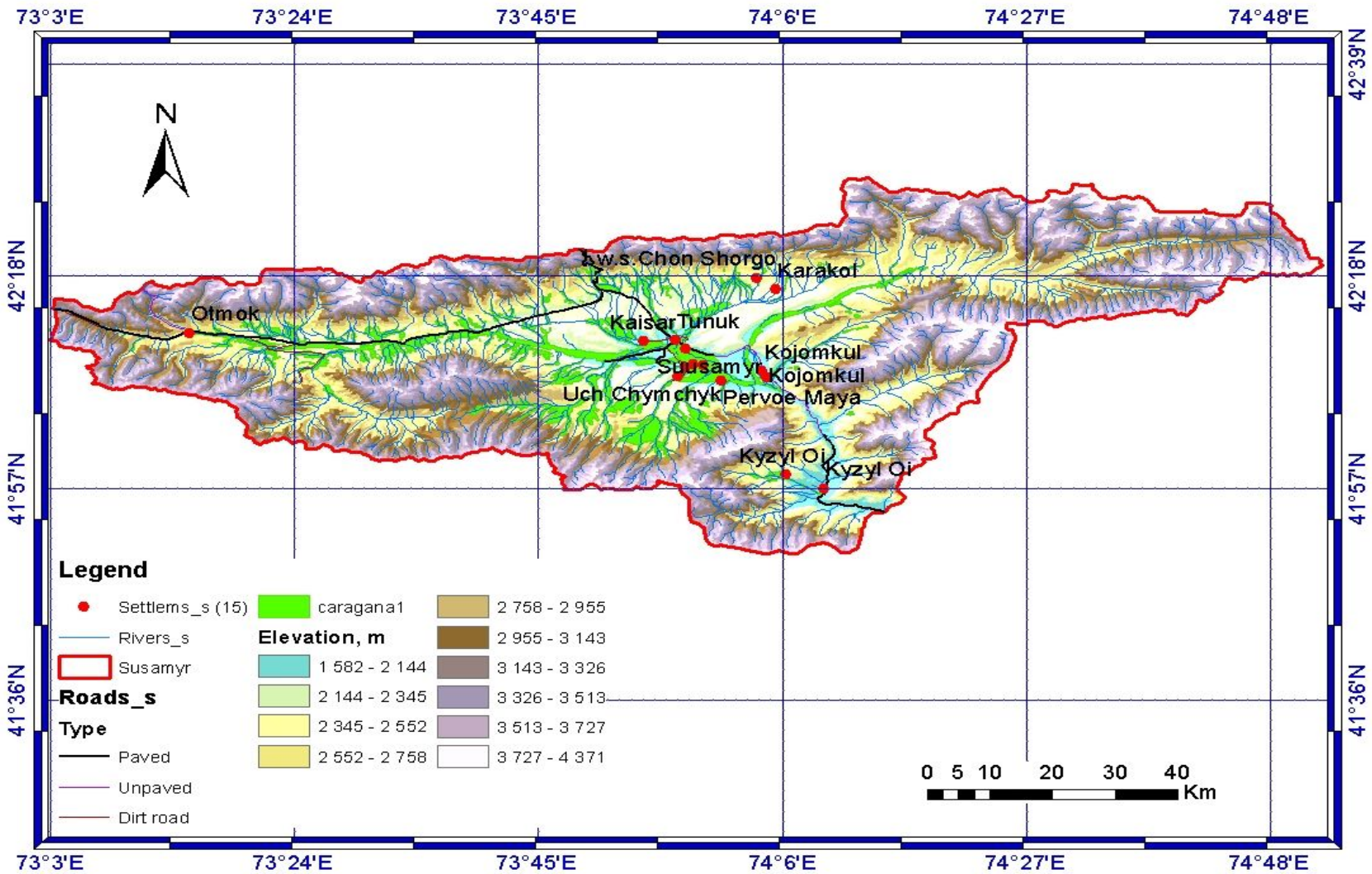
September 1, 2018

Suusamyр valley

Location: 41°60'N and 42°40'N; 73°10'E and 74°60'E

Altitude: 2200-2600 m a.s.l

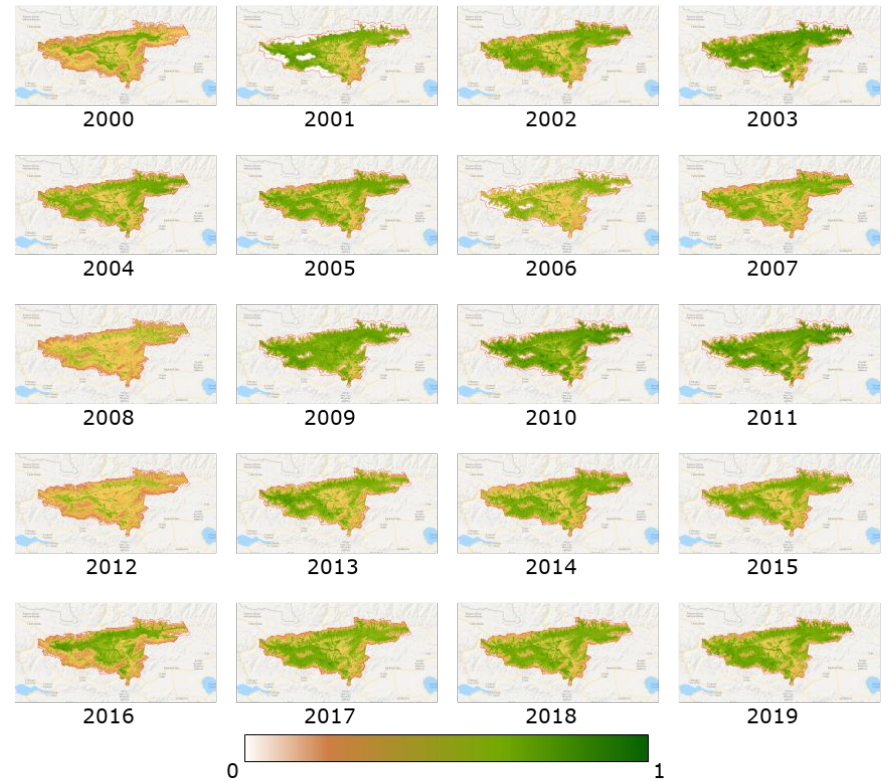
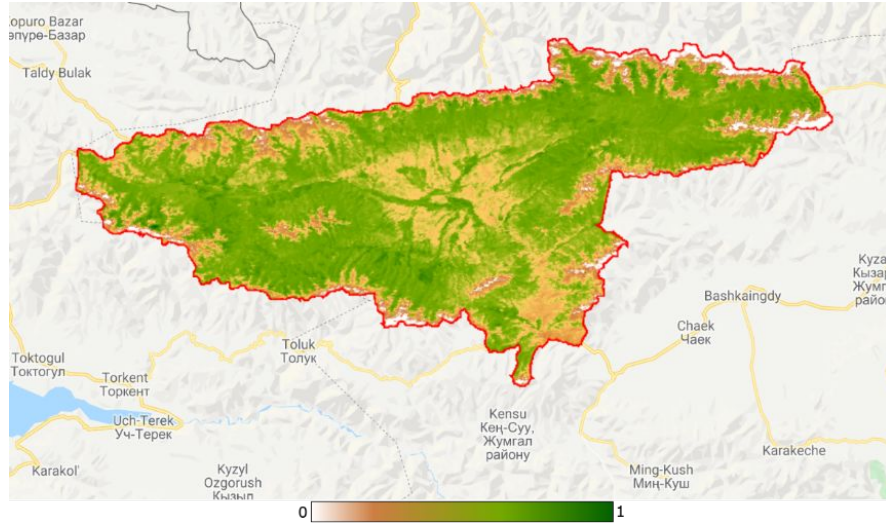




AUCA research goals

- Using satellite imagery to calculate NDVI dynamics in Suusamyr for the last 15-20 years.
- Collect opinions and perceptions of the local community members and pasture users on land degradation in the valley.
- Study changes in dynamics of specific weedy shrubs (*Caragana aurantiaca* Kochne).

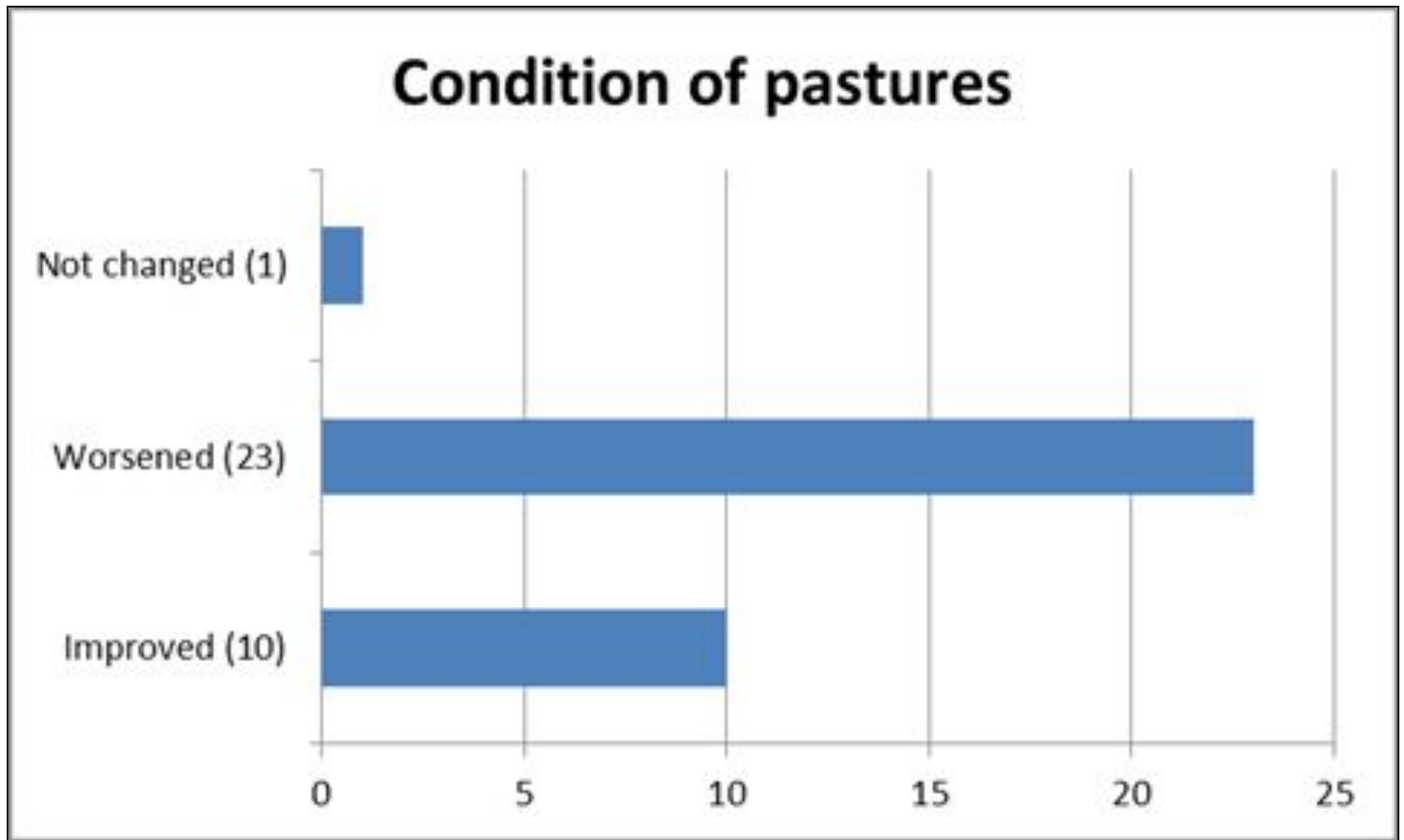
NDVI patterns in Suusamyr



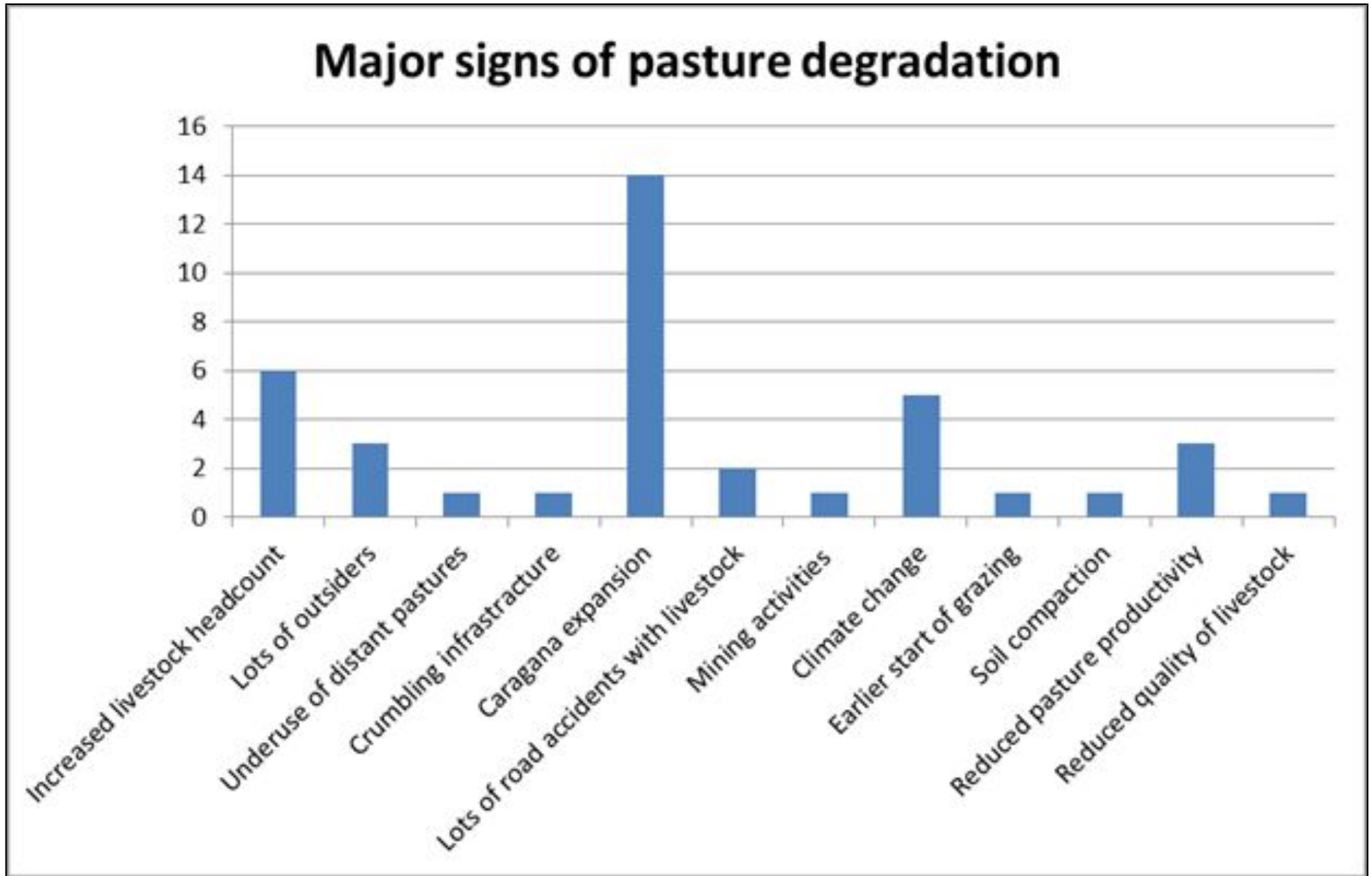
Caragana area assessment

Category	Period	Area (Accuracy)		
		2000 Landsat 7	2010 Landsat 5	2018 Landsat 8
Shrubs (incl. Altygana)	July	15377.58 ha (70.9%)	19438.74 ha (72.1%)	23272.92 ha (73.5%)
	August/September	13450.23 ha (62.3%)	18048.24 ha (65.5%)	23252.76 ha (77.8%)

Survey results in Suusamyr



Survey results in Suusamyr







Key conclusions

- Vegetation in Suusamyр Valley shows a productivity growth;
- The area covered by the caragana shrub expanded during the study period for up to 72%, which is consistent with previous assessments;
- Pasture users see the expansion of shrubs in certain areas of the valley as a major sign of deterioration of pasture resources;
- NDVI analysis showed a limited correlation between climatic parameters and NDVI values - it is necessary to improve the methodology further;



THANK YOU!