AGORA

Drought Impact & Resilience In Agro - Pastoral Communities

Executive Summary

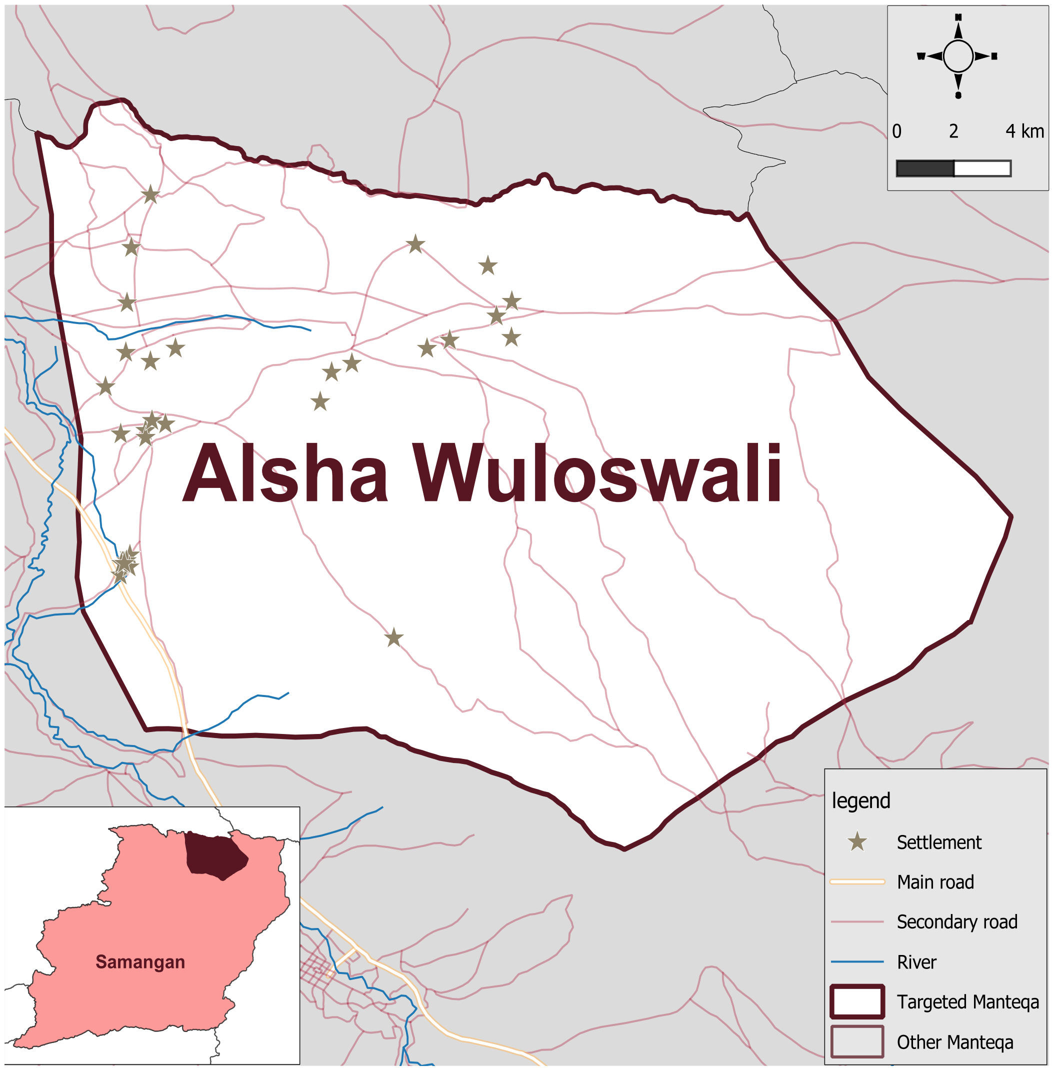
In terms of climate, Afghanistan ranks as the 5th most at-risk country globally, with natural hazards exacerbated by low household resilience. Recurring droughts heightens vulnerabilities in rural areas, where livelihoods heavily depend on agriculture and livestock. In Alsha Wuloswali, food security is classified as being in Integrated Food security Phase 3 classification (IPC Acute Food Insecurity Analysis, assessed 18 December 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 pools, degraded pastures, and declining horticultural yields. Socio-economic effects include diminished financial assets, reduced access to credit (for loans), deprioritization of health services, and strained community cohesion due to conflicts over shrinking resource pools.

Qualitative data from Focus Group Discussions (FGDs) with farmers, sharecroppers, and women, paired with satellite-data analysis of temperature and precipitation trends, reveal external vulnerabilities. These include a 1°C increase in summer 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 Alsha Wuloswali Manteqa (Samangan Province)



July 2024

Key Findings

Water Scarcity and Management: Springs, rainwater and solar-powered borewells are the primary water source in the manteqa. In the absence of water storage and rainwater harvesting mechanisms, borewell overuse has led to a continuous depletion of ground water storage levels.

Climatic Vulnerabilities: Projected precipitation declines near the manteqa's settlements may leave rainfed agricultural lands and pastures particularly vulnerable. Effective natural resource management mechanisms will become essential to ensure sustainable levels of demand pressure on the manteqa's water resources, forests and pastures less affected by precipitation decline.

Impact on Education and Child Welfare: With most livelihoods in the manteqas depending on agro-pastoralism, communities noted resorting to child labour and earlier marriages to increase household income, suggesting that drought may affect access to education in Alsha Wuloswali.

Socio-Economic Inequalities: Financial capacity varies among households, influencing their ability to adapt to changing climatic conditions. During droughts, IDPs were reportedly more common to resort to migration, while women mentioned health concerns for pregnant and breastfeeding women.

Need for Agricultural Training: FGDs and KIs participants highlighted communities' willingness to acquire knowledge on sustainably improving agricultural practices but noted the lack of access to such trainings.

About Alsha Wuloswali

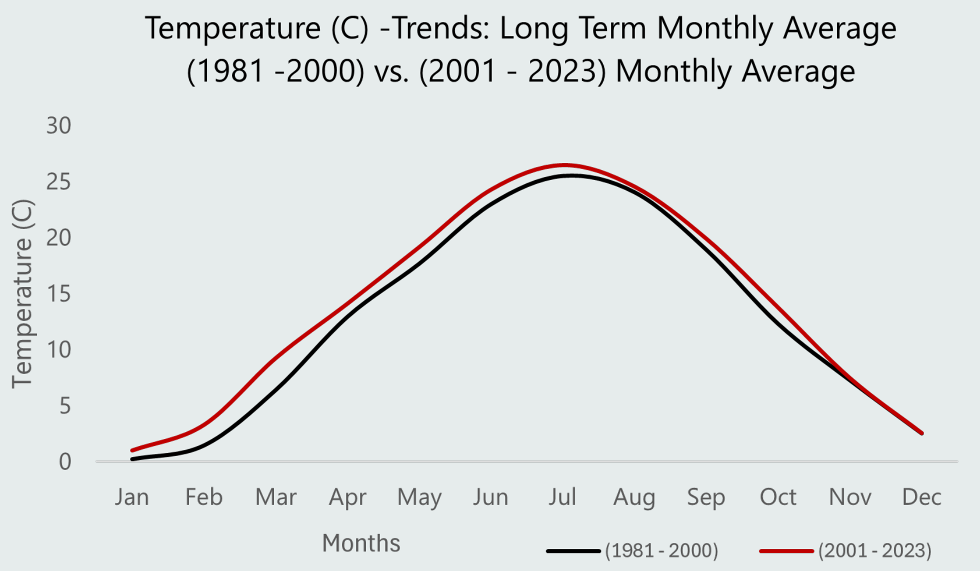
Alsha means 'between,' referring to the manteqa's location between the mountains. While 'Wuloswali' typically means a district, Alsha Wuloswali is not an official district but a manteqa with the designation of a district in its name. According to 2023 IMPACT assessment, the manteqa is home to approximately 6197 households, predominantly consisting of host populations, though Key Informants (KI) mentioned the presence of displaced populations in some villages. Additionally, Alsha Wuloswali's economy revolves around livestock, agriculture, and informal daily labor, with 25% of villages reportedly adopting mechanized agricultural techniques. Land ownership is divided, with lalmi (rain-fed) lands typically publicly and privately owned while pasturelands are publicly managed, and forests fall strictly under government control.

Population	6197	**Irrigated land**	1 %
Villages	18	**Rainfed Land**	43%
IDPs	1.34%	**Pasture**	30%
Food Insecurity	Phase 3 IPC AFI	**Horticulture**	2.4%
Irrigation Source	Rainfed and streams	**Minimum Expenditure Basket (Faryab 2023)**	U$240
		MEB (Faryab 2024)	U$264

Alsha relies mostly on rainfed agriculture, leaving it acutely vulnerable to environmental shocks, particularly drought, with respondents identifying water scarcity 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 until 2040. Agro-pastoral communities in Alsha Wuloswali, whose livelihoods are heavily dependent on agriculture and livestock, face heightened vulnerability within this context due to their reliance on weather-sensitive income sources. Drought-induced poverty, for example, is pervasive within the manteqas's agro-pastoral communities. Consequently, families often resort to drastic coping strategies, "Selling land, selling household items, selling some of the animals to feed themselves and their remaining livestock". Financial capacity was a major factor in resilience. Households with stronger financial resources (e.g., landowners, wealthier families) were able to employ more diverse coping strategies (e.g., migration, changing occupations) Relying on bread was a universal coping mechanism adopted by all groups including women. Also, to make sure their children eat enough, mothers skip meals and avoid eating the existing food in the house. 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

Alsha has experienced a steady warming trend over the past two decades. During summer (June–August), average temperatures rose by 1°C, from 24°C in 1981-2000 to 25°C by 2001-2023, further underscoring the region's warming trajectory. Seasonal data for for 2000-2023 show significant deviations from historical norms, highlighting the year as a drought period.



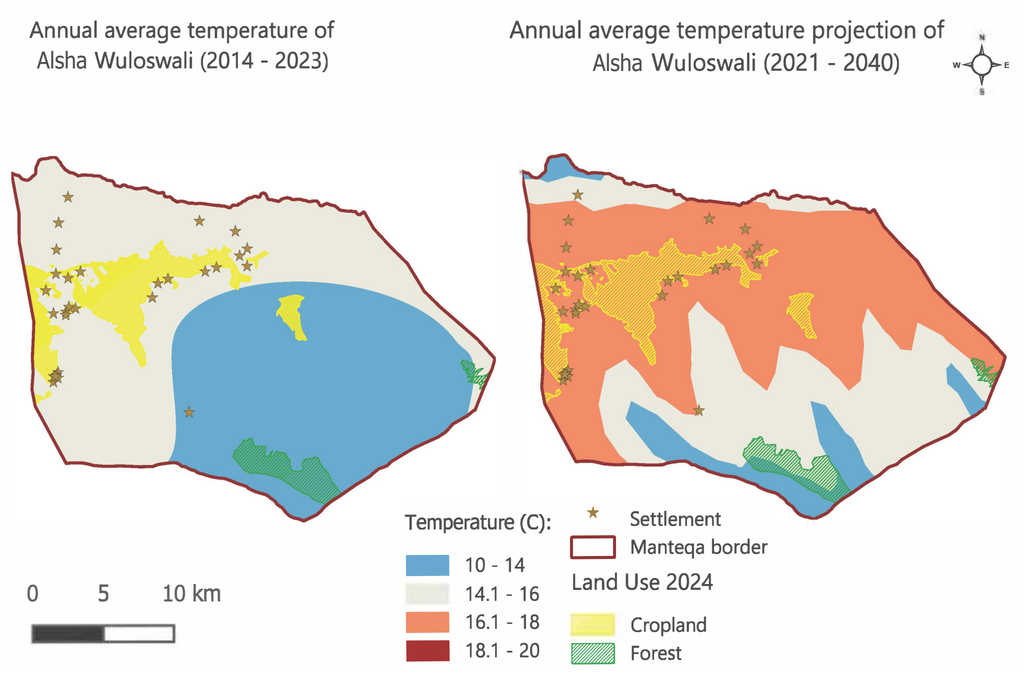
In 2001-2023, temperatures showed notable deviations from the historical average (1981-2000), particularly during winter, early summer, and autumn.

- Winter (Jan-Mar): Despite a colder start to the year, temperatures averaged 1°C above the historical mean 3°C (1981-2000), disrupting winter crop cycles and reducing the chilling period required for certain crops. This warming trend also limits snowpack accumulation, essential for spring water supply and early-season irrigation.

- Summer (Jun-Aug): Temperatures were 1°C higher than average 24°C (1981-2000), particularly in June and July, increasing water demand for crops and livestock, potentially lowering yields where water resources are limited.

- Autumn (Sep-Nov): Autumn temperatures were 1°C above the long-term average 13°C, (1981-2000) especially in November and December, delaying cooler temperatures needed for winter crop planting and reducing soil moisture.

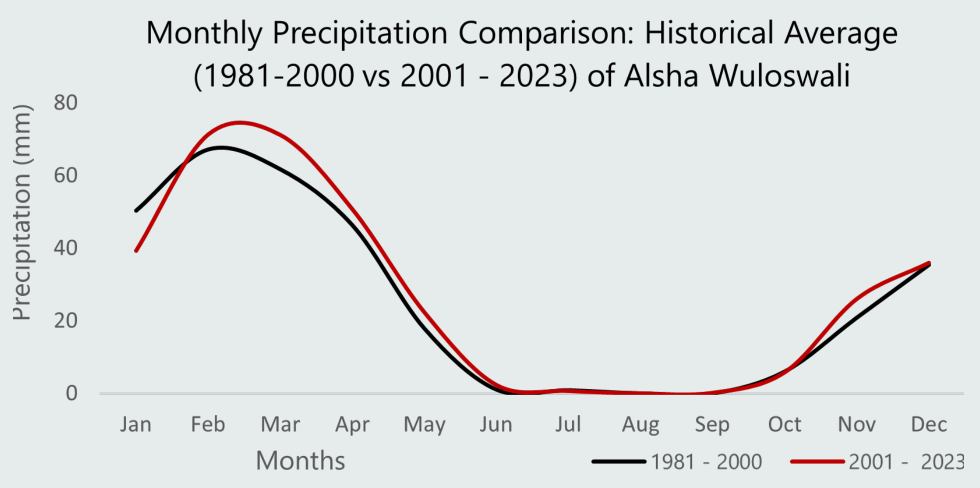
Predictive Forecast



Projections for 2021-2040 ([ERA5/ WorldClim](), assessed 2024) indicate that Alsha Wuloswali annual average temperatures could reach 16.1- 18 °C by 2040, with the highest temperatures concentrated around the villages and pastures in the north and northwest of the manteqa. This warming will considerably strain current cropland, potentially reducing rainfall and agricultural productivity. Most unpopulated areas housing pastures and rainfed towards the Southwest and southeast will rise from 14.1-16°C. Key areas, such as Qaflanee village, which relies mostly on rainfed agriculture, will also face higher temperatures.

Precipitation

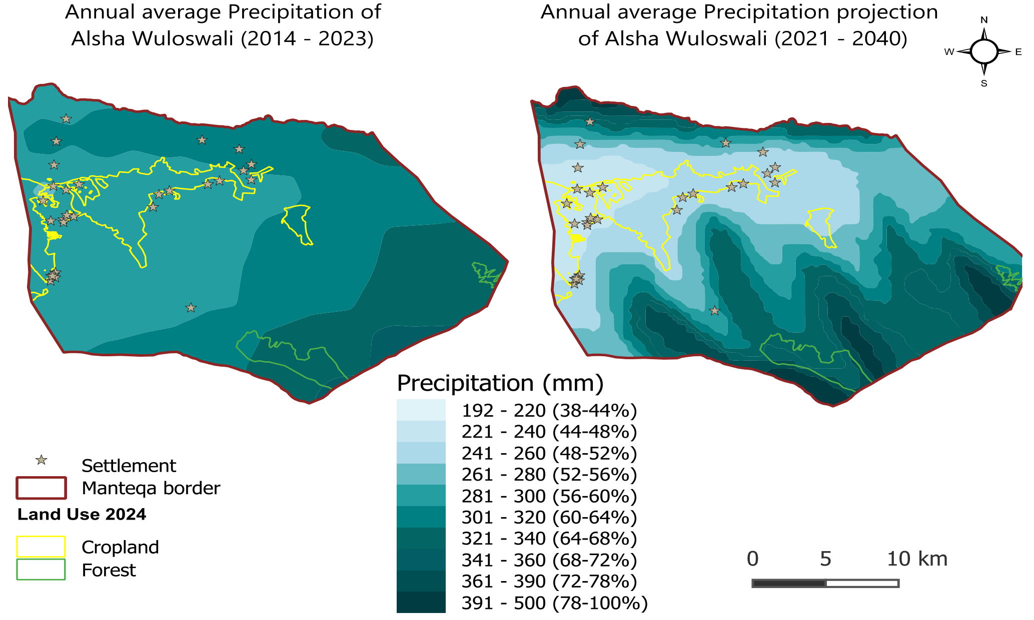
Alsha Wuloswali's average annual precipitation was 249 mm from 1981 to 2000, with significant fluctuations rather than a clear trend. From 2001- 2023, average annual precipitation reached 252mm.



The 2000-2023 pattern shows a shift in both the timing and volume of rainfall, impacting planting cycles, and heightening drought risks for Alsha Wuloswali's agricultural communities.

- Winter (Jan-Mar): From 2001-2023 winter precipitation was 6 mm above the historical average of 62 mm in 1981-2001. On average, precipitation from 2001-2023 showed a peak in mid-February, deviating from the historical (1981-2000) early February peak.
- Summer (Jun-Aug): The manteqa has historically received little to no rainfall in summer, averaging 1mm from June to August during the past four decades, affecting summer and late summer crops.
- Autumn (Nov-Dec): In the months of Sep- Nov, there was a 2mm increase in average precipitation from 2000- 2023 as compared to the historical average of 4 mm (1981-2000) which extends moisture replenishment needed for winter planting and may be beneficial for early-season growth.

Predictive Forecast

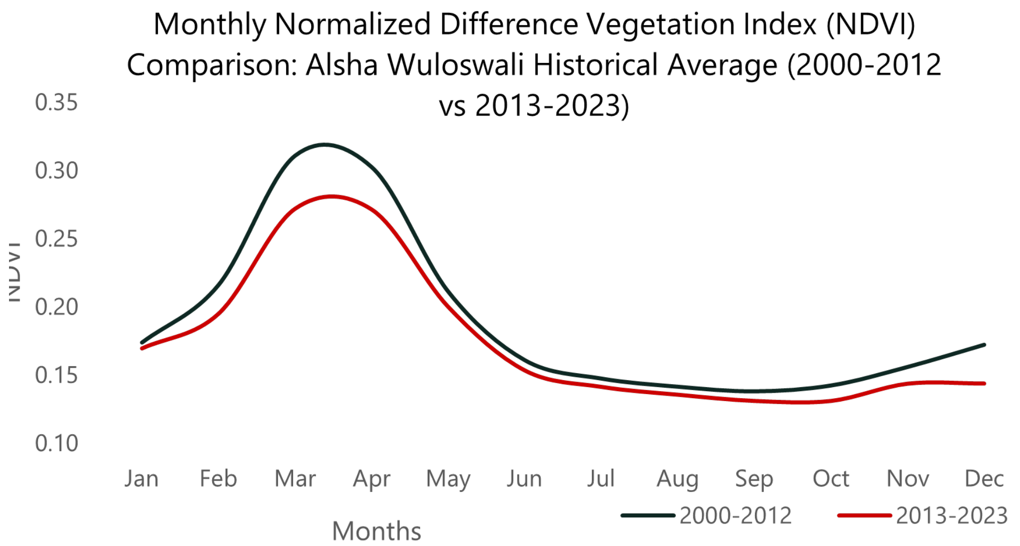


Projections 2021-2040 (CHIRPS/Worldclim, assessed 2024) indicate a continued decrease in annual precipitation around the Manteqa's villages. The northern and northwestern parts of Alsha Wuloswali could see annual precipitation levels reach around 192-220 mm (38-44%), affecting croplands, pastures, and most of the villages. Combined with rising temperatures, this decrease poses a severe threat to agricultural productivity in these regions. This trend is less pronounced in the higher-altitude areas in the southeast of the Manteqa, where annual average precipitation may reach 391-500mm, sustaining existing forests and rangelands. 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 Alsha Wuloswali

Both men and women identify reduced rainfall during critical agricultural months (March and April) and less snowfall in December, January, and February as a primary drought indicator. All groups from the FGDs focused on environmental cues like warmer, drier, dusty and windy or even stormy weather during a drought year, with women also emphasizing the occurrence of fog and haze in drought years.

Drought Season and Growing Season according to Climatic parameters



Community vs. Remote Sensing on Drought Years:

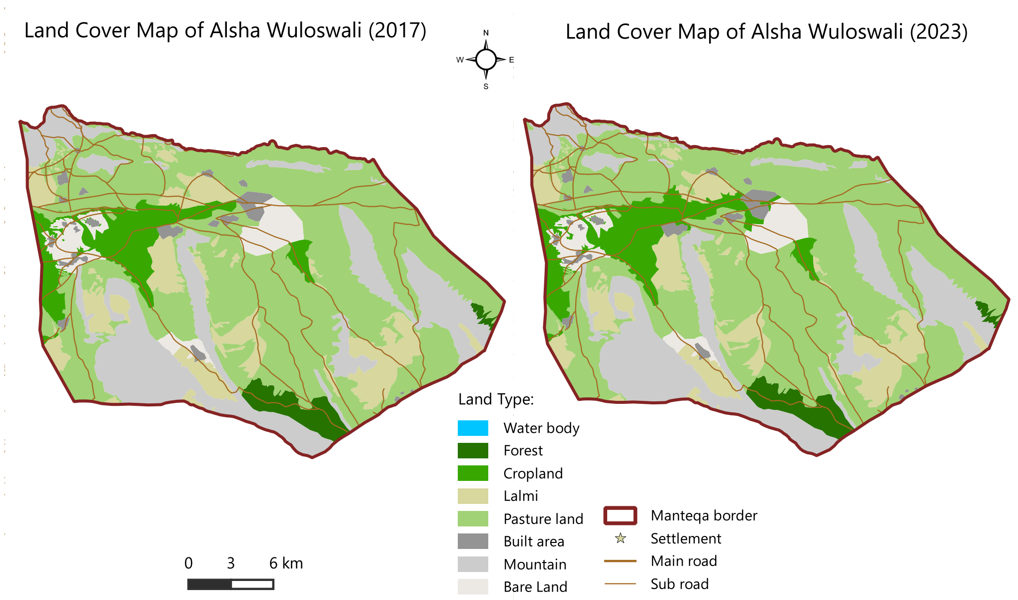
Local indicators such as a decrease in rainfall and suppression of vegetation largely align with remote sensing (RS) data:

- **2021**: Both sharecroppers and farmers and livestock owners, due to lower surface water levels and vegetation, perceived 2021 as a severe drought year, with NDVI values showing sparse vegetation (0.18) and low annual precipitation (255 mm).
- **2022**: Farmers, relying on precipitation and a decrease in water levels in water reservoirs as an indicator, perceived this year as a drought year, supported by NDVI data showing moderate to weak vegetation health or agriculture yields. Annual precipitation (269 mm) was below the historical average between 1981 and 2021 (319mm).
- **2023**: Farmers and livestock owners as well as women reported this year as a drought year based on indicators like rainfall and sparse vegetation. At 194 mm, the precipitation rate was at its lowest historically since 1981.

Drought and crop growing seasons in Alsha Wuloswali were identified using climatic parameters like Land Surface Temperature and NDVI. The growing season generally lasts from March to August, with drought conditions most common in the hot summer months (June to August). This overlap shows that drought directly impacts crop growth.

From March to May, the optimum green months, the NDVI value for 2013–2023 was 0.24, which is lower than the 2000–2013 average of 0.27. This decline suggests minimal vegetation cover or possibly drier conditions, which may indicate drought, land degradation, or the presence of non-vegetative surfaces such as bare soil. Average summer precipitation is almost none with rising temperatures leading to pressure on rangelands as well as heat stress on crops, reducing yields and increasing crop failure risks. 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 Alsha Wuloswali

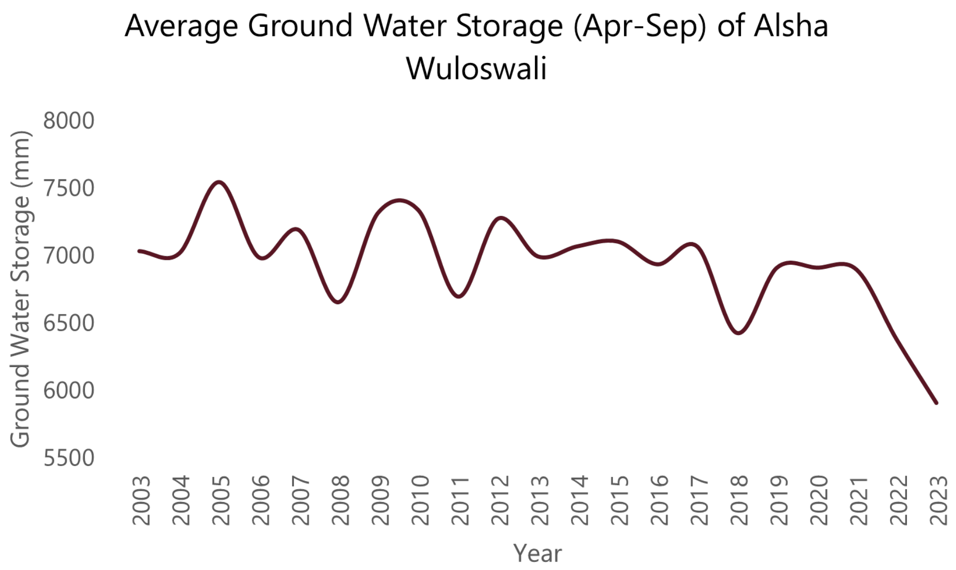


Drought Impact on Land and Vegetation

A comparison of 2017 and 2023 landcover maps of Alsha Woluswali reveals no observable change in forests, but hints at an expansion of cropland near built in areas in the center of the manteqa. Particularly in dry years such as 2021, 2022 and 2023, such conversions not only put strain on pasturelands, but may also threaten the long-term sustainability of irrigation agriculture due to overuse of available water resources. Despite projections suggesting relatively higher levels of precipitation for the mountainous areas in the southeast of the Manteqa, declining precipitation elsewhere in the Manteqa may also result in increased demand pressure on or conversion of current rangelands and forests in the absence of sustainable management strategies.

Average Groundwater Storage:

Groundwater storage (GLDAS, assessed Dec. 2024) in Alsha Wuloswali from April to September (2003-2023) shows fluctuating levels, with a peak in 2005 due to favorable rainfall. However, severe droughts in 2008-2011, 2018, and 2023 have caused significant declines. Despite occasional recoveries, the long-term trend indicates a decrease in groundwater levels, posing a substantial risk to the Manteqa's agricultural sector. This decline, exacerbated by drought conditions and heavy reliance on groundwater irrigation, highlights the urgent need for effective water management practices. Policymakers and stakeholders should prioritize water conservation, implement water-efficient irrigation techniques, and explore alternative water sources to ensure long-term sustainability of Alsha Wuloswali's agricultural sector.

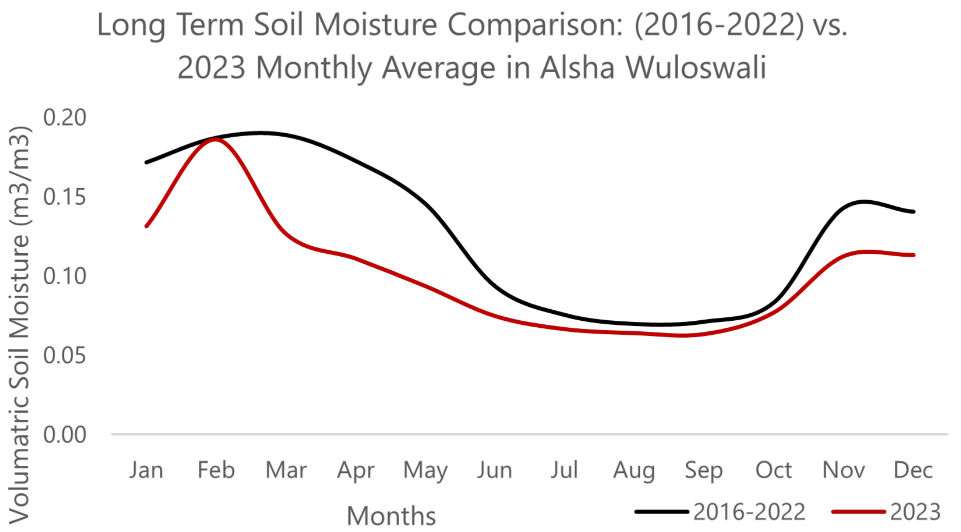


Water Sources and Availability:

According to a 2023 Manteqa profiling assessment by IMPACT , Alsha Wuloswali primarily relies on springs for irrigation for agriculture and horticulture, with deep solar-powered wells as secondary water sources. Aside from this, there are no major water bodies in the manteqa. However, as the Manteqa profiling also indicates, much of the irrigation infrastructure is damaged. Mismanagement, borewell overuse and drought have further depleted resources, emphasizing the need for sustainable water management strategies to secure agricultural productivity.

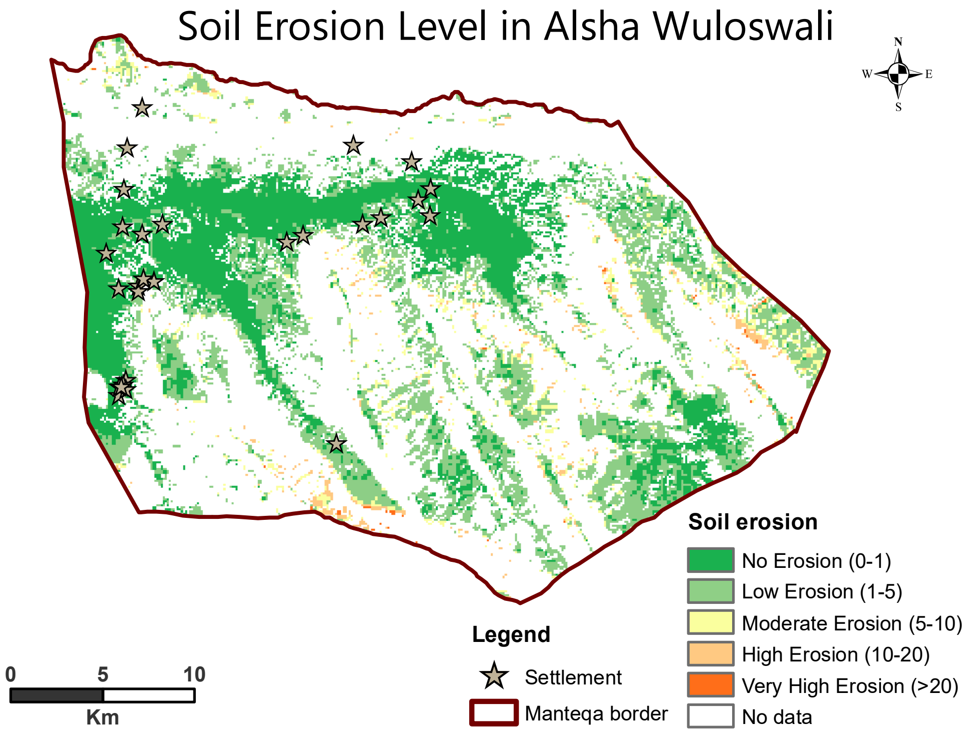
Soil Moisture:

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 peaks in mid-February, earlier than than March peak typical from 2016-2022, potentially threatening the health of crops needing moisture closer to planting. Tracking these shifts helps identify fields, pastures, and horticultural areas most prone to soil dryness and informs adaptive strategies.



Soil Erosion:

Soil erosion (GloSEM 1.3) is widespread across the Manteqa, particularly affecting vegetation and croplands. The high erosion zones, marked in yellow and orange, affect pastures and rainfed areas with lower precipitation and higher temperatures. Intensive farming, deforestation, and overgrazing further expose the soil to erosion. 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 Alsha Wuloswali

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. To adapt, farmers are shifting to drought-resistant crops like chickpeas, wheat, and barley, though high costs limit access to drought-resistant seeds. Residents also report a shift toward organic fertilizers, which require less water, and new crop varieties like pistachio and walnut.

Pastoralism:

According to FGDs participants, drought has severely impacted pastures, leading to sparse grass and vegetation, which affects livestock health. Livestock face poor nutrition and heightened disease risks, reducing their market value. This decline in livestock quality and numbers in drought periods weakens income and food security for agro-pastoral households that depend on pastures for fodder.

Agriculture

Alsha Woluswali has limited irrigation water, which restricts cultivation to select areas and make the region highly vulnerable to environmental conditions. Remote sensing shows an increase in cultivated cropland, with a slight decrease in pastures. The reliance on irrigation agriculture heightens the risk of water overuse during drought periods, posing challenges to sustaining agriculture.

Water availability heavily influences agricultural practices, with crops like wheat, barley, and alfalfa, which require less water, being prevalent. Wheat, a staple, remains dominant, reflecting both its cultural importance and the practical adaptation to Alsha's limited water resources.

Cropping Calendar (Samangan Province)

Fruit Crops: Apricots, grapes, almond and plums grow from February to April and are harvested by June, making them moderately drought resistant. Almonds and pistachio, harvested in late summer, face greater drought risk. Grapes with a March to September growing and an October harvest, are highly vulnerable to late summer drought

Vegetable Crops: Winter vegetables carrots, turnips and spinach (October to February) are less affected by rising temperatures, avoiding peak heat. Summer crops like eggplants and onions (January to June) and tomatoes and melons (March to August) are highly drought-sensitive due to their summer harvest.

Cereals and Cash Crops: Fall-adapted wheat (September–July) is highly vulnerable to drought as it remains on rainfed land year-round. Spring wheat (March–August) also faces drought risk, enduring two hot months with little to no precipitation before harvest. Barley (March to June) is vulnerable to late-season drought, with barley less affected due to earlier harvest. Peas, Sunflower and sesame, planted from March to July is highly drought-sensitive due to its late harvest and prolonged growth period. Saffron, planted in August is less drought-sensitive due to its early harvest in the following months of September and October.

Basic Needs and Community-Level Impact

Financial constraints hinder the community's ability to purchase fodder from other districts, further impacting livestock production. Findings from an earlier IMPACT assessment (2023) indicate that 195 KIs reported insufficient pasture access, and 19% (7/36) highlighted water shortages. Drought-related crop failures and livestock health issues decrease household income, impacting food security, community celebrations, and social well-being, while rainy years bring essential opportunities for surplus production and community resilience.

Human wellbeing and social sphere:

With economic stability of agro-pastoral communities in Alsha Wuloswali heavily reliant on agriculture and livestock, FGD participants and KIs noted that decreased food production during drought periods directly affects communities' health, nutrition, and education access. All groups reported a decrease in food quality as well as resorting to child labor to increase household income. Women and farmers and livestock owners highlighted an increase in emigration rates school and university dropouts, with women also reporting a heightened risk of failed pregnancies and illness. Drought periods have also led to a strain on social and family relationships, with increased tensions and conflicts over scarce water resources and pastures. In addition, KIs described conflicts over the distribution of humanitarian assistance and significant price hikes for essential goods and relayed that community members have requested more support from agricultural extension services, NGOs, and the government.

Vulnerabilities

Factors That Contribute to Vulnerability/Sensitivity to Drought

- While some community members do have access to solar-powered boreholes, farmers and sharecroppers reported dropping ground water levels during drought periods to sustain irrigation agriculture.
- According to farmers, livestock owners and sharecroppers, communities lack water storage facilities and irrigation infrastructure to mitigate the effects of drought
- Women noted that some community members are already faced with limited access to water, food, and other necessities, with sharecroppers pointing out the insufficiency of humanitarian aid especially during prolonged drought periods.
- During sharecropper FGDs, respondents raised a lack of training and education opportunities, resulting in dependency on agriculture for livelihoods, as well as limited opportunities to improve agricultural practices.
- KIs highlighted a lack of efficient resource management, leading to wastage and increased vulnerability

Factors that may exacerbate vulnerability to drought

- According to women FGD, women-headed households and pregnant or breastfeeding mothers face additional challenges due to limited access to resources, as nutritional and health needs are not being met during droughts.
- Women and farmers reported a risk of drought-induced diseases and a lack of access to medical care.

Understanding Coping, Adaptive Strategies, and Gender Perspectives

Coping mechanisms are strategies available to communities to offset (some of) the adverse impacts of a shock, such as selling livestock, seeking alternative livelihoods etc. Households prioritize positive coping mechanisms but resort to negative ones when these are exhausted. Women's strategies focus heavily on self-sacrifice, such as changing diets and selling personal assets, as they lack access to migration, loans, or alternative occupations. Their actions are often centered around family wellbeing, prioritizing children's and men's needs over their own.

Adaptation is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences. Adaptation involves long-term planning, is oriented towards sustainable livelihood security, and uses resources efficiently and sustainably. Adaptive practices are fewer than coping mechanisms, as they require financial resources, social unity, external support, and technology. Besides selling livestock women's strategies often revolve around maintaining household resources and children's well-being. They seem willing to diversify their income sources, such as working in other people's houses. However, this opportunity is rarely available and is considered a last resort, as it is not socially esteemed.

Coping Mechanisms and Adaptive Practices Reported by FGD Participants

Coping Mechanisms	Adaptive Practices
• **Migration:** The importance of agriculture and pastoralism for livelihoods in the manteqa means that all groups considered migration as a possible coping mechanism. In addition, all highlighted the migration of herders and IDPs, as more common than for other groups, suggesting that droughts constitute a barrier to durable solutions in the manteqa's communities.	• **Adjustments of agricultural practices:** Weather changes in drought periods have resulted in communities adjusting, using improved seeds, mulching and greenhouses to protect plants and soil from extreme heat and dryness. Farmers also report cover cropping, tillage, contour farming, water harvesting and trenching as low-cost agricultural strategies.
• **Fertilizers, pesticides and herbicides:** As prices for input materials such as fertilizers rise during droughts, sharecroppers and KIs reported using animal dung and fertilizers to allow plant growth under challenging conditions. Women report a heightened need for herbicides to treat and mitigate plant and livestock diseases during droughts.	• **Learning and Knowledge sharing:** According to KIs and sharecropper FGDs, communities increasingly rely on weather forecasts and local weather condition identifiers such as reduced precipitation early in the year but note gaps in access to training and new skills.
• **Loans and sale of assets:** Droughts have a direct financial impact, and often lead to money borrowing. To meet rising prices for essential resources such as water and fodder for animals, all groups reported the sale of assets such as land, jewelry and livestock. Farmers also noted taking out loans or purchasing on credit, leaving a lasting burden on households even beyond drought periods.	• **Community Organization:** KIs highlighted the establishment of coordination groups to better manage limited resources, fostering a sense of shared responsibility and cooperation. At the same time, sharecroppers noted that discussions around the overuse of borewells are not always successful within their communities, suggesting the need for improved coordination structures to effect lasting change.
• **Human wellbeing:** All groups highlighted that drought periods are often accompanied by changes in diets to less varied and nutritious foods, with women FGD noting a reduction in the quantity and frequency of meals. Farmers also mentioned separating family units to reduce the financial burden on the household.	• **Alternative livelihoods:** Women FGD participants report a permanent shift to sewing, weaving and embroidery due to droughts affecting agricultural livelihoodds for some women in their communities.
• **Child labour and early marriages:** As reported by sharecroppers, some households resort to child labour to offset the loss of income from agricultural activities. All groups mentioned dowries from marriages at an earlier age as a way to generate immediate funds.	• **Reduction of expenses:** Sharecroppers and women considered the avoidance of unnecessary expenses a permanently necessary measure to mitigate the impact of future droughts.

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:

i. Understanding how affected communities defined 'drought' and 'drought periods' by creating a comprehensive list of community-based 'drought indicators.

ii. 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,

iii. Mapping the existing community-based drought resilience infrastructures and how they interact with international, national and sub-national drought resilience frameworks.

This assessment combines primary data collected through Focus Group Discussions and expert interviews with secondary geospatial data from satellite imagery and previously collected information in the relevant manteqa or district. This research was conducted in 5 manteqas where Acted promotes sustainable agro-pastoral livelihoods.

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 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 Alsha, one FGD with sharecroppers, one FGD with women, and one 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). The inclusion of women and sharecroppers depended on access and presence of sharecroppers in the manteqa. 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, plums and mulberries	February – March	Early June- Oct	Moderate
	Almonds, grapes and Apples	February – April	May – Early July	High (harvests in peak summer)
Vegetables	Winter Varieties	October – January	January – February	Low (harvested in cooler months)
	Eggplant, Turnips, Onion, leak, Alfalfa	March	September	High
	Other Summer Vegetables	February- March	June – July	High (summer harvest)
	Tomatoes, melons	March – April	June – August	High
	Late Varieties (carrots)	July – August	October – December	Moderate
Cereals	Wheat	September – June	June – July	High (harvest in summer)
	Barley	Late Febuary – May- June	June	Moderate (early harvest)
Cash Crops	Saffron	August – September (1 yr)	August – September (1 yr)	High (late season, sensitive crop)
	Cotton	March- April	August -September	High (harvest in late summer)