AGORA

Drought Impact & Resilience In Agro - Pastoral Communities

Executive Summary

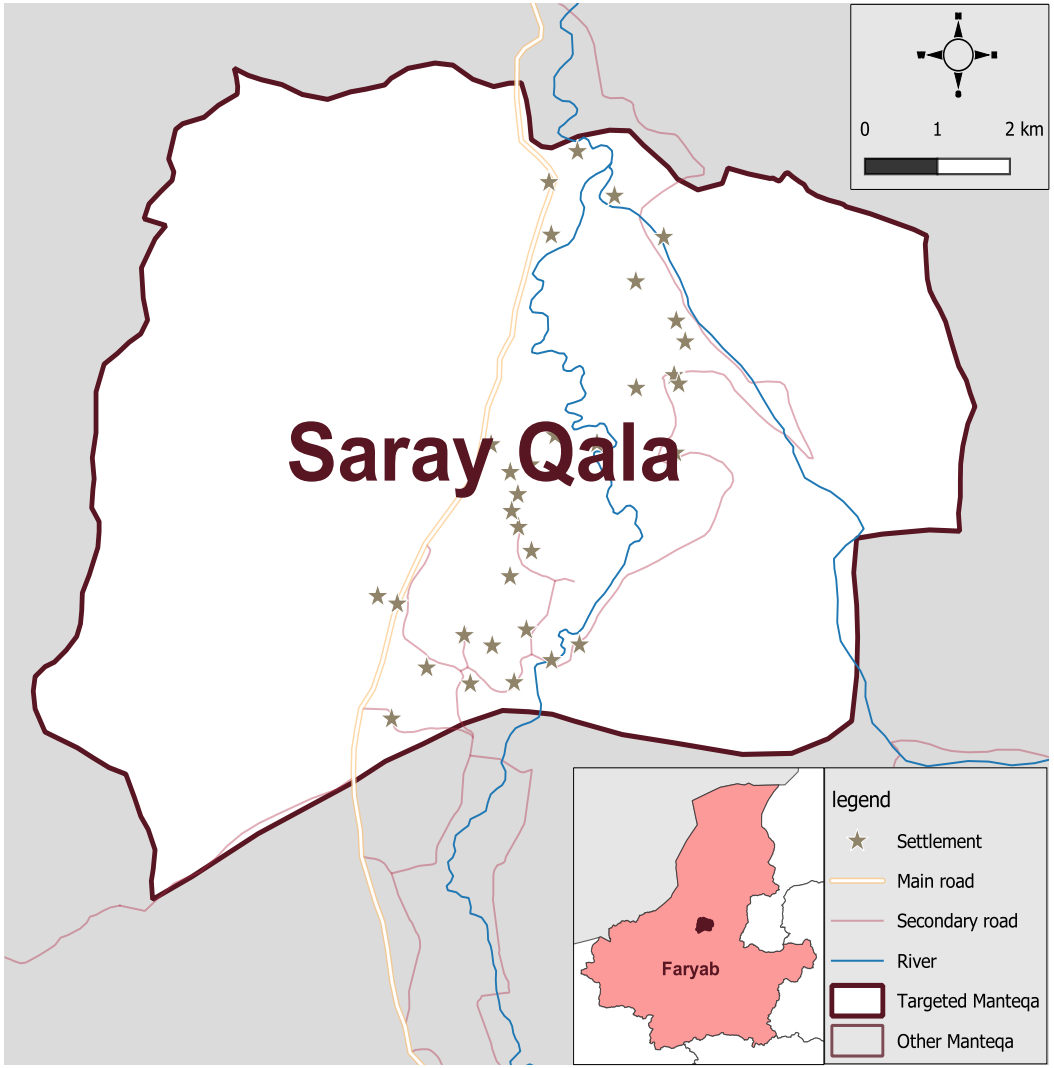
In terms of climate, Afghanistan ranks as the 5th most at-risk country globally, with natural hazards exacerbated by low household resilience. Recurring droughts heightens vulnerabilities in rural areas, where livelihoods heavily depend on agriculture and livestock. In Sary Qala Manteqa, food security is classified as being in Integrated Food security Phase 3 classification (IPC Acute Food Insecurity Analysis, assessed Dec 2024), indicating acute challenges in meeting basic needs.

Under ACTED's THRIVE program, this research examines occurrence and impact of drought in five manteqas across Balkh, Faryab, Samangan, and Jawzjan provinces. The study highlights how these regions, which are heavily reliant on agriculture and natural resources, face severe consequences from drought, including depleted water sources, degraded vegetation, and reduced crops and livestock productivity. Examples include drying springs, degraded pastures, and declining horticultural yields. Socio-economic effects include diminished financial assets, reduced access to credit (for loans), children education, lack of healthy food, deprioritization of health services, and strained community cohesion due to conflicts over shrinking resource pools.

Qualitative data from Focus Group Discussions (FGDs) with sharecroppers, farmers and livestock owners and sharecroppers paired with satellite-data analysis of temperature and precipitation trends, reveal external vulnerabilities. These include a 2°C increase in average winter temperatures since 2000-2023 compared to its historical average from 1981-2000, declining rainfall, and heightened drought susceptibility of rainfed lands and pastures.

The 2023 drought, driven by below-average precipitation, underscores the persistent risks to agro-pastoral livelihoods. While communities employ various coping strategies, these are not always sustainable. Coping practices such as food reduction, occupational changes, child labor, and migration, reflect the limitations of these resilience frameworks. This assessment identifies priority areas for adaptive agricultural practices and sustainable natural resource management to combat the ongoing impacts of drought in the studied manteqas.

Location of Saray Qala Manteqa (Faryab Province)



July 2024

Key Findings

Water Management: Water wastage and inefficient use of available irrigation water reduce ground water storage levels more than necessary to sustain agricultural production, particularly during droughts.

Climatic Vulnerabilities: By 2040, precipitation in the Manteqa is expected to decline across pastures in the northeast of Saray Qala, threatening pasture health and making natural resource management essential to sustaining local livelihoods.

Social Conflict: Pasture access and water issues in the Manteqa leads to social conflict, particularly during drought years when demand pressure on pastures is high.

Agricultural Challenges: Despite the use of improved seeds and drought-adapted crops, a lack of crop rotation leads to limited agricultural productivity.

Socio-Economic Inequalities: Financial capacity varies among households. Strategies to respond to drought-related challenges are limited, with landless households often resorting to migration.

Soil Erosion: Remote Sensing data shows wide-spread soil erosion across the Manteqa, with particularly high levels of erosion on rainfed land and pastures. Data from an earlier IMPACT assessment (2023) suggests limited awareness of the risk of soil erosion among community members.

About Saray Qala

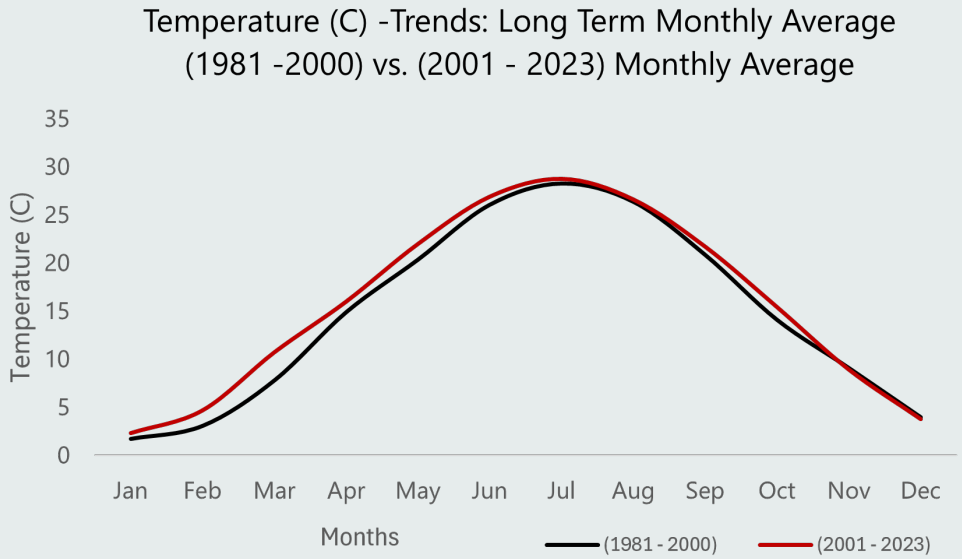
Saray Qala, meaning 'red castle' stands as a historic landmark in the region. It boasts a rich history reportedly a century old, characterized by its rugged mountains, water sources, arid deserts, and visually striking landscapes. The Manteqa is home to approximately 10029 households, predominantly consisting of host populations, though key informants (KIs) mentioned the presence of displaced populations in a previous IMPACT assessment (2023). Saray Qala's economy revolves around agriculture, daily labour and livestock, as well as tailoring and handicrafts for women. Notably, 79% of KIs reported mechanized agriculture in their villages. Land ownership is divided, with lalmi (rain-fed) lands both privately and publicly owned, while pasturelands are publicly managed.

Population	74968	**Irrigated land**	20 %
Villages	30	**Rainfed Land**	46%
IDPs	In 50% villages	**Pasture**	33%
Food Insecurity	Phase 3 IPC AFI	**Horticulture**	1%
Irrigation Source	Rainfed and stream	**Minimum Expenditure Basket (Faryab 2023)**	U$ 239
		MEB (Faryab 2024)	U$262

The Manteqa's reliance on rainfed agriculture leaves it acutely vulnerable to environmental shocks, particularly drought, with reduced rainfall identified as a critical challenge. Climate change has exacerbated these issues, contributing to rising temperatures and erratic rainfall and snowfall patterns over the past four decades—a trend projected to persist at least until 2040. Agro-pastoral communities in Saray Qala, whose livelihoods are heavily dependent on agriculture and livestock, face heightened vulnerability within this context due to their reliance on weather-sensitive income sources. In contrast, other residents with skill-based income are less affected. Drought-induced poverty, for example, is pervasive within agro-pastoral communities. Consequently, families often resort to drastic coping strategies such as selling their livestock, sending their children to other cities or abroad, or as a last resort, selling a portion of their land to feed themselves and their remaining livestock. Overall, the key findings of the study indicate that the community's resilience framework lacks sustainable adaptive practices, such as constructing check dams or water reservoirs, that could mitigate the impacts of drought and decrease its vulnerability to future shocks.

Temperature

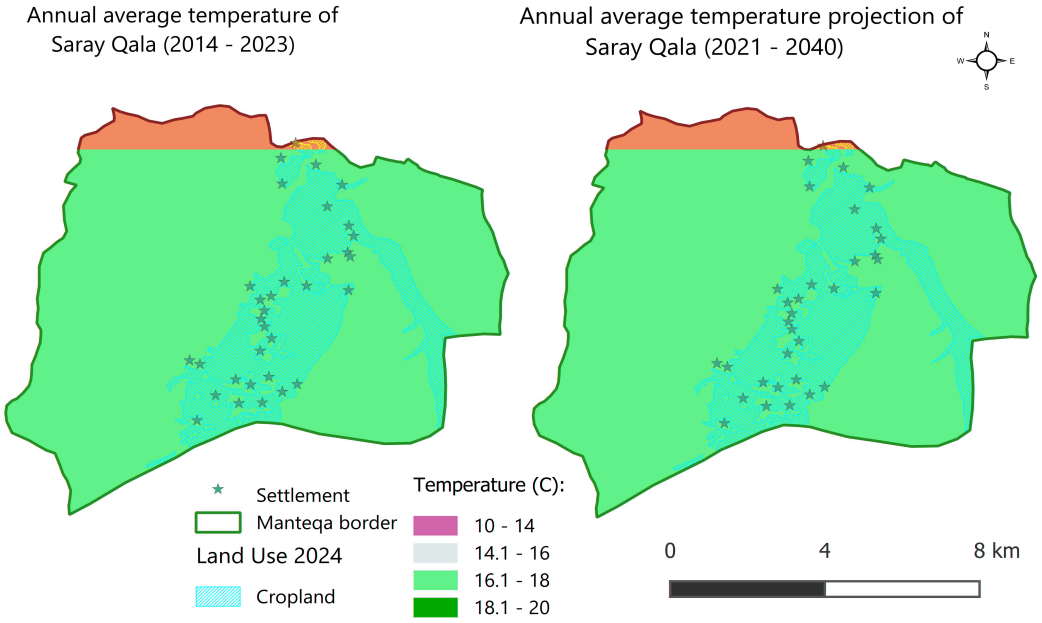
Saray Qala has experienced a seasonal warming trend over the past two decades. Temperatures in winter (Jan-Mar) increased by an average of around 2°C from 2001-2023 versus the historical average of 4°C (1981-2000), further underscoring the region's warming trajectory.



In 2001-2023, temperatures mostly did not show notable deviations from the historical average (1981-2000), except in winter:

- Winter (Jan-Mar): Temperatures averaged 2°C above the historical mean (4°C), disrupting winter crop cycles and reducing the chilling period required for certain crops. This warming trend may also limit snowpack accumulation, essential for spring water supply and early-season irrigation.
- Summer (Jun-Aug): Summer temperatures reached an average of 27°C for both periods. Hot temperatures in summer months increase water demand for crops and livestock, potentially lowering yields where water resources are limited.
- Autumn (Sep-Nov): Average Autumn temperatures remained around 15°C, with no increase over the past four decades. Cooler temperatures and soil moisture are needed for winter crop planting in Autumn.

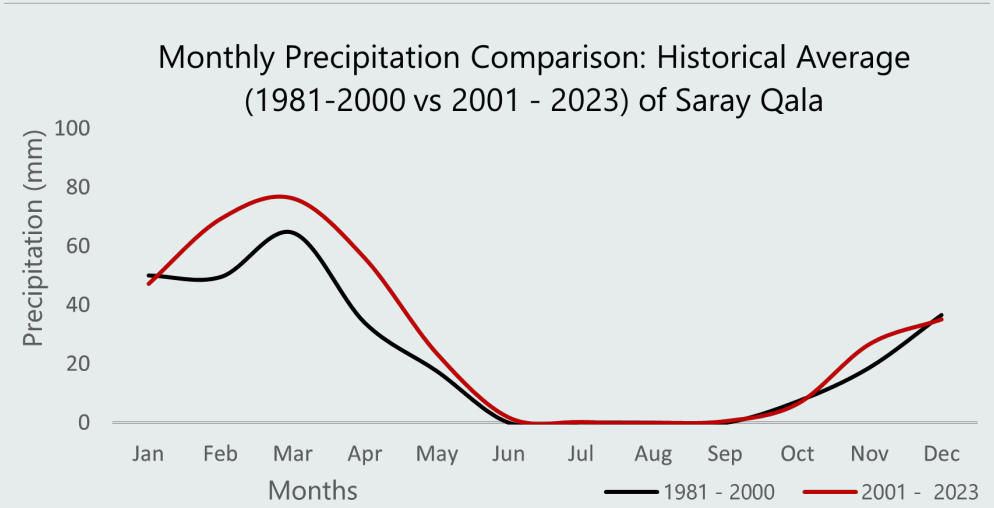
Predictive Forecast



Projections for 2021 to 2040 (ERA5/ WorldClim, assessed Dec, 2024) indicate that Saray Qala's annual average temperatures would remain uniformly around 16-18°C across the entire Manteqa until 2040. Unlike other manteqas in the region, temperature increases in Saray Qala may be limited to warmer winters, which may affect the availability of spring water as well as irrigation patterns.
In the absence of effective irrigation water management, this trend may lead to water stress and resource shortages, challenging Saray Qala's agro-pastoral systems and threatening livelihoods and long-term resilience.

Precipitation

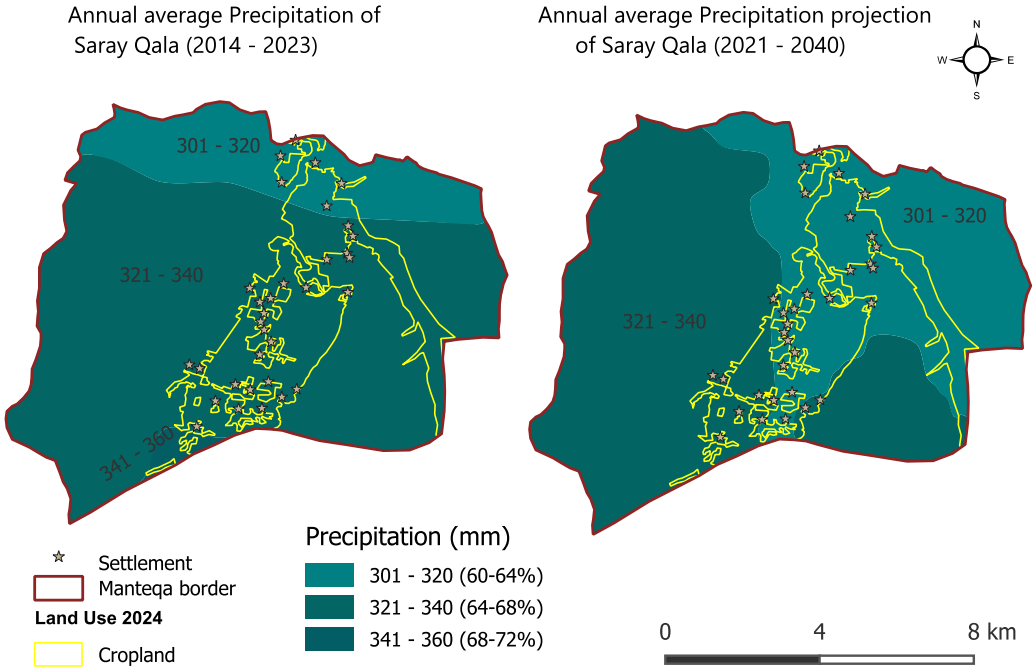
Saray Qala's average annual precipitation was 318 mm from 1981 to 2022, with significant fluctuations rather than a clear trend. In 2023, precipitation reached a historic low of 194 mm.



The 2001-2023 pattern shows a shift in the volume of rainfall, enhancing planting cycles, increasing soil moisture retention, and decreasing drought risks for agricultural communities.

- Winter (Jan-Mar): In 2001-2023 the winter precipitation (Jan-Mar) was 64 mm, above the historical average of 53 mm (1981-2000), providing comparatively good water availability for winter crops and increasing snowpack essential for spring irrigation. February and March showed an early peak, deviating from the historical March peak that typically supports spring vegetation.
- Summer (Jun-Aug): No rainfall was recorded in the summer of either periods (1981-2000, 2001-2023). This absence of summer rain increases water stress on crops, as June to August are the hottest months when water demand is highest.
- Autumn (Nov-Dec): Precipitation late in the year, from November to December shows an increase (31 mm) in 2001–2023 versus historical values (28 mm in 1981–2000), improving soil moisture for winter planting.

Predictive Forecast

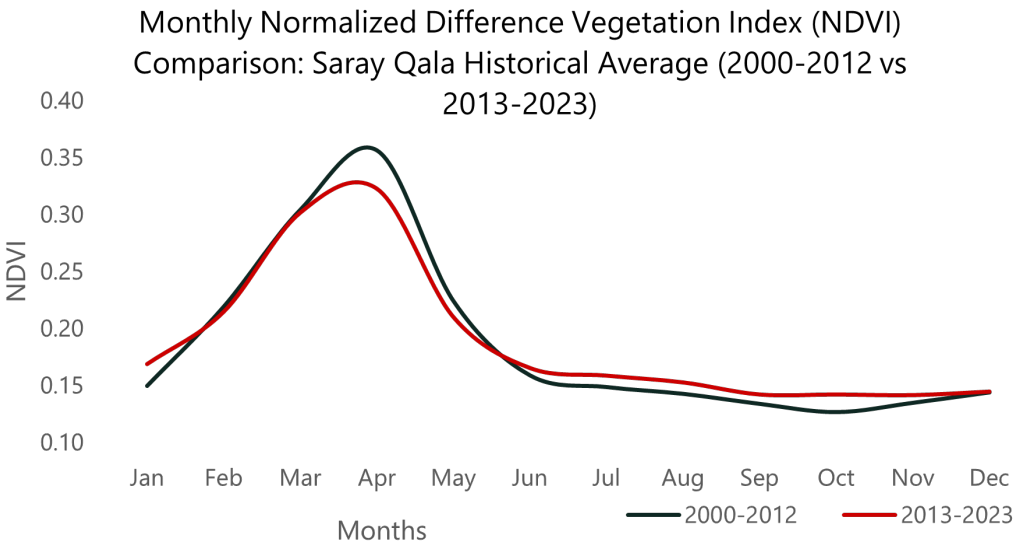


Projections for 2023-2040 (CHIRPS/ World clim, assessed, Dec 2024) show a continued decrease in annual precipitation, particularly in the northern and northeastern areas, where levels could drop to 280-300 mm, directly affecting rainfed lands and pastures, and potentially reducing available irrigation water for croplands in the same areas. This trend is less pronounced in the west and south-west of the Manteqa, where annual precipitation levels are projected to remain around 320-340mm. With increased pressure on natural resources and croplands in the more densely populated parts of the Manteqa, effective management mechanisms will likely become essential for the sustainability of the manteqa's natural resources and the livelihoods of its population.

Understanding Drought Occurrence Trends and Conditions in Saray Qala

In Focus Group Discussions (FGD) in Saray Qala, both sharecroppers and farmers identify reduced rainfall during critical agricultural months (Dec- Feb) as a primary drought indicator. Sharecroppers emphasized lower agriculture yields and inaccessible water sources, while farmers and livestock owners focused on environmental changes like dust storms, winds, and plant diseases. These perceptions result in some differences in the drought years identified by each group.

Drought Season and Growing Season according to Climatic parameters



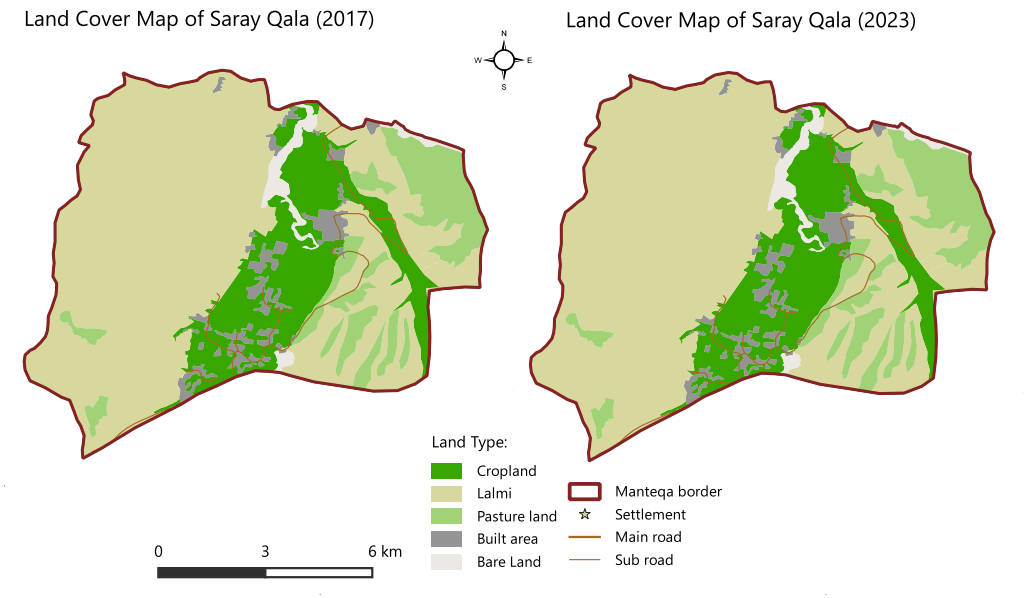
Community Vs. Remote Sensing on Drought Years:

Local indicators such as a decrease in rainfall and suppression of vegetation largely align with remote sensing (RS) data:

- **2022**: Sharecroppers and farmers, relying on vegetation and precipitation as an indicator, perceived these years as drought-affected, supported by NDVI data showing moderate to weak vegetation health. Average annual precipitation (188 mm) was below normal.
- **2023**: Both farmers and livestock owners and RS data point to 2023 as a severe drought year, with NDVI values showing poor vegetation. FGD participants also reported making use of weather forecasts and news.
- **2024**: Neither Sharecroppers nor farmers and livestock owners consider 2024 a drought year due to adequate winter rainfall, with RS data showing increased precipitation and improved vegetation.

Drought and crop growing seasons in Saray Qala were identified using climatic parameters such as Land Surface Temperature, NDVI, and Standardized Precipitation Index. The growing season generally lasts from March to August, with drought conditions most common in the hot summer months (June to August). From March to May, the optimum green months, the NDVI value for 2013–2023 was 0.27, lower than the 2000–2013 average of 0.29. This decline suggests a slight reduction in vegetation cover, indicating drier conditions, potential land degradation, or an increase in non-vegetative surfaces such as bare soil. Average precipitation during these months (March to May) also decreased from 53 mm (2000 to 2012) to 48 mm (2013-2023). This decrease in precipitation, with consistently warm temperatures makes the growing season increasingly vulnerable to drought, leading to heat stress on crops, reduced yields, and increased risk of crop failure. Seasonal drought patterns, particularly in summer, overlap with the crop-growing and harvesting periods, affecting crop resilience. Monitoring NDVI fluctuations is crucial to understanding drought impacts, though seasonal cycles, such as harvesting times, should be cross-checked to distinguish between drought effects and natural vegetation changes.

Mapping Drought Effects on Natural Resources in Saray Qala

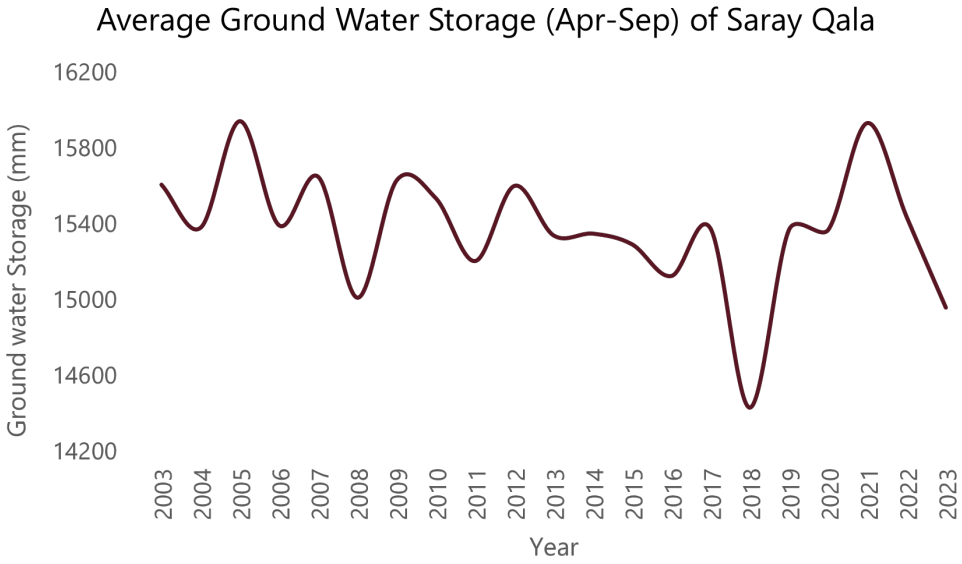


Drought Impact on Land and Vegetation

A comparison of land cover maps (Google Earth& GIS Basemap) from 2017 (Google Earth) and 2023 (arc GIS) reveals no observable change in cropland, pastures or built up areas. In both years, horticultural areas were mostly concentrated around Saray Qala settlements, particularly the stretch of crop land extending from north to south across the center of the Manteqa. In FGDs, community members reported overuse of available water resources in drought years such as 2023, with water sources and ground water storage in the manteqa running low as a result. Combined with declining precipitation, drought in Saray Qala may have longer-term consequences on available water resources and agricultural lands in the absence of sustainable management strategies.

Average Groundwater Storage:

Groundwater storage: (GLDAS, assessed, Dec, 2024) from April to September (2003-2023) shows fluctuating levels, with peaks in 2005 and 2021 following favorable rainfall. However, severe droughts, particularly in 2008-2011, 2018, and 2023, have caused notable declines. Despite occasional recoveries, there is a long-term downward trend in groundwater levels, highlighting the need for effective water management in drought-prone periods.

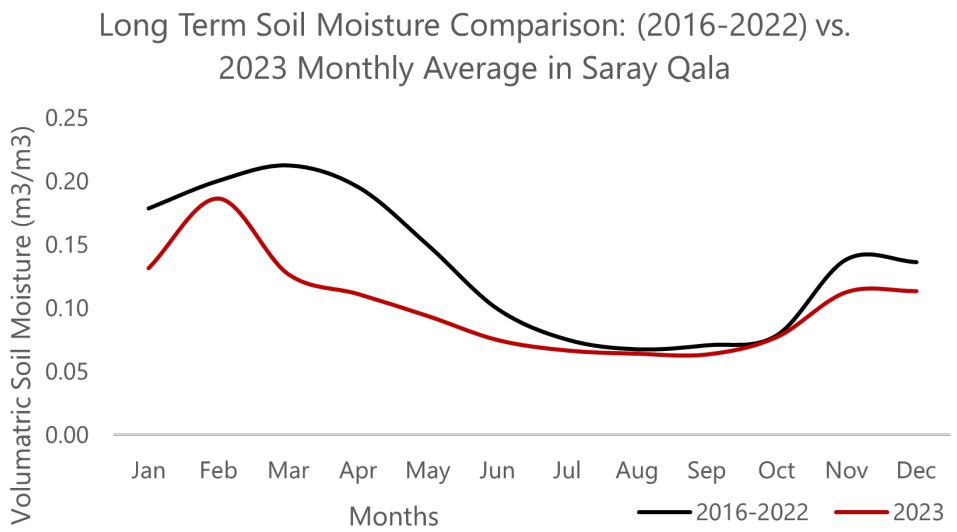


Water Sources and Availability:

According to a 2023 Manteqa Profiling (IMPACT), Saray Qala primarily relies on canals for irrigation, with deep solar-powered wells as secondary sources. Canals supply irrigation for agriculture and horticulture, with water distributed based on land area. FGD participants noted that limited water resources especially in drought years have severely impacted Saray Qala, with groundwater levels dropping significantly, particularly those located in lower parts of the manteqa. Mismanagement, borewell overuse, and drought have contributed to a depletion of resources, emphasizing the need for sustainable water management strategies to maintain agricultural productivity.

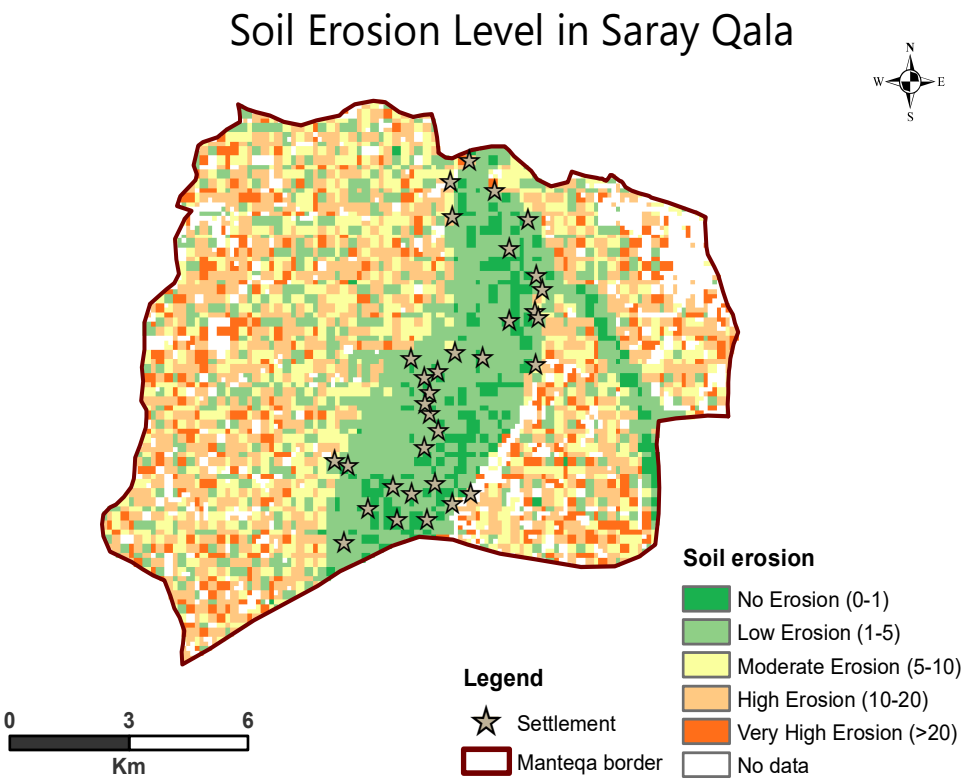
Soil Moisture:

Soil moisture trends are critical for understanding climate impacts as declines in moisture can lead to more frequent droughts, while increases may cause waterlogging and erosion. Comparing 2016-2022 with 2023 shows that 2023 moisture peaked in February, earlier than the March peak from 2016-2022, and declined to much lower levels between March and June than in the years before. Lower soil moisture such as in 2023 potentially reduces benefits for crops needing moisture closer to planting. Tracking these shifts helps identify periods in which fields, pastures, and horticultural areas are most prone to soil dryness and can help inform adaptive strategies.



Soil Erosion:

Soil erosion (GloSEM 1.3) in Saray Qala is widespread, except in croplands, where erosion levels are relatively low. Across pastures and rainfed agricultural land in the rest of the Manteqa, erosion varies from low to very high. While 75% of KIs in the Manteqa reported insufficient grass cover across the landscape, 0% reported a risk of erosion in a 2023 assessment, suggesting low awareness of erosion risks in local communities (Manteqa Profiling, IMPACT). Raising awareness for sustainable land management practices to reduce soil disturbance, reforestation as well as terracing are essential to mitigate further degradation, especially in areas vulnerable to heavy rainfall and runoff.



Mapping Drought Effect on Natural Resources in Saray Qala

Impact on Agro-pastoralism

Production/Crop Health:

Drought significantly reduces crop growth, particularly on infertile rainfed lands, leading to sparse vegetation, poor yields, and lower income for farmers. Weak crop growth and the spread of plant diseases impact market prices and agricultural sales. FGD participants reported using improved seeds as a strategy to cope with drought, as well as planting varieties like wheat and barley that require less water, although high

Pastoralism:

According to FGD participants, drought has severely impacted pastures, leading to sparse grass and vegetation, which affects livestock health. Animals face poor nutrition, reducing their market value. The decline in livestock quality and numbers in drought periods weakens income and food security for agro-pastoral households that depend

Agriculture

Saray Qala has limited irrigation water, which restricts cultivation to selected areas and makes the region highly vulnerable to environmental conditions. Land cover maps show that except for a strip of irrigated cropland around the Manteqa's main settlements, rainfed land and pastures constitute the majority of Saray Qala's land area. The reliance on rainfed lands and pastures heightens the risk of reduced productivity and pasture health during drought periods, posing challenges to sustaining agriculture. Water availability heavily influences agricultural practices, with crops like wheat, barley, which require less water, being prevalent. Wheat, a staple, remains dominant, reflecting both its cultural importance and the practical adaptation to Saray Qala's limited water resources.

Cropping Calendar (Faryab Province)

Fruit Crops

Apple, peach, apricots and cherry grow from February to March and are harvested by June, making them moderately drought resistant. Pistachio and grapes harvested in July, face greater drought risk. Almonds and melons, with a March to September growing and harvest season, are highly vulnerable to late summer drought.

Vegetable Crops

Winter vegetables (October to February) are less affected by drought. Summer crops like onions (January to July) and tomatoes (March to August) are highly drought-sensitive due to their summer harvest. Late summer vegetables (August / September to November/ December) face moderate drought risk, avoiding peak heat.

Cereals and Cash Crops

Wheat and barley (September to July/ August) grown on rainfed land are vulnerable to late-season drought and summer heat during harvesting. Wheat on irrigated land (January to July) is comparatively less exposed to drought, much like corn, millet, and mungbean (June to August) due their short season.

Basic Needs and Community-Level Impact

Drought-related crop failures and livestock health issues decrease household income, impacting food security, and social well-being, while rainy years bring essential opportunities for surplus production and community resilience. According to a previous IMPACT assessment (2023), 60% of KI in Saray Qala reported insufficient pasture access, and 40% face water shortages.

Human Wellbeing and Social Sphere:

FGD and KI participants noted that the economic stability of agro-pastoral communities in Saray Qala is heavily reliant on agriculture and livestock, both of which have been weakened by drought. The resulting decline in food production has reduced household access to nutritious food, impacting health. Limited income also restricts families' ability to afford healthcare and medicines. Educational access has declined as children leave school to work or gather fuel, a negative coping mechanism that jeopardizes long-term development and resilience.

According to both FGD and KI feedback, drought has increased tensions and conflicts over limited resources, particularly water and pasture. Competition over these scarce resources has strained community relations, and the drought had also lessened participation in social gatherings, such as Eid celebrations.

Vulnerabilities

Factors That Contribute to Vulnerability/Sensitivity to Drought

- Limited access to irrigation water means that Saray Qala heavily relies on rainfed agriculture.
- Communities lack methods and resources to store rainwater, as well as systems to effectively manage existing stores.
- Despite the crucial role of agro-pastoralism for livelihoods in Saray Qala, the availability of external resources, input materials and services to respond to or prepare for drought has been missing.

Factors That May Exacerbate Vulnerability to Drought

- Conflicts over the use of available water resources result in inefficient water management in the Manteqa.
- Most households depend on agriculture and livestock for income, and especially women have restricted opportunities for earning due to a lack of alternative livelihoods.
- Community members noted limited access to financial services (e.g. loans), and lack of resources and opportunities to diversify income sources.
- Price hikes during droughts and high input costs mean that improved seeds do not reach all housholds.
- The reduction of available income during drought periods has direct effects on access to health and education services, and disproportionately affects children.

Understanding Coping Mechanisms and Adaptive Strategies in Saray Qala

Coping mechanisms are strategies available to communities to offset (some of) the adverse impacts of a shock. In Saray Qala, farmers reported relying on stored products, buying water for livestock during droughts, and using private boreholes for irrigation. Sharecroppers, in contrast, moved livestock to distant water sources, took loans to sustain themselves and reported being faced with acute food insecurity.

Adaptation is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences. It involves long-term planning, is oriented towards sustainable livelihood security, and uses resources efficiently and sustainably. In Saray Qala, farmers reported no coordinated efforts to address drought. Instead, respondents across FGDs pointed to migration to cities (sharecroppers) or abroad (farmers) to respond to their livelihoods becoming unsustainable.

Coping Mechanisms and Adaptive Practices Reported by FGD Participants

Coping Mechanisms	Adaptive Practices
• **Organic fertilizers, pesticides and herbicides:** To accelerate plant growth in drought, Key Informants and FGD participants reported use of fertilizers and buying animal feed.	• **Drought-adapted agricultural practices:** Bore wells , drip irrigations, cultivating less land and the use of drought-resistant seeds have also helped mitigate the impact of drought, but rising prices for seeds and input materials mean that these strategies are not available to all households, especially during drought periods
• **Loans and sale of assets:** Droughts have a direct financial impact, and often lead to money borrowing or the sale of assets such as livestock to buy livestock feed, seeds and other input material.	• **Unequal livelihood options:** The financial strain that drought periods cause is especially severe for population groups that have reduced options to pursue alternative livelihoods or rely on community support, such as women, IDPs, and people with disabilities.
• **Diet change:** Drought periods are often accompanied by changes in diets to less varied and nutritious foods, both due to financial constraints and conscious efforts to reduce expenses in times of increased market prices	• **Migration:** The importance of agriculture and pastoralism for livelihoods in Saray Qala means that community members resort to migration to other locations in Afghanistan or to other countries due to drought.
• **Conflicts:** increased social tension over the use of natural resources such as water and pastures can lead to reduced community cohesion and increased conflict, making cooperation and mutual support harder during droughts.	• **Adjustments of agricultural practices:** Management of water channels, planting new forests to stop soil erosion, however new input materials, machinery, pesticides not applicable reflecting the need for external support mentioned by KIs.
• **Child labor:** Female-headed households may resort to child labor to increase household income in the absence of alternative livelihood options.	
• **Water storage and conservation efforts:** During drought periods, community members report storing and conserving water and using alternative irrigation methods through more efficient use of available resources, which may benefit from initiatives to strengthen systematic water management mechanisms at the communal level, including through the construction of check dams.	

Methodology Overview

The overarching objective of this exploratory assessment was to enhance understanding of, and inform, the development of sustainable and adaptive agricultural practices and natural resource management strategies to combat drought impact across five manteqas in Northwest Afghanistan.

The goal is to provide a foundational understanding of community-level resilience and vulnerability, within the context of how drought affects the local environment and livelihoods of affected populations in the selected manteqas. As such, the assessment focused on:

1. Understanding how affected communities defined 'drought' and 'drought periods' by creating a comprehensive list of community-based 'drought indicators';
2. Evaluating community perception of the impact of drought on critical agricultural and natural resources — namely pastures, forests, fields, horticulture, and water sources — and socio-economic dynamics (such as livelihoods and family structures) to estimate the exposure of agro-pastoral communities to these adverse effects; and,
3. Mapping the existing community-based drought resilience infrastructures and how they interact with international, national and sub-national drought resilience frameworks.

The remote sensing analysis leveraged publicly available databases, primarily Google Earth Engine (GEE), to collect information on various climatic parameters such as temperature, precipitation, and NDVI. This data helps in understanding how shifts and anomalies in climate patterns contribute to drought conditions.

The data was processed using GEE's geospatial processing services. For drought assessment, MODIS Moderate Resolution Imaging Spectroradiometer Land Surface Temperature (LST) data is used to identify drought manifestations, such as vegetation health, through indices like the Vegetation Health Index (VHI). Additionally, the Standardized Precipitation Index (SPI) is applied to detect precipitation anomalies using CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) datasets.

The analysis focuses on different land cover types, including croplands, forests, and rangelands, utilizing Copernicus land cover data.

The collected data was further analyzed using GIS tools to derive meaningful insights. The primary data was collected in July 2024. For each manteqa, two agricultural service providers, such as NGO workers and local government authorities, were purposefully sampled based on their expertise of the research topics and manteqa. They were interviewed using a semi-structured interview tool.

In Saray Qala, 1 FGD with Sharecroppers and 1 FGD with farmers and livestock owners were conducted. Eight participants were purposefully selected considering geographic representation, even distribution between the livelihoods of interest (agriculture and pastoralism). Following data collection, a content analysis identified the main themes, trends, and factors contributing to drought vulnerability and resilience.

Please refer to the Terms of Reference for more information about Remote Sensing.

Limitations

This research uncovered factors that may negatively contribute to vegetation growth and health. However, the exact effects of drought on crop yields or pasture growth are difficult to predict, because it depends on when water or nutrient shortage occurs, vegetation's sensitivity, and human practices. The research scope is limited to natural resources and agriculture. The impact on other sectors, such as domestic water availability, and hygienic practices, are excluded from the analysis. Similarly, the cascading impact of drought on other areas such as energy consumption, migration patterns, social structures, market prices, health, etc., are not included.

Future analysis should consider the effect on ecosystems and biodiversity of drought and dry spells, and the available groundwater and surface water, which could not be included in this research. Due to the qualitative nature of the assessment, the findings are not representative of the Manteqa population. The available climate change predictions of Afghanistan should be treated with uncertainty as they are dependent on a multitude of factors, including the actual global warming rate (RRC).

Crop Calender

Crop Type	Crop	Growing Months	Harvesting Months	Drought Vulnerability
Fruits	Apricots, peach & cherry	January – March	June- July	Moderate
	Almonds	February – April	September	High (Passes through peak summer)
	Grapes	Jan - March	August	High (late season, overlaps drought)
	Melons	March - April	June - August	High (summer harvest)
Vegetables	Winter Varieties	October – January	January – February	Low (harvested in cooler months)
	Eggplant, onion	January – March	June	High
	Tomatoes	March – April	June – August	High (summer harvest)
	Other Summer Vegetables	March – April	June – August	High
	Late Varieties	July – August	October – December	Moderate
Cereals	Wheat (rainfed)	September – June	June – July	High (harvest in summer)
	Barley (Fall season)	September – October	May/ June	Moderate (early harvest)
Cash Crops	Saffron	August – September	August – September	Low (late season, sensitive crop)