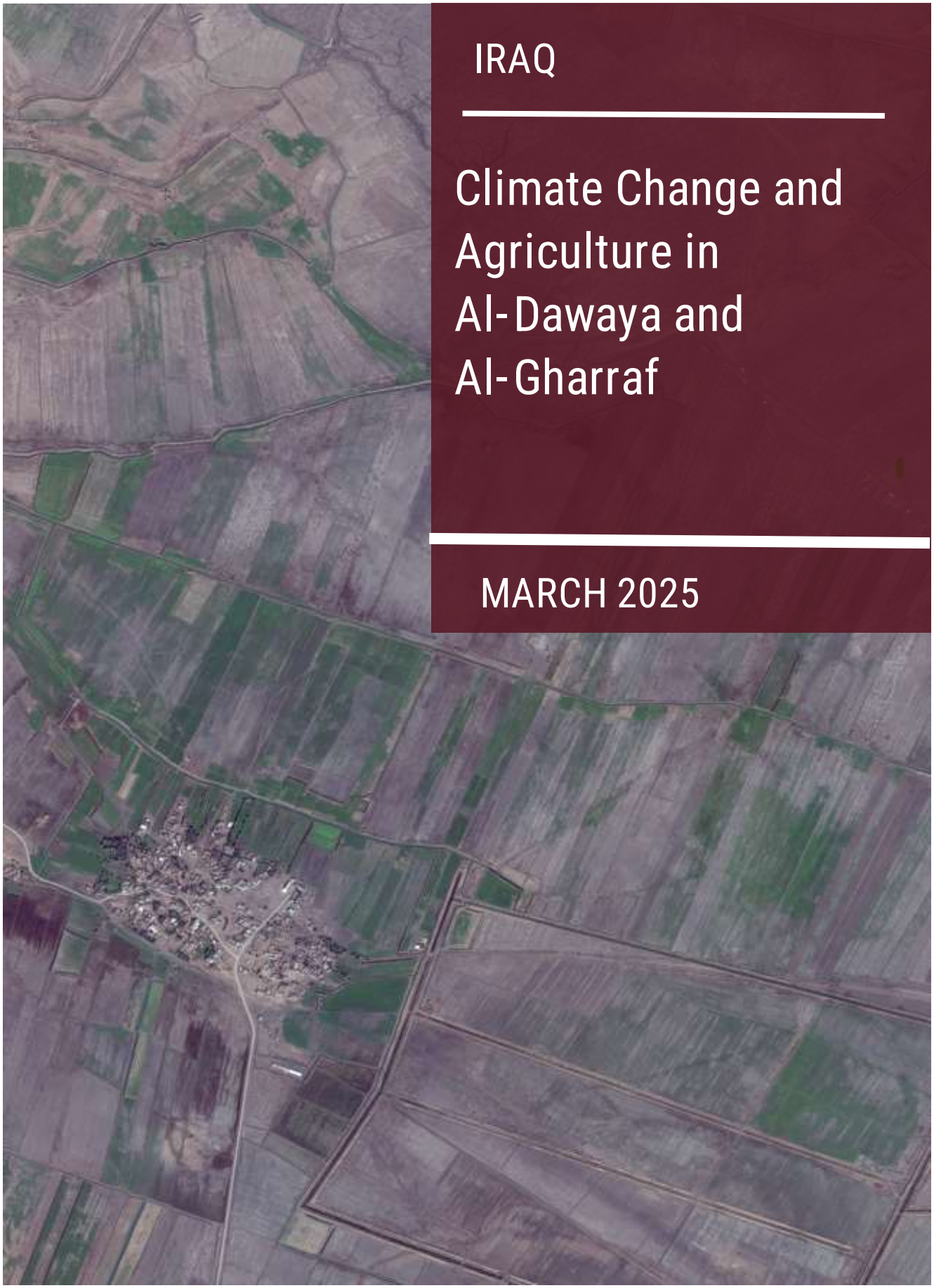

IRAQ

Climate Change and Agriculture in Al-Dawaya and Al-Gharraf

MARCH 2025

Funded by European Union Civil Protection and Humanitarian Aid

IMPACT Shaping practices Influencing policies Impacting lives
REACH | AGORA

acted

About IMPACT

IMPACT Initiatives is a Geneva based think-and-do-tank, created in 2010. IMPACT is a member of the ACTED Group.

IMPACT's teams implement assessment, monitoring & evaluation and organisational capacity-building programmes in direct partnership with aid actors or through its inter-agency initiatives, REACH and Agora. Headquartered in Geneva, IMPACT has an established field presence in over 15 countries. IMPACT's team is composed of over 300 staff, including 60 full-time international experts, as well as a roster of consultants, who are currently implementing over 50 programmes across Africa, Middle East and North Africa, Central and South-East Asia, and Eastern Europe

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SUMMARY

Introduction

This assessment was conducted in the Al-Dawaya and Al-Gharraf sub-districts of Thi-Qar governorate, a region facing an unprecedented climate-induced crisis. Iraq's arid to semi-arid climate, exacerbated by rising temperatures, shifting rainfall patterns, and upstream water policies, has led to severe water scarcity. The crisis, driven primarily by climate change, poor irrigation infrastructure, and long-standing issues of water and soil salinity, has affected all farmers and livestock owners in the area. According to official displacement and water shortage data, thousands of families have been forced to migrate, while many remain to cope with diminishing agricultural productivity.

Key stakeholders in this assessment include national and local government bodies—such as the Directorates of Agriculture and Water—international organizations, local NGOs, and the affected communities themselves. This multi-stakeholder process was coordinated under the broader humanitarian and development framework facilitated by IMPACT in partnership with ACTED and funded by ECHO. The assessment was designed to address critical information gaps concerning the vulnerabilities of local agricultural communities, specifically the economic, social, and environmental dimensions tied to water scarcity, soil degradation, and limited fodder access.

The research employed a mixed-methods approach, integrating quantitative surveys (conducted remotely via phone interviews) with qualitative tools like key informant interviews, focus group discussions, and participatory mapping exercises. The study covered detailed household profiles, income and expenditure patterns, and infrastructural evaluations, complemented by remote sensing analyses. While the remote data collection imposed some limitations on representativeness, the triangulation of multiple data sources ensured a robust understanding of the challenges and informed the subsequent identification of priority interventions.

Key Findings

Vulnerabilities of Agricultural Communities

The assessment reveals that water scarcity, poor irrigation infrastructure, and worsening soil salinity have compounded economic and social vulnerabilities in both sub-districts. Farmers and livestock owners are experiencing crop losses and high mortality rates among animals, with many forced to incur significant household debt to meet basic needs. These vulnerabilities are exacerbated by limited access to affordable inputs and fodder, highlighting a critical need for targeted financial support and improved resource management. Key data points include widespread reports of saline water and compromised saline soil, both of which undermine agricultural productivity.

Agro-Pastoral Practices

Farmers have adapted to the challenging environment by shifting to drought- and salt-tolerant crops and adopting water-saving techniques such as drip irrigation and covered agriculture. Livestock owners, on the other hand, are increasingly opting for breeds that require less water. Despite these adaptive practices, traditional methods still persist, and the transition is hampered by the high cost and limited reliability of modern irrigation systems—further compounded by frequent water shortages. The diversity in crop types and land use patterns between Al-Dawaya and Al-Gharraf also underscores the region's evolving agro-pastoral strategies in response to climate pressures.

State of Key Infrastructure

The region's irrigation systems and broader agricultural system are under severe strain. Inefficient water distribution—illustrated by the rotational "Bid'a regulator" system—has led to inequitable water allocation, especially disadvantaging Al-Gharraf compared to Al-Dawaya. Infrastructural challenges include aging canals, poor maintenance, and unreliable mechanized pumping systems. These factors,

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combined with limited access to modern technologies, inhibit the capacity of farmers to effectively manage water and sustain agricultural activities amid increasing climate variability.

Drought Risk Mitigation Measures and Priority Interventions

Both sub-districts are experiencing prolonged and extreme drought events that have led to extensive crop failure and forced migration. Remote sensing analyses confirm that drought severity is widespread, with some areas consistently exhibiting extreme vegetation stress. In response, local communities have resorted to digging wells and water trucking, though these measures have proven costly and only partially effective. The assessment recommends a mix of short-term interventions—such as improving canal lining and water conservation measures—and long-term infrastructural projects like deep well drilling and the transition to mechanized, drip irrigation systems to mitigate drought risks.

Addressing Barriers to Adaptive Practices

Informational, institutional, and financial barriers continue to hamper the community's ability to adopt effective coping mechanisms. Limited knowledge of efficient irrigation practices and drought risk mitigation, combined with a lack of government support and fragmented community coordination, have stifled adaptive capacity. Strengthening training programs, enhancing regulatory oversight of water resources, and increasing access to affordable agricultural inputs are identified as crucial steps to lift these barriers. Enhancing cooperation among communities, NGOs, and institutions will be essential to create an enabling environment for resilient, adaptive practices.

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List of Acronyms

HH Household
HoHH Head of Household
LCSI Livelihood Coping Strategies Index
DoA Directorate of Agriculture
DoW Directorate of Water
MFDG Mapping Focus Group Discussion
KII Key Informant Interview
RS Remote Sensing
NDVI Normalized Difference Vegetation Index
ABRA Area-based Risk Assessment
DRR Disaster Risk Reduction

Definitions

Area-based risk assessment – is an approach to analyze multiple hazards, both natural and anthropogenic, that an area/settlement is prone to and identify the most at-risk areas, by evaluating existing conditions of vulnerability that could potentially harm exposed people, property, services, livelihoods, and the environment on which they depend (own definition, UNGA, 2016).

Disaster risk - the potential loss of life, injury, or destroyed or damaged assets that could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity (UNGA, 2016).

Hazard - A process, phenomenon, or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption, or environmental degradation (UNGA, 2016).

Exposure - the situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas (UNGA, 2016).

Vulnerability - the conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards (UNGA, 2016).

Geographic Classifications

Region Highest form of governance
Governorate Top-level administrative division
District Secondary administrative division within a governorate
Sub-district Tertiary administrative division linking municipal services and district governance

Figures, Tables and Maps

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INTRODUCTION

Iraq, an arid to **semi-arid** country, is among the most **climate-vulnerable** in the Middle East. [1] Water scarcity is an escalating crisis driven by climate change, the oil industry[2], and upstream water policies from neighboring countries. The Euphrates and Tigris Rivers, Iraq's primary water sources, have been severely impacted by dam construction[3], experiencing significant **water scarcity** between 2009 and 2014. Continued upstream consumption in Turkey, Iran, and Syria worsens the shortages[4], while rising temperatures[5], shifting rainfall patterns[6], and increasing freshwater contamination[7] further threaten water security.

Thi-Qar governorate, in southern Iraq, depends on both rivers and contains large portions of the Mesopotamian Marshes, once the Middle East's largest wetland ecosystem. After extensive drainage in 1991, efforts to restore the marshes began in 2003, but inconsistent water flow has hindered recovery.[8] [9] The governorate is also a key agricultural region. However, **water scarcity has severely impacted agricultural activities**, leading to declining yields and increasing economic strain on local communities. As the largest consumer of water, agriculture is especially vulnerable to climate change, with droughts and erratic water access making farming increasingly unsustainable, driving economic instability and displacement.[10]

As of September 2024 , IOM Iraq's Displacement Tracking Matrix (DTM) recorded that 28,116 families (168,696 individuals) in Iraq displaced due to climatic factors, with **50% of Iraq's climate-displaced originating from Thi Qar** (14,052 families). [11]

Water scarcity not only **threatens livelihoods** but also has far-reaching consequences for food security, poverty reduction, energy security, and environmental sustainability. Addressing these challenges requires comprehensive water policies that balance agricultural needs with **long-term resource management**. Setting global, regional, national, and local water policies is essential to controlling water demand which requires an understanding of the reasons behind water shortages. [12]

In response to these challenges, IMPACT partnered with ACTED to launch this research cycle and collaborated closely with other national and local stakeholders, including the community itself, while ACTED will implement activities based on the findings. The assessment is designed as a **collaborative, multi-stakeholder exercise** funded by European Civil Protection and Humanitarian Aid Operations (ECHO) and involved various partners across different stages of the Research Cycle. This research

[1] Shareef, M. E., & Abdulrazzaq, D. G. (2021). River flood modelling for flooding risk mitigation in Iraq. Civil Engineering Journal, 7(10), 1702–1715.
[2] Al-Maliki, L. A., Farhan, S. L., Jasim, I. A., Al-Mamoori, S. K., Al-Ansari, N., Fegade, S. L., & Fegade, S. L. (2021). Perceptions about water pollution among university students: A case study from Iraq. Cogent Engineering, 8(1), 1–17.
[3] Karim, I. R., Hassan, Z. F., Abdullah, H. H., & Alwan, I. A. (2021). 2D-HEC-RAS modeling of flood wave propagation in a Semi-Arid Area due to dam overtopping failure. Civil Engineering Journal, 7(9), 1501–1514.
[4] Aljanabi, A. A., Mays, L. W., & Fox, P. (2018a). Application of an optimization model for assessing the performance of water appropriation in Iraq. *Environment and Natural Resources Research*, 8(1), 105–118.
[5] Salman, S. A., Shahid, S., Ismail, T., Ahmed, K., & Wang, X.-J. (2018). Selection of climate models for projection of spatiotemporal changes in temperature of Iraq with uncertainties. *Atmospheric Research*, 213, 509–522.
[6] Osman, Y. Z., Abdellatif, M., Al-Ansari, N., Knutsson, S., & Jawad, S. (2017). Climate change and future precipitation in an arid environment of The Middle East: Case Study of Iraq. *Journal of Environmental Hydrology*, *25*(3), 1–18
[7] Aljanabi, A. A., Mays, L. W., & Fox, P. (2018b). A reclaimed wastewater allocation optimization model for agricultural irrigation. *Environment and Natural Resources Research*, 8(2), 55–68.
[8] Asa, A. (2011). The swamps of home: Marsh formation and settlement in the early medieval Near East. *Journal of near Eastern Studies*, 70(1), 55–79.
[9] Guarasci, B. L. (2015). The national park: Reviving eden in Iraq's marshes. *The Arab Studies Journal*, 23(1), 128–153
[10] Ethaib, S., Zubaidi, S. L., Al-Ansari, N., & Fegade, S. L. (2022), Evaluation water scarcity based on GIS estimation and climate-change effects: A case study of Thi-Qar Governorate, Iraq. Cogent Engineering, 9(1).
[11] International Organization for Migration. (2024, November). Climate-Induced Displacement in Central and Southern Iraq. IOM, Iraq. https://iraqdtm.iom.int/files/Climate/2025113334336_Climate_ET_Sep_2024.pdf
[12] Liu, J., Yang, H., Gosling, S. N., Kummu, M., Florke, M., Pfister, S., Hanasaki, N., Wada, Y., Zhang, X., Zheng, C., Alcamo, J., & Oki, T. (2017). Water scarcity assessments in the past, present and future. *Earths Future*, 5(6), 545–559.

specifically addresses **critical information gaps about the crisis**, including: details on agro-pastoral practices in the sub-districts; vulnerabilities of farmers and livestock owners in the area; the state and condition of the region's key infrastructure including irrigation systems; drought risk mitigation measures and priority intervention areas that may be of use for the sub-districts; and the ways NGOs and institutions can help overcome barriers that prevent effective coping mechanisms and adaptive practices.

In short, the primary objective of the research is to inform **context-adapted** agricultural Disaster Risk Resilience **(DRR) programming** of ACTED and policies of local stakeholders by providing reliable and **actionable evidence on the impacts of climate** – with a special focus on **water scarcity** – and environmental hazards on agricultural communities for better integration of climate mitigation and **adaptation measures**. This effort, while facilitated by IMPACT, reflects a robust partnership approach aimed at enhancing evidence-based decision-making in the humanitarian response to support affected populations and improve long-term resilience.

This report provides a detailed description of the methodology and why it was chosen, and then outlines the key assessment findings, organised into the following sections:

1) Farmer and Livestock Owner Profiles

2) Agricultural Practices and Land Use

3) Challenges

4) Proposed Solutions

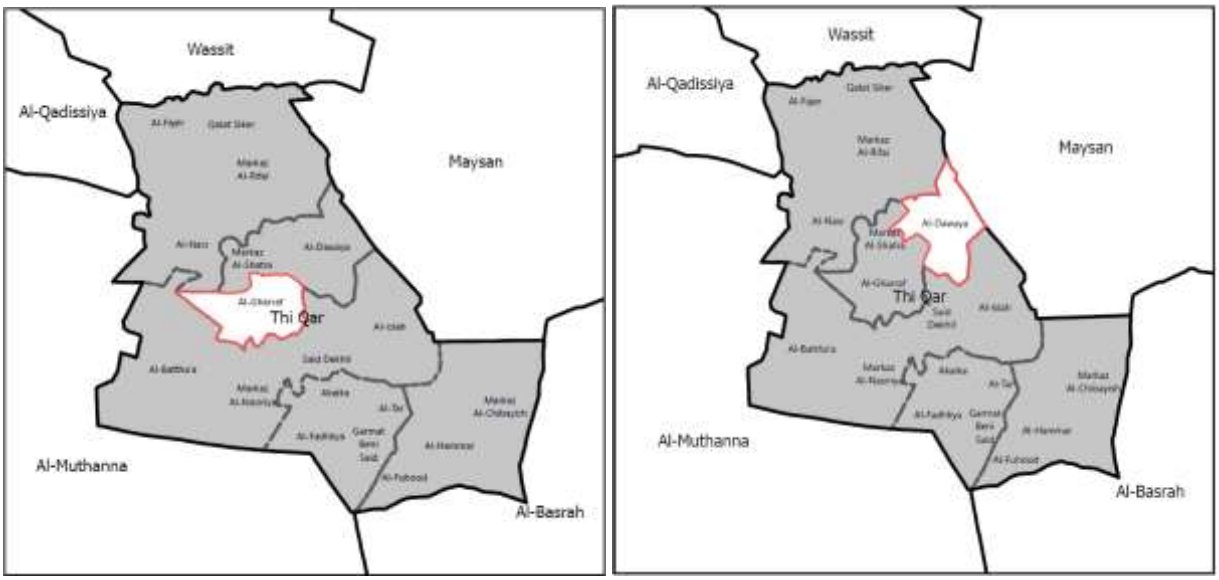
METHODOLOGY

Area-based risk assessment (ABRA) is an approach to analyze multiple hazards, both natural and anthropogenic, that an area or settlement is prone to, and to identify the most at-risk areas by evaluating existing conditions of vulnerability that could potentially harm exposed people, property, services, livelihoods, and the environment on which they depend (own definition, UNGA, 2016). Using an integrated partnership approach with ACTED, under IMPACT's AGORA initative, the ABRA in Thi Qar aimed to inform the planning and implementation of localized adaptation interventions to support climate-affected farming communities. The findings from REACH ABRA will directly inform ACTED's activities and will be shared with other relevant stakeholders in the area to support an evidence-based response.

Geographical scope

The ABRA was conducted in the Al-Gharraf and Al-Dawaya sub-districts of Thi Qar governorate. These sub-districts were selected because they are key agricultural areas that are heavily affected by climate change and water scarcity. Their critical role in local food production and the concentration of vulnerable farming communities made them a priority for this assessment. It is also noteworthy that Thi Qar governorate accounted for 50% of climate-displaced families in Iraq in September 2024, according to the IOM Iraq Displacement Tracking Matrix (DTM).[13]

Map 1: Map of assessed areas



Data Collection Methods

The assessment employed a mixed-method approach that combined both quantitative and qualitative techniques, along with secondary data and remote sensing tools. Quantitative data were collected via a structured individual-level survey focusing on households engaged in farming and livestock onwership. Secondary quantitative data, including statistical records and remote sensing imagery, provided objective measures of key risk factors such as hazard exposure and infrastructure condition.

[13] International Organization for Migration. (2024, November). Climate-Induced Displacement in Central and Southern Iraq. IOM, Iraq. https://iraqdtm.iom.int/files/Climate/20251133334336_Climate_ET_Sep_2024.pdf

For the qualitative component, data were gathered through key informant interviews (KIIs), semi-structured mapping focus group discussions (MFDGs), and solution-generating workshops. A total of 28 semi-structured KIIs were conducted in person between December 18–25, 2024, with purposively selected participants including 4 agricultural experts from the Directorate of Agriculture, 4 water experts from the Directorate of Water, and 20 community leaders, evenly distributed between the two sub-districts. Additionally, two semi-structured MFDGs (one per sub-district) were conducted with 8 community leaders in each group—primarily mukhtars and heads of local agricultural associations. Four experts from the Directorates of Water and Agriculture participated in mapping exercises conducted in person between December 16–22, 2024. Furthermore, together with ACTED, IMPACT facilitated three Community Insights and Recommended Interventions (CIRI) workshops in February 2025. The first two workshops, held in Al-Dawaya and Al-Gharraf, gathered 14 and 11 participants respectively, including local and tribal leaders, farmers, and livestock owners. A third workshop convened local authorities representing both sub-districts. Remote sensing data were also collected from various secondary sources, including very high-resolution satellite imagery, which served as basemaps for the mapping focus group discussions.

Quantitative data sources, including statistical and remote sensing data, provide objective measurements of key risk factors such as vulnerability and hazards, while qualitative tools—such as participatory mapping, KIIs, and focus group discussions—capture local knowledge, coping strategies, and risk perceptions. By combining these methods, the ABRA offers a comprehensive and nuanced understanding of disaster risk, which can inform the development of evidence-based risk reduction strategies tailored to the specific needs of the communities in the targeted sub-districts.

Sampling Strategy

The overall population of interest included farmers and livestock owners in the selected sub-districts, as well as local stakeholders, leaders, and experts from water service providers and the Directorate of Agriculture.

For the quantitative component, a structured survey was administered to individual farmers via phone interviews, with respondents selected using snowball sampling techniques. According to the Agriculture Directorate in Thi Qar, there were an estimated 1,900 farmers and livestock owners in Al-Gharraf and 4,100 in Al-Dawaya.

Table 1. Estimated sample size for individual interviews with farmers and livestock holders according to the local Directorate of Agriculture

Location	Farmers/ Buffalo herders	Estimated #	95/10 sample	+ 10% buffer	Total sample
Al-Dawaya	Farmers (owners and renters)	1,700	91	100	173
	Buffalo herders	200	66	73	
Al-Gharraf	Farmers (owners and renters)	3,600	94	103	192
	Buffalo herders	500	81	89	
Total					365

IMPACT aimed to achieve a 95% confidence level with a 10% margin of error (plus a 10% buffer). However, due to the remote data collection with purposive choise of respondents through snowballing, **the survey data cannot be considered fully representative**. In total, 186 surveys were completed in Al-Dawaya and 213 in Al-Gharraf, with household composition information collected from 1,038 household members in Al-Dawaya and 1,285 in Al-Gharraf. Sampling challenges, such as non-responses and limited remote access, were mitigated by follow-up calls and additional outreach where possible.

Challenges and Limitations

Remote data collection was conducted through phone-based surveys, with respondents purposively sampled from contacts provided by ACTED, including individuals and mukhtars from the area. The sampling was implemented via a snowballing technique, ensuring a proportionate number of interviews per village within the sub-district. Enumerators collected the data using a KOBO survey tool.

This method offered the advantage of speeding up the data collection process and ensuring that all types of farmers—regardless of crop or livestock type—had the opportunity to participate. However, there were significant challenges. The remote nature of the surveys could result in a loss of data quality and compromise representativeness, making it more difficult to verify the geographic location of respondents and conduct a detailed geographic analysis. To address these issues, the assessment incorporated qualitative data collection methods, such as key informant interviews and participatory mapping, alongside strong data checking and cleaning protocols. Nevertheless, as noted previously, the survey data cannot be considered fully representative, which may affect subsequent analysis and interpretation.

Additionally, the remote sensing analysis was subject to standard limitations, including a reliance on open-source imagery data sources and the absence of field validation.

FINDINGS

Farmer & Livestock Owner Profiles

This section outlines assessment findings related to the profiles of farmers and livestock owners, including their livelihood activities, household composition, economic conditions, and coping strategies utlized in the Al-Dawaya and Al-Gharraf sub-districts.

Demographics & Household Characteristic

The survey with farmers and livestock owners included 186 in Al-Dawaya and 213 in Al-Gharraf. Of those surveyed, 78% of respondents engaged in farming activities and 56% in livestock ownership.

Figure 1. Livelihood activities, Al-Dawaya (n=186)

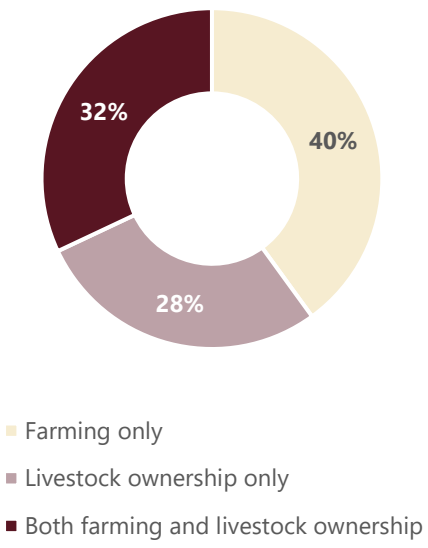
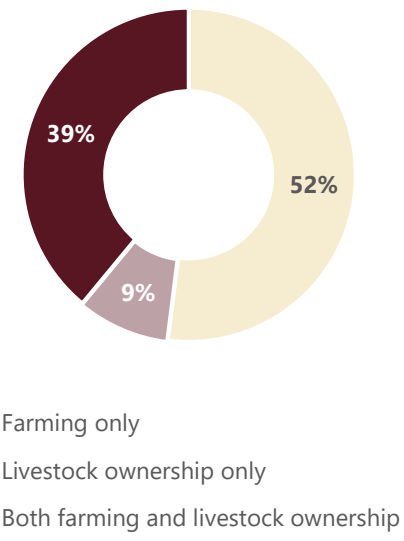


Figure 2. Livelihood activities, Al-Gharraf (n=213)



Nearly all respondents (99%) reported that their household owned the farming or livestock enterprise, indicating that most farming or livestock activities in the surveyed population are family-owned rather than externally managed.

98% of respondents identified as the head of household (HoHH) with the average respondent age being 43 years. Of those surveyed, 98% of households were male headed as compared to just 2% female headed. This illustrates a potential limitation in our dataset as key informants indicated some presence of **female headed households** hightlighting that these households are **uniquely vulnerable** to the difficulties of farming and livestock ownership.

The median household size in Al-Dawaya was 5 while Al-Gharraf was 6. Household size was categorized into three groups: small (3 or fewer members), medium (4-6 members), and large (7 or more members). These findings indicate that a substantial share of households in both areas—30% in Al-Dawaya (n=186) and 35% in Al-Gharraf (n=213)—fall into the **"large" household** category, which local key informants identified as a **vulnerability indicator**. This means that more than a third of households in Al-Gharraf and nearly one-third in Al-Dawaya potentially face **additional pressures** due to the demands of larger family units, which could include resource constraints, difficulty in meeting basic needs, and increased exposure to shocks.

Figure 3. Household size classification, Al-Dawaya (n=186)

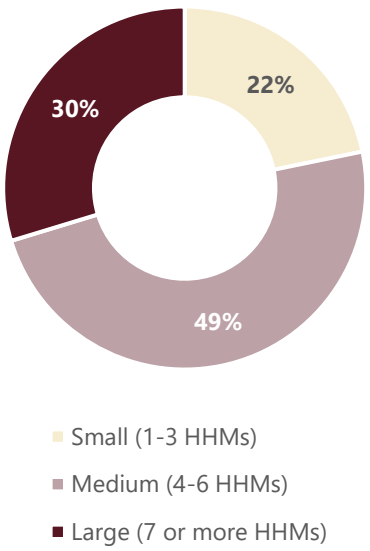
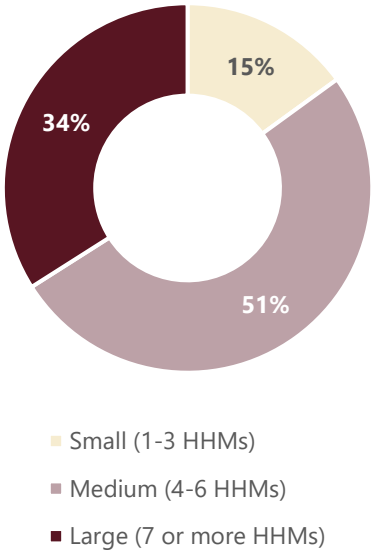


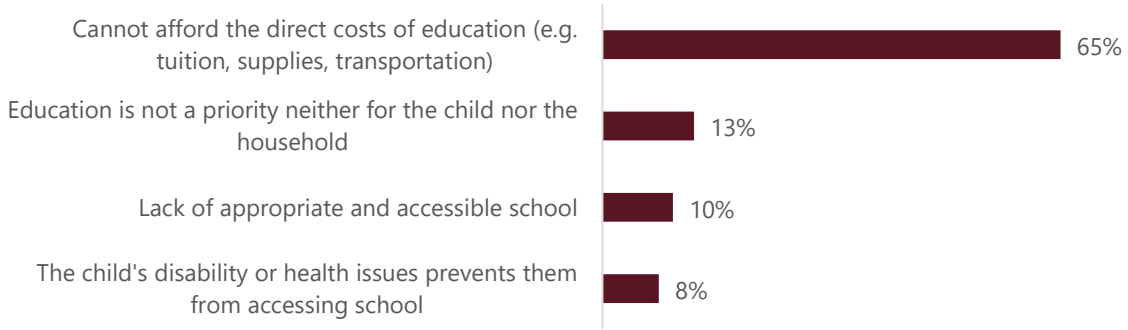
Figure 4. Household size classification, Al-Gharraf (n=213)



Nearly all surveyed farmers and livestock owners reported that their agricultural enterprises were household-owned, underscoring the family-run nature of these activities. Notably, various household members play significant roles: 76% of households reported that at least one adult female (18+) contributed to agricultural livelihood activities, 73% had children aged 6 to 15 involved in farming and livestock operations, while only 21% indicated participation by girls under 18. This data highlights the **broad family engagement in sustaining these enterprises**, even as the involvement of young girls remains comparatively limited.

12% of households reported that one or more school aged children (6 - 15 years old) were not enrolled and/or regularly attending school and 6% reported having children 16-17 years old that were not enrolled and/or regularly attending schools. The most reported reason (65%) for lack of formal education access was the inability to afford the direct costs of education (n=99).

Figure 5. Commonly reported reasons why formal education was inaccessible for school-age children (n=99)



While working on the family enterprise was not a commonly reported reason for children missing school, the data shows that a significant number of children are actively involved in household farming. Coupled with the fact that the most commonly reported barrier to school attendance is the inability to afford direct educational costs (65%), it is evident that **financial constraints are a key vulnerability** among these households—a finding also echoed by key informants.

Income Profile

The profile of farmers and livestock owners in the sub-districts is categorized by economic challenges. Income and expenditure data was collected on the month of November 2024 (the month prior to data collection) as well as some seasonal data going back 1 year from the survey collection (November 203).

Figure 6. Income sources, November 2024, Al-Dawaya (n=186)

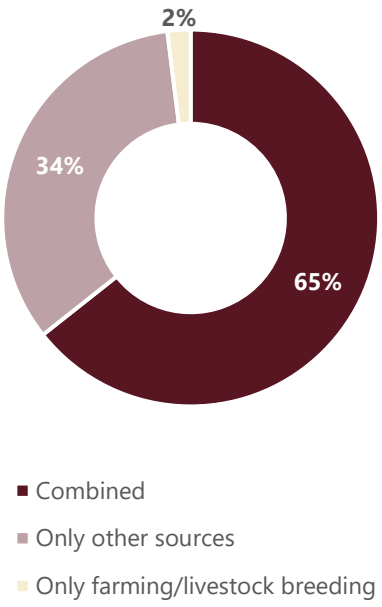
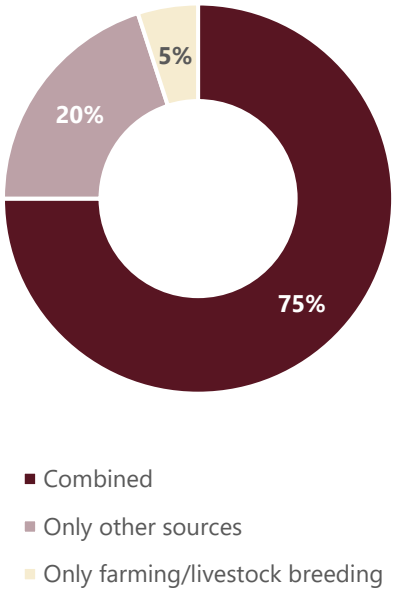


Figure 7. Income sources, November 2024, Al-Gharraf (n=213)



65% of respondents in Al-Dawaya (n=186) and 75% of respondents in Al-Gharraf (n=213) reported combined income streams meaning both income from farming and/or livestock ownership as well as income from other sources.

Just 2% and 5% of respondents in Al-Dawaya and Al-Gharraf respectively reported that their income came exclusively from their agricultural livelihood activities.

These findings suggest that farmers and livestock owners in the sub-districts **must rely on diverse income streams**—likely a strategic response to mitigate risks and address the insufficiency of agricultural returns alone. The reliance on combined income streams underscores underlying economic vulnerabilities, highlighting that **agricultural activities may not fully meet household needs**.

Table 2. Median HH income by type and sub-district in IQD[14], November 2024

Income source	Al-Dawaya	Subset	Al-Gharraf	Subset
Farming/livestock ownership	IQD 500,000	n=123	IQD 500,000	n=170
Other sources	IQD 280,000	n=183	IQD 270,000	n=203

Table 3. Median HH expenditure by type and sub-district in IQD, November 2024

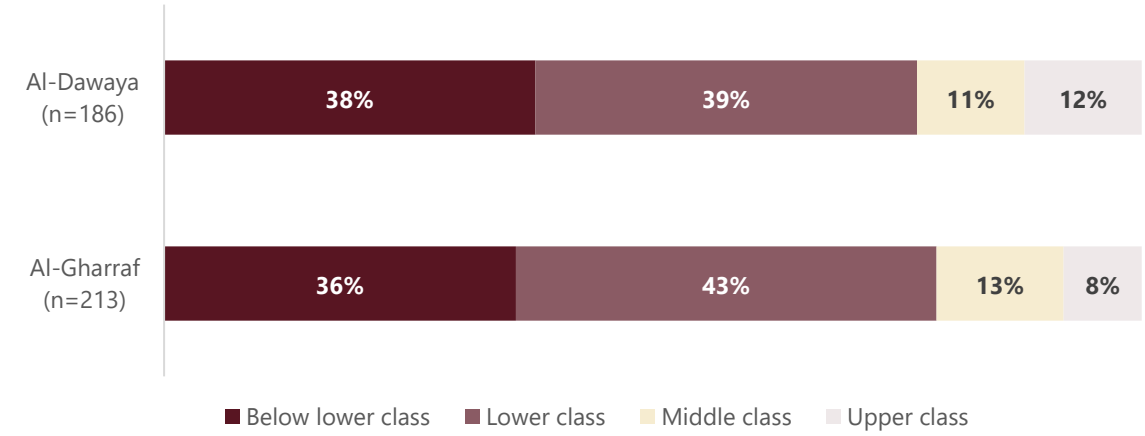
Expenditure Type	Al-Dawaya	Subset	Al-Gharraf	Subset
Living expenditure	IQD 400,000	n=186	IQD 400,000	n=212
Farming and livestock ownership-related expenditure	IQD 250,000	n=163	IQD 300,000	n=203

While median household **income is comparable** across both sub-districts, respondents in **Al-Gharraf reported higher farming and livestock ownership-related expenditure**, with a median that is 50,000 IQD higher than that in Al-Dawaya.

Respondent households were categorized using an income classification framework developed by international organizations such as the World Bank, UNICES, and ESCWA, as referenced by CSIS. Under this framework, households earning less than $2 per day per individual are classified as "below lower class," those earning between $2 and $5 per day fall into the "lower class," households earning $6 to $10 per day are considered "middle class," and those with earnings above $10 per day are classified as "upper class."

77% of respondents are classified as either **lower or below lower class**, illustrating the prevalence of lower-income households in these areas.

Figure 8. Income classification by sub-district, November 2024



It is important to note that while this classification does not account for debt, **73% of respondents reported household debt**—including among those in the upper class. Debt emerged as a critical **coping strategy** employed by farmers and livestock breeders to manage the financial stress and burdens faced by those engaged in livelihood activities in the sub-districts. The primary reasons for this debt were **food expenses**, cited by 81% of respondents in Al-Dawaya (n=186) and 73% in Al-Gharraf (n=213), as well as **farming costs**, reported by 70% in Al-Dawaya and 80% in Al-Gharraf.

[14] Exchange rate of 1 USD: 1,309 IQD, as sourced from xe.com on 22/03/2025, reflecting the standard approximate rate per the central bank; however, field conditions indicate an effective rate of approximately 1,482 IQD (https://shafaq.com/en/Economy/USD-IQD-exchange-rates-hold-ground-in-Baghdad-surge-in-Erbil).

Figure 9. Proportion of respondents reporting HH debt, November 2024 (n=399)

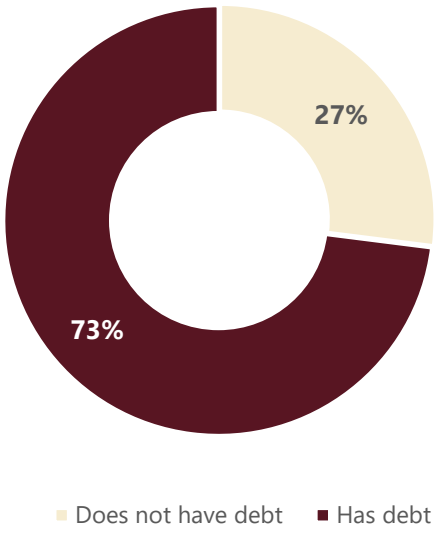
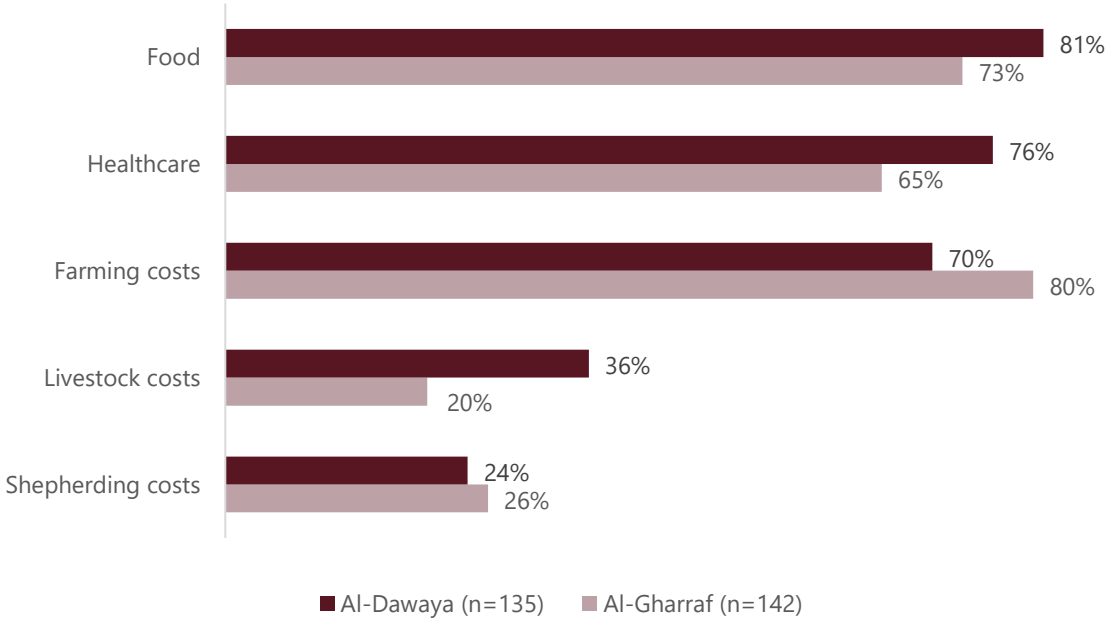


Table 4. Median debt by income category by sub-district (n=293)

Income Group	Al-Dawaya	Al-Gharraf
Below lower class	IQD 3,300,000	IQD 3,000,000
Lower class	IQD 1,700,000	IQD 2,000,000
Middle class	IQD 1,000,000	IQD 2,500,000
Upper class	IQD 1,000,000	IQD 550,000

Figure 10. Most commonly reported reasons for debt by sub-district



Key informants emphasized that **low-income** farmers and livestock owners are the **most vulnerable segment of the population**. With 77% of respondents categorized as lower or below lower class, and 73% reporting household debt across all income groups—primarily driven by food, farming expenses, healthcare, and livestock/shepherding costs—the data underscores a **remarkably high level of vulnerability** across both sub-districts and agricultural livelihood activities.

Coping Mechanisms

The Livelihood Coping Strategies Index (LCSI)

LCSI measures how households manage and respond to livelihood stress and shock by assigning coping mechanisms a grade of stress, crisis, or emergency. **71%** of respondents reported that their household

employed **at least one coping mechanism** (as measured by the LCSI) in the last 30 days due to lack of food or money to buy it.

Figure 11. LCSI usage by category[15] by sub-district (n=302)

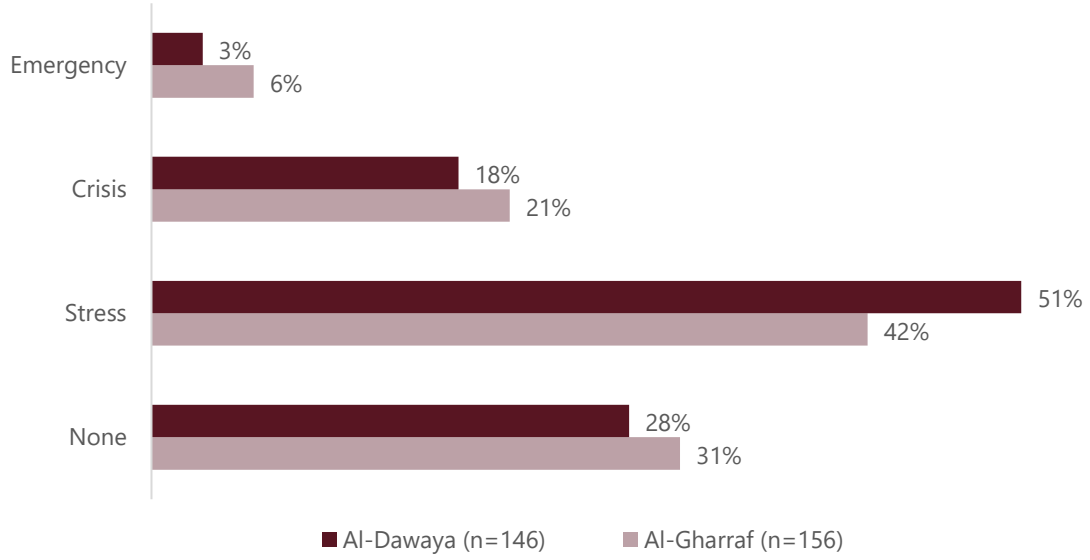


Table 5. Most commonly reported LCSI strategies used by HH

Grading	Coping Strategy	Al-Dawaya	Al-Gharraf
Stress	Buying food on credit or through borrowed money from relatives and friends	54%	51%
Stress	Reducing expenditure on non-food items (health-related such as drugs, education-related such as books, uniforms)	6%	16%
Stress	Selling household properties (refrigerator, television, jewellery…)	9%	12%
Crisis	Children under 18 work to provide resources	5%	12%

The three most reported coping strategies across both sub-districts were classified as **stress strategies** under the Livelihood Coping Strategies Index (LCSI). The most reported coping strategy employed by respondents across both districts was **buying food on credit or borrowing money from relatives and friends**. With 73% of respondents already in debt, these findings indicate a high level of vulnerability and need among households.

Coping Mechanisms by Activity

KIs also shared several coping strategies utilized by farmers and livestock owners, with some notable differences per livelihood activity. **Community leaders identified the most frequently reported coping strategies for each group**, listed in order of frequency:

[15] The LCSI categories classify coping mechanisms as follows: "stress" reflects minor adjustments, "crisis" indicates more significant measures, and "emergency" involves extreme actions that could have lasting adverse effects. An example for the emergency category is not provided in the next table.

Table 6. Most commonly used coping strategies by livelihood activity type and frequency of reported by KIs

Farmers	Livestock Owners
Digging wells to access groundwater	Selling livestock to reduce resource strain
Shifting to drip irrigation for more efficient water use	Purchasing/trucking water from other areas to sustain animals
Changing crop types to those requiring less water	Digging wells to secure water sources

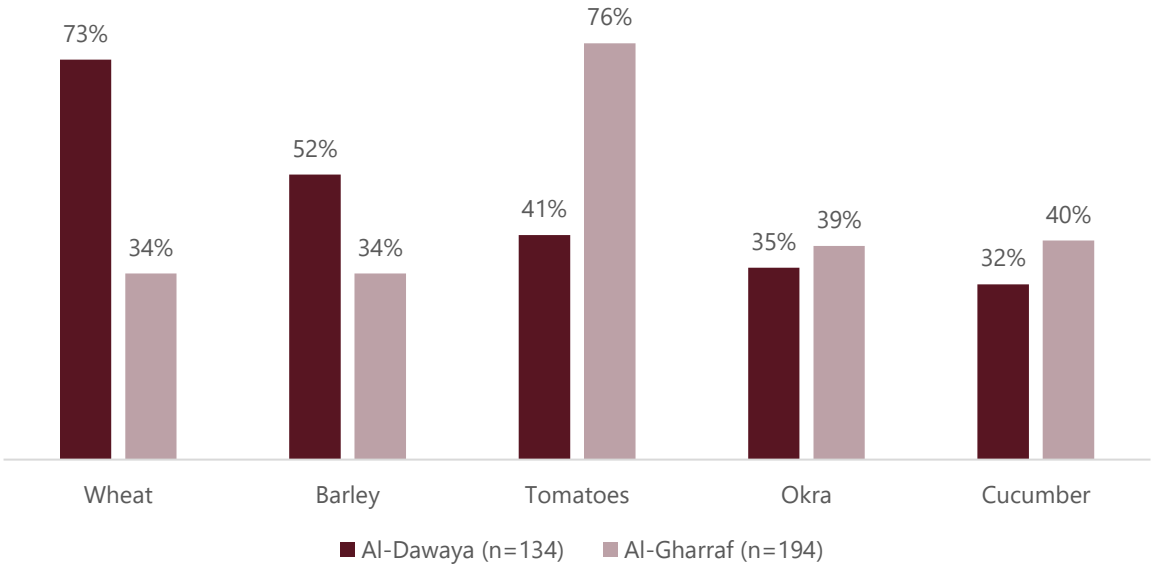
Key informants also noted several **limitations to these coping strategies**. For example, many wells dug by farmers are not deep enough, often bringing up saline water. Additionally, trucking water from other areas remains a costly and unsustainable solution.

In addition to these strategies, **migration** has emerged as a significant response to ongoing agricultural challenges. Although only 6% of respondents reported plans to migrate, many have already left, with key informants highlighting this trend more prominently in Al-Gharraf than in Al-Dawaya.

Agricultural Practices and Land Use

Farming Activities

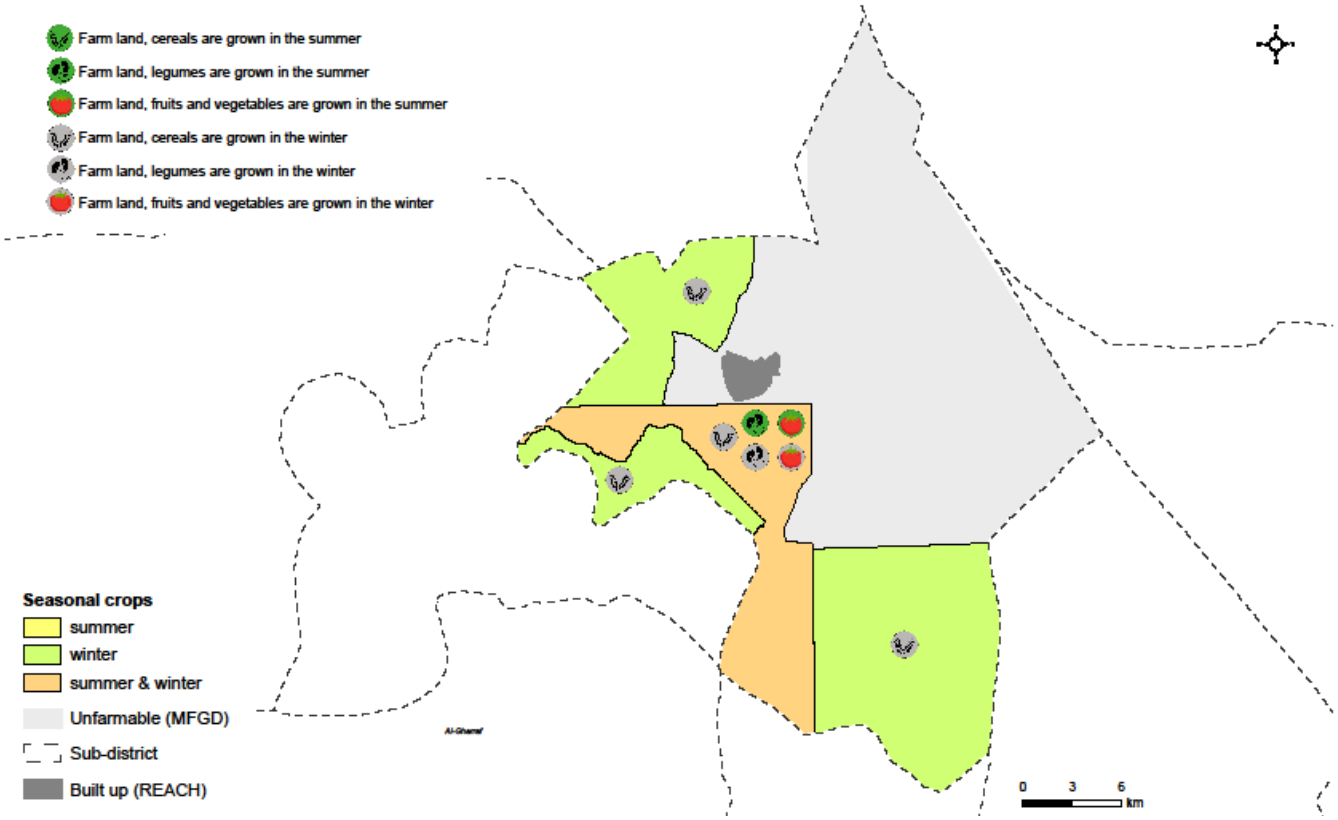
Figure 12. Proportion of respondents reporting crop types by sub-district



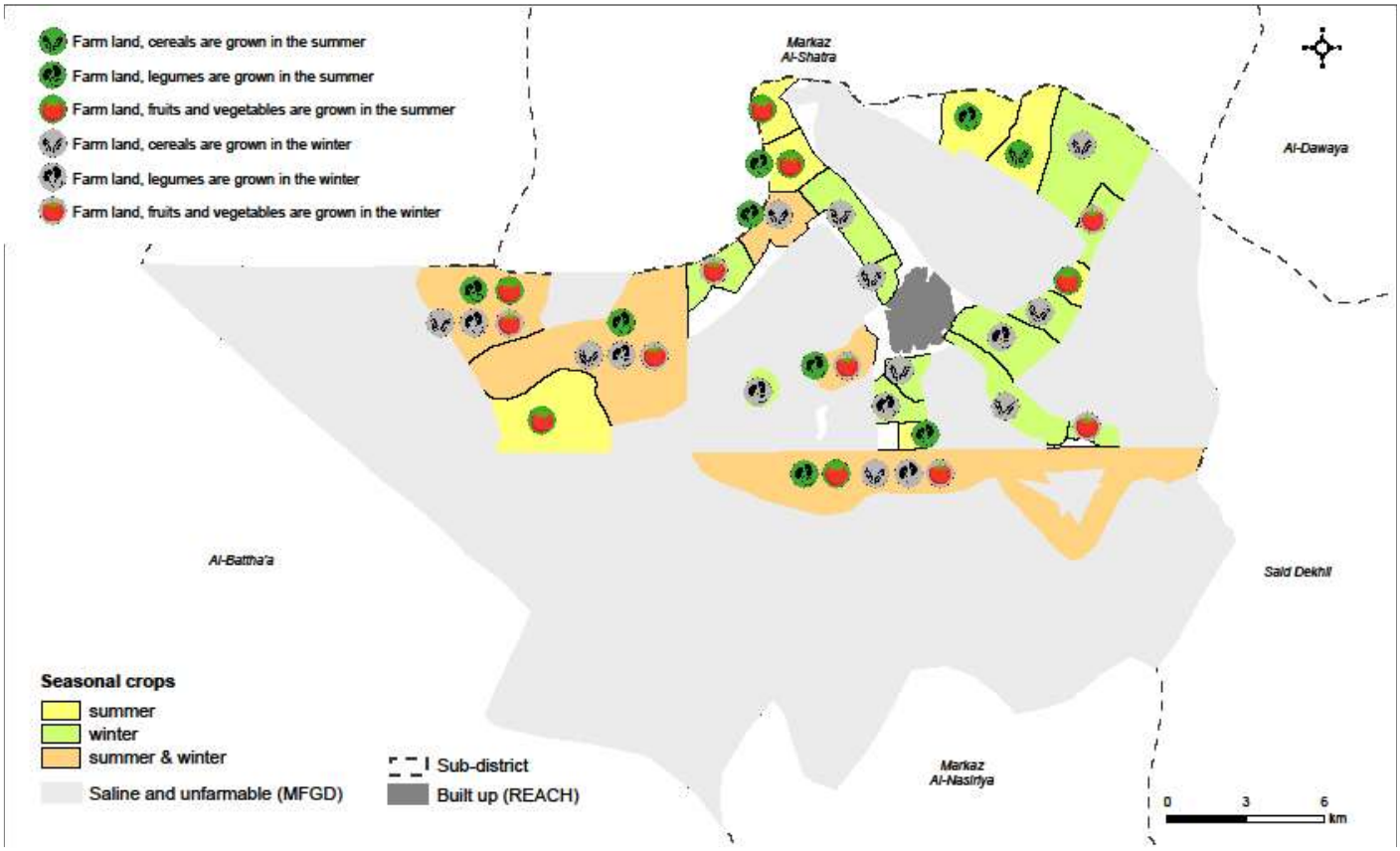
Crop distribution differs significantly between the sub-districts. In Al-Gharraf, tomatoes and cucumbers are more common, while wheat and barley prevail in Al-Dawaya.

The maps below illustrate the seasonal patterns of crop cultivation in each area. **In Al-Dawaya, farming is concentrated in four distinct zones.** Three of these areas exclusively grow cereals in the winter, whereas the fourth supports both summer and winter farming—growing fruits, vegetables, and legumes in both seasons, with cereals growing only in the winter. In contrast, **Al-Gharraf features more diverse land use**, with some areas dedicated solely to winter farming, others to summer, and some to both. These findings suggest that **Al-Gharraf cultivates a wider variety of crops**, whereas large portions of Al-Dawaya are used exclusively for winter cereals.

Map 2. Crops and seasons, Al-Dawaya



Map 3. Crops and seasons, Al-Gharraf



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In addition to the seasonal differences shown on the maps, the land use data further highlights the **distinct agricultural practices in each sub-district**. The median number of dunams per respondent was 10 in Al-Dawaya, compared to 6 in Al-Gharraf. This disparity is in line with the crop types, as a significantly higher percentage of farmers in Al-Dawaya reported growing wheat (73%) and barley (52%), which typically require more land than vegetables and legumes according to KIs.

Respondents in Al-Dawaya reported a median of 15 greenhouses, which is more than double the median of 6 reported in Al-Gharraf. This finding is somewhat unexpected as tomatoes and cucumbers generally benefit from more greenhouse cultivation, while wheat and barley do not. However, since the survey did not specify greenhouse sizes, it is possible that the greenhouses in Al-Gharraf are larger.

Livestock Activities

Regarding livestock ownership, both sub-districts showed similar trends, with only slight variations in the median number of animals and the proportion of respondents reporting ownership of specific livelihood types. Notably, only 9% of respondents in Al-Gharraf (n=213) engaged exclusively in livestock ownership without farming, compared to 28% in Al-Dawaya (n=186).

Figure 13. Proportion of respondents owning animal types by sub-district

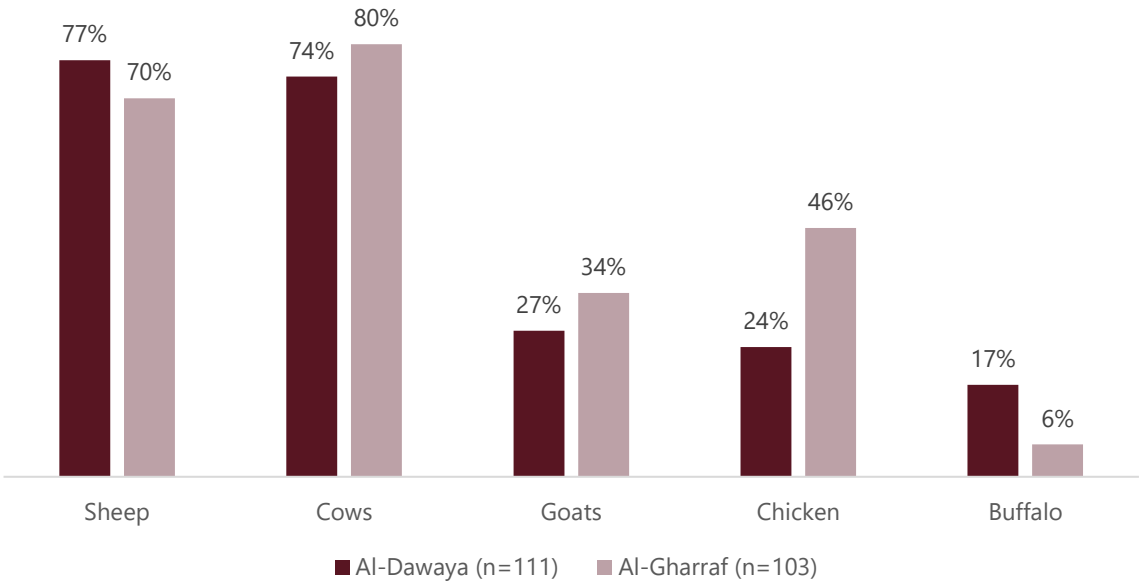
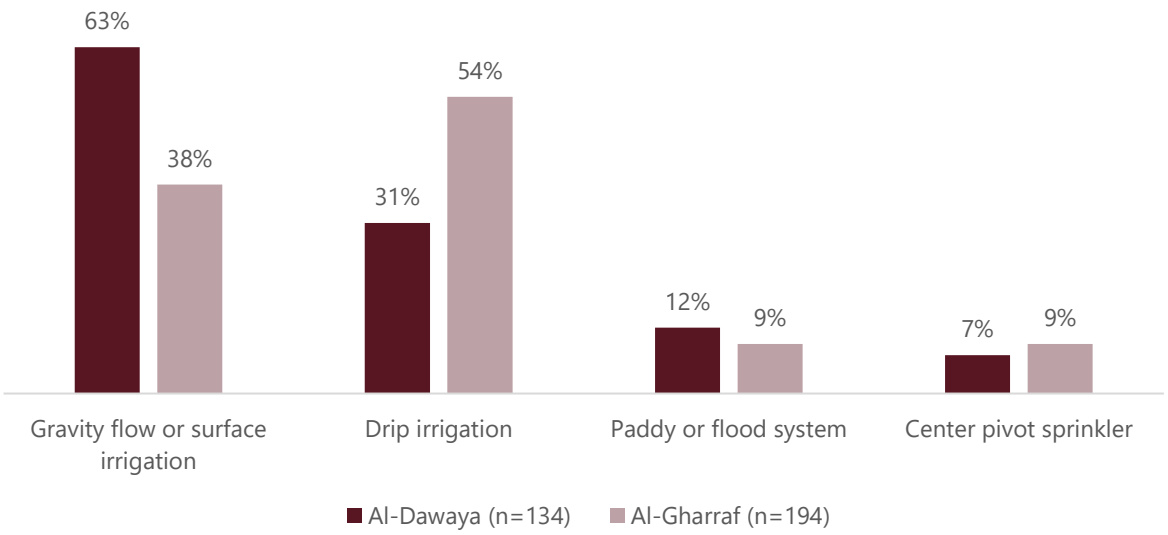


Table 7. Median number of livestock by type and sub-district

	Al-Dawaya	Al-Gharraf
Sheep	18	22
Cow	5	5
Goats	10	16
Chicken	15	16
Buffalo	5	3

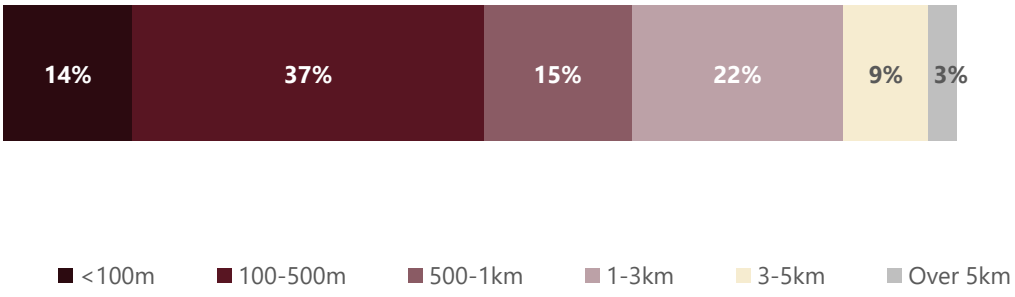
Irrigation Methods and Water Access

Figure 14. Commonly reported irrigation methods by sub-district



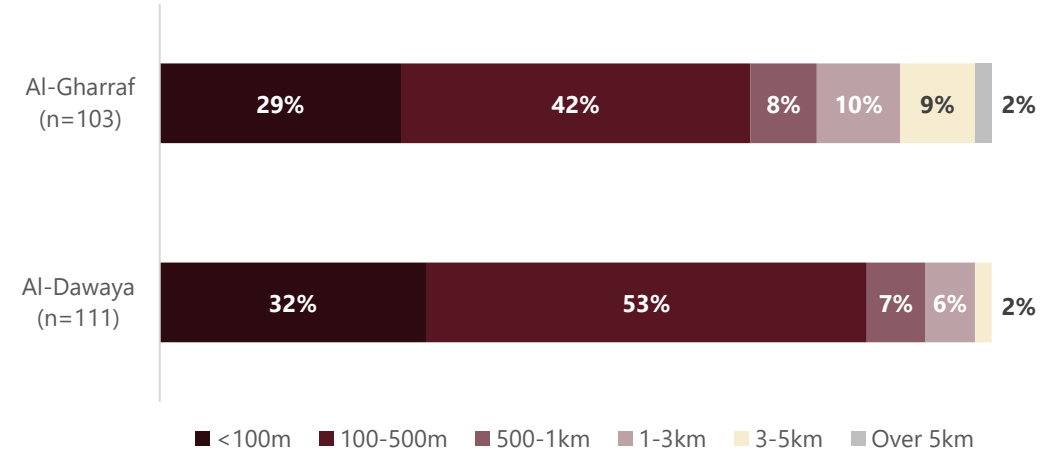
Significant differences emerged between the sub-districts in terms of the dominant irrigation methods. Most surveyed farmers and livestock owners have **transitioned away from traditional paddy or flood irrigation**—a change that many key informants praised. However, the alternative method varied by location. In Al-Dawaya, 63% of farmers (n=134) reported using gravity flow or **surface irrigation**, whereas in Al-Gharraf, **drip irrigation** was the most common method, used by 54% of farmers (n=94), with only 38% relying on gravity flow or surface irrigation. While gravity flow or surface irrigation represents an improvement over paddy/flood systems, key informants emphasized that it is less water-efficient than drip irrigation, underscoring the need to adopt drip systems more widely in both sub-districts.

Figure 14. Share of respondents by distance reported from the closest municipal water source used for irrigation, overall (n=328)



Both sub-districts display similar distributions regarding the distance to municipal water sources for irrigation. Overall, 88% of farmers (n=328) reported that their farms are located within 3 km of a municipal water source, indicating generally good accessibility. However, 3% of farmers are situated more than 5 km away, suggesting that some are located on the outskirts. Key informants emphasized that greater distances could increase the effort, time, and cost associated with water transport, thereby reducing irrigation efficiency. Overall, the distance metrics are comparable between the two sub-districts.

Figure 15. Share of respondents reporting livestock roaming distance for water by sub-district



The findings illustrate that livestock roaming distances are also comparable across the two sub-districts with some notable difference. In Al-Dawaya, a larger share of livestock remains relatively close, with 53% roving within 100–500 meters and 32% within less than 100 meters of their home base. In contrast, in Al-Gharraf, while 43% of livestock are kept within the 100–500 meter range and 29% within less than 100 meters. A greater percentage roam further—9% between 3 and 5 km and 2% over 5 km, compared to none in Al-Dawaya. These patterns may reflect differences in land management practices or water accessibility constraints inherent to each sub-district.

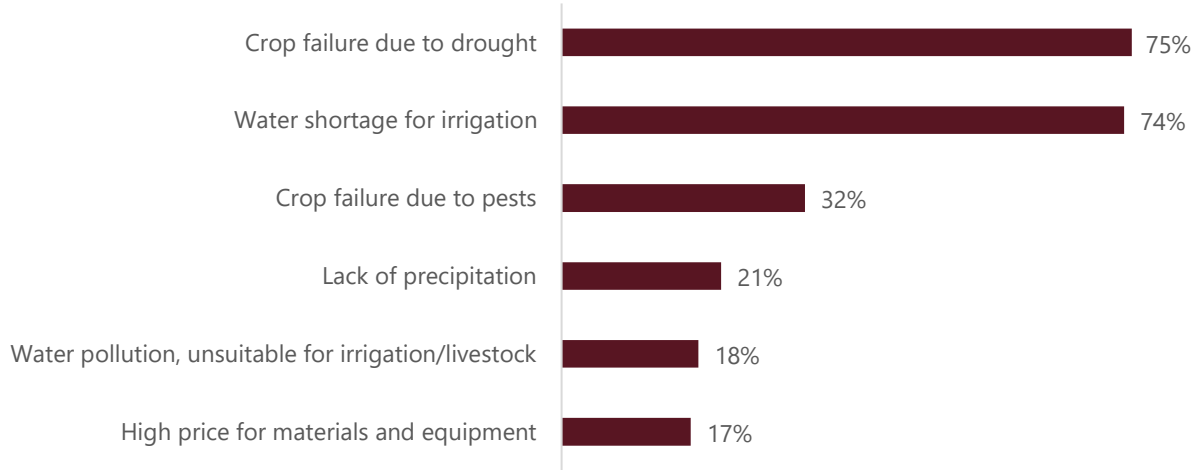
Challenges

Introduction

This section provides an overview of the most frequently reported challenges encountered by farmers and livestock owners in the sub-districts. The following graphs summarize the diverse issues affecting agricultural productivity and livestock sustainability, reflecting the perspectives of those directly involved in these sectors.

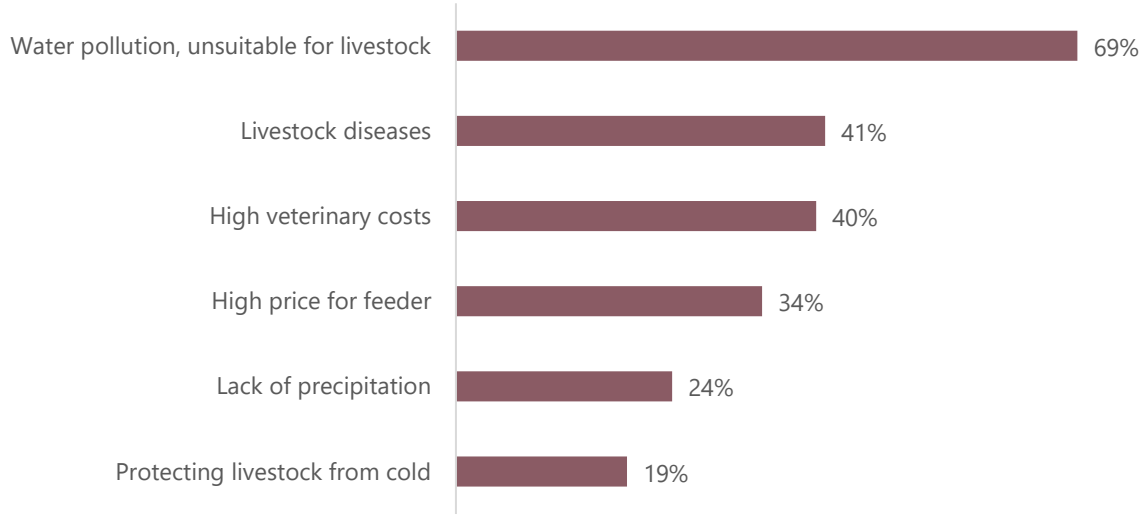
For farmers, the data highlights that **water-related concerns**—especially drought-induced crop failure (75%) and inadequate irrigation (74%)—are at the forefront, with significant challenges also arising from pest infestations and erratic climatic conditions. In parallel, livestock owners report major hurdles such as **water pollution** (69%) and **livestock diseases** (41%), **compounded by high costs** and fluctuating environmental conditions.

Figure 16. Most reported issues faced by farmers related to growing crops (n=311)



Funded by European Union Civil Protection and Humanitarian Aid

Figure 17. Most reported issues faced by livestock owners related to livestock raising (n=214)



These findings indicate that farmers and livestock owners in the two sub-districts face **a wide range of challenges**. To facilitate a deeper understanding of these issues, the subsequent sections will categorize them into six main groups: water, climate, raw materials, livestock healthcare, social and institutional, and informational challenges. This detailed breakdown will help clarify how overlapping and distinct factors contribute to the difficulties experienced in each sector.

While water and climate challenges are fundamentally intertwined, some water-related issues—such as poor irrigation infrastructure—are not directly related to climate change. Similarly, drought is discussed under the climate category because it is primarily a climate-related event, even though it also creates water challenges.

Water Challenges

Water Scarcity

"Water scarcity is the biggest influencing factor and the greatest challenge."
– Representative of Agricultural Directorate

"Most farmers abandoned agriculture; in the past, our land was the source of livelihood for many families. They used to grow vegetables like cucumbers and tomatoes, as well as wheat and barley, which were a staple for many families. There was competition among farmers to grow and export products to other governorates, but due to the lack of water, the land is now barren."
– Community Leader, Al-Gharraf

Water scarcity is widely recognized as the root cause of many challenges faced by farmers and livestock owners. Its far-reaching impacts include crop failure, low yields, barren land, livestock illness, fodder shortages, increased raw material prices, and shifts away from traditional agricultural practices—issues that community leaders have identified as critical concerns. Notably, **72%** of respondents reported that water scarcity affected their agricultural activities in the past year.

For the purposes of this assessment, water scarcity was defined to include the **drying up of water sources** including rivers and canals, an overall **decline in water levels**, extreme weather events such as **drought**, **lack of rainfall**, as well as factors like **groundwater depletion**, **reduced river or stream flow**, shifts in precipitation patterns, and **insufficient water infrastructure**. A number of key informants referenced these factors as the primary causes of water scarcity.

Among farmers, **74%** experienced irrigation water shortages (n=328), and **59%** of livestock deaths were attributed to a lack of water (n=178).

In many interviews, key informants described how **water scarcity is driving broader shifts in agriculture**. In Al-Gharraf, informants emphasized that water shortages serve as a critical barrier to crop productivity, often leading to farmer migration and the abandonment of agriculture as a livelihood. In Al-Dawaya, while similar challenges were noted, some informants observed a shift toward cultivating less water-intensive crops, and others reported that once-productive land had become barren. The repercussions of water scarcity extend to livestock ownership as well. Many informants discussed how water shortages have compelled livestock owners to **sell their animals or migrate** in search of better conditions, a trend more frequently reported in Al-Gharraf that has contributed to an overall decline in livestock numbers and wealth.

Due to water scarcity, the government has implemented a rotational water allocation system, colloquially known as the Bid'a regulator. Under this system, water is rotated among fields rather than being allocated directly to individual farmers. While the most common approach involves weekly rotations, other models include proportional rotations based on field size or district, biweekly rotations, and intermittent interruptions every other week according to Water Directorate representatives. Some informants also mentioned the use of sprinkler systems.

Notably, key informants from Al-Gharraf highlighted **disparities in water distribution through the Bid'a regulator**, suggesting that the system favors Al-Dawaya. One key informant even noted that some villages have gone **without any water supply for the past five years**, underscoring severe inequalities in access to this essential resource. These responses point to systemic imbalances in water allocation that further **exacerbate the vulnerabilities and disputes** among affected communities.

Overall, these insights underscore that water scarcity is not only a standalone challenge but also a driving force behind significant long-term changes in agricultural practices, livelihoods, and land use across both sub-districts.

Water Quality

Nearly all respondents, **97%, reported experiencing water quality issues** for agricultural purposes, attributing also the declining water quality to water scarcity. 99% of affected respondents highlighted an **overall insufficiency** in water quality with the predominant concern among farmers, livestock owners, and key informants being **water salinity**. A slightly higher percentage of respondents in Al-Gharraf (70%, n=195) reported salinated water compared to those in Al-Dawaya (64%, n=168).

Representatives from the Water Directorate noted that water quality issues stem from both **groundwater salinity** and the **poor quality of stored water.** Beyond salinity, community leaders also identified contamination as a broader issue affecting water quality. Notably, reports of **bad-smelling water** varied between the sub-districts, with 19% of respondents in Al-Gharraf (n=195) citing this problem, compared to only 5% in Al-Dawaya (n=168).

Soil Salinity

Findings indicate that soil salinity is one of the most **extensive and damaging challenges** facing farmers and livestock owners in the sub-districts.[16] Soil salinity poses a significant threat to agricultural productivity and food security. Elevated salinity levels create osmotic stress, hindering plants' ability to absorb water, leading to reduced growth, lower crop yields, and, in severe cases, plant mortality. Additionally, saline soil can cause nutrient imbalances, as excess salts interfere with the availability and

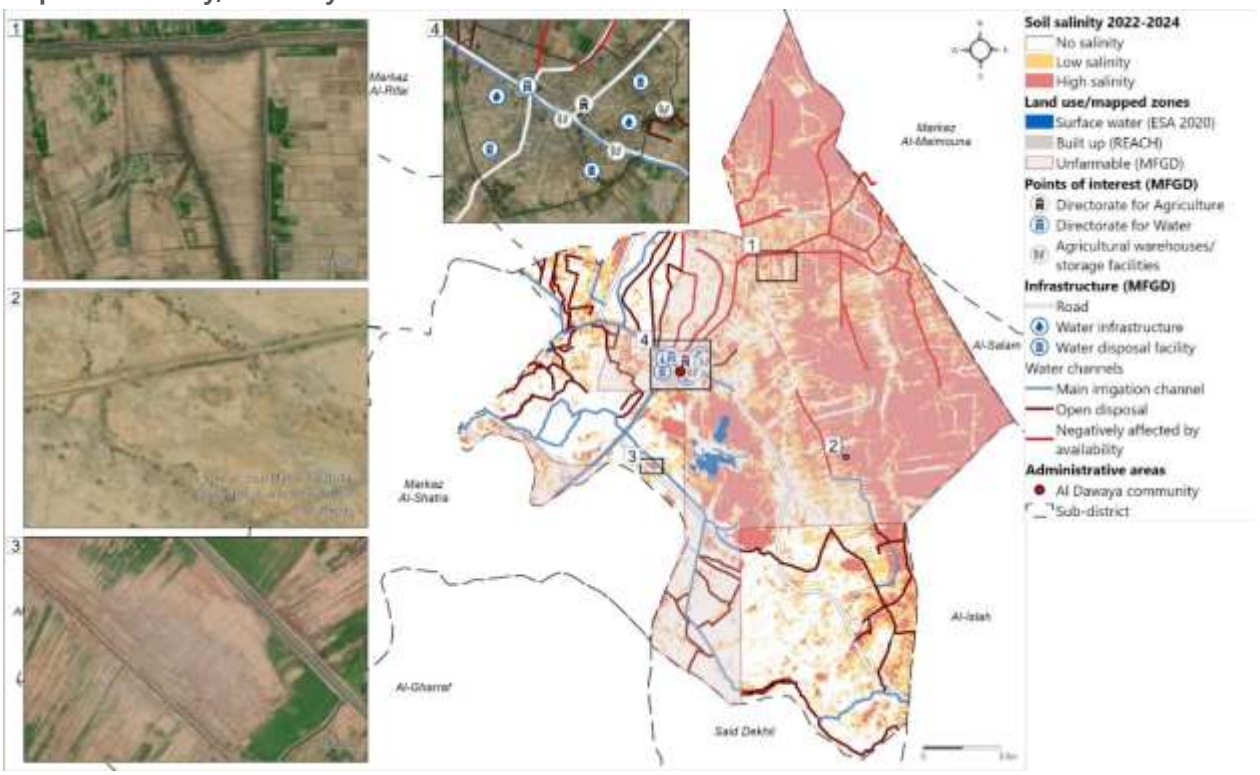
[16] In Iraq, particularly in the central and southern regions, soil salinization has become a critical issue. Approximately 70% of the total irrigated area has experienced diminished production potential due to salinity, with up to 30% of the land rendered completely unproductive. (https://www.researchgate.net/publication/270509466_Extent_Characterization_and_Causes_of_Soil_Salinity_in_Central_and_Southern_Iraq_and_Possible_Reclamation_Strategies)

uptake of essential nutrients such as nitrogen, phosphorus, and potassium, further impairing plant health and productivity.[17]

Although climate factors, such as extreme heat-driven evaporation, contribute to soil salinity, this degradation is primarily attributed to poor irrigation practices and inadequate drainage facilities, which lead to rising groundwater tables and subsequent soil salinization, fundamentally tying the issue to irrigation management and water quality.[18]

The MFGDs revealed that large areas in both sub-districts have been **unfarmable** for at least the past two seasons, with soil salinity being one of the two primary causes along with water scarcity. To elucidate the spatial variability within these sub-districts, a remote sensing analysis utilizing Landsat 8 satellite imagery was performed. The S7 soil salinity index was computed using a combination of visible and shortwave infrared (SWIR) bands to detect saline-affected soils[19]. The combination of visible and SWIR bands is effective for soil salinity detection because it captures both surface reflectance changes caused by salt deposits (visible bands) and subsurface moisture variations linked to salinity stress (SWIR bands).

Map 4. Soil salinity, Al-Dawaya



Significant portions of Al-Dawaya exhibit **high soil salinity**, particularly in the northern and eastern regions, as well as in a patch just south of the central administrative area. Key informants identified these zones as unfarmable[20]. The northern-east and central-north areas also experience compromised water channels that have been negatively affected by availability, underscoring **the link between water scarcity and soil salinity**. Some parts of the sub-district with high salinity are still being farmed, partly due to shifts toward alternative irrigation methods—such as gravity flow/surface irrigation or drip

[17] (Ankita et al, 2019 https://link.springer.com/chapter/10.1007/978-981-13-8801-9_13?utm_source=chatgpt.com)

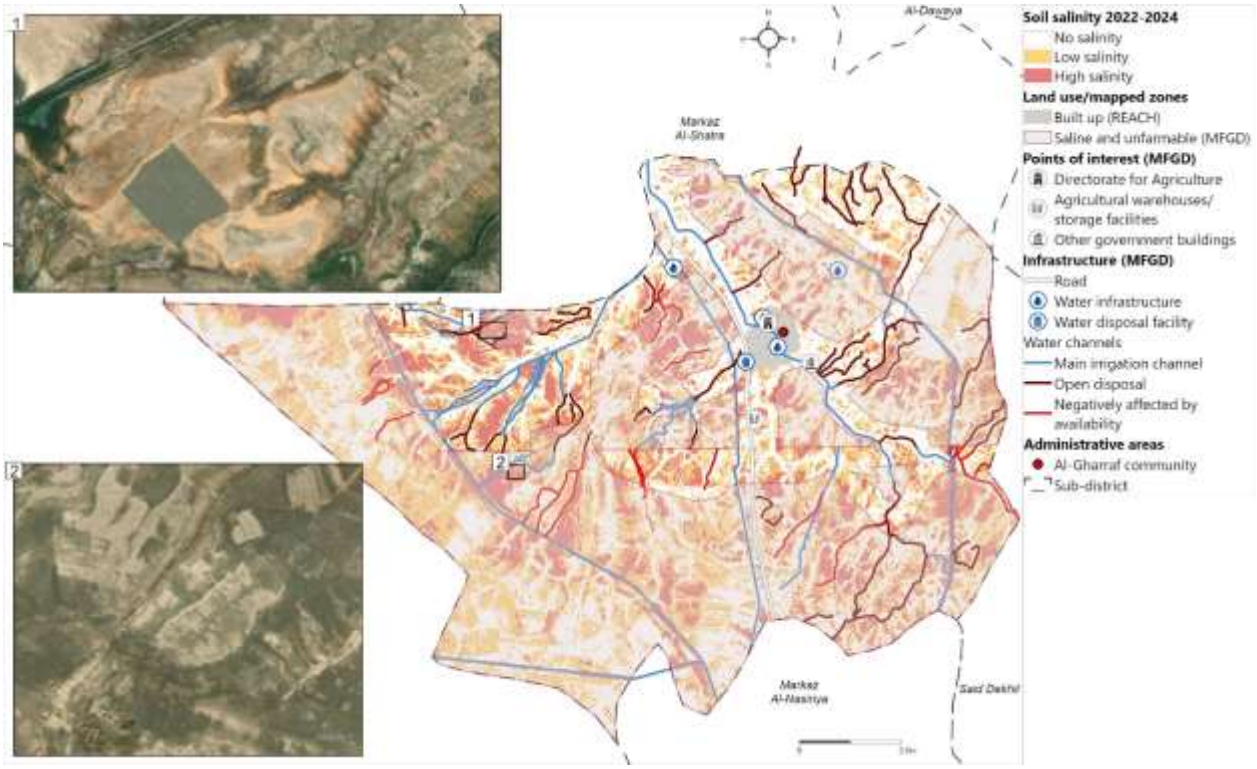
[18] https://www.researchgate.net/publication/270509466_Extent_Characterization_and_Causes_of_Soil_Salinity_in_Central_and_Southern_Iraq_and_Possible_Reclamation_Strategies

[19] (Allbed et al. 2023, https://www.mdpi.com/2073-4395/13/2/583).

[20] There were some discrepancies between areas marked as farmed versus unfarmable between the Crops and Seasons map of Al-Dawaya in the Agricultural Practices and Land Use section and the Soil Salinity map here, notably in the long strip in the southwest portion of the district.

irrigation—and the adoption of more salt-resilient crops, along with other coping mechanisms reported by key informants[21].

Map 5. Soil salinity, Al-Gharraf



Similarly, Al-Gharraf was characterized by evidence of high soil salinity and unfarmable lands. However, unlike in Al-Dawaya, **patches of high salinity in Al-Gharraf are dispersed** throughout the sub-district rather than concentrated in a few locations. In the northwest areas, high salinity is evident along the main irrigation channels, yet the land is still farmed. Conversely, in the western corridor—where most of the area exhibits low or no salinity—key informants indicated that the land is not farmed. This discrepancy may be explained by the different coping strategies employed by farmers.

Several factors may explain the higher soil salinity rates observed in certain areas[22]:

- **Extensive irrigation** without proper drainage can lead to the accumulation of salts in the soil. Inadequate leaching of salts due to insufficient water application exacerbates salinity issues.
- **High evaporation rates** in arid and semi-arid regions, especially during heat waves, concentrating salts in the surface, increasing salinity levels.
- **Soils with low permeability** hinder the downward movement of water, leading to salt accumulation in the root zone.

Soil salinity remains a critical factor undermining land usability and water quality, highlighting the interplay between climate change and water management. These challenges affect crop viability and necessitate integrated solutions that address both water and soil management. Enhanced irrigation practices, the use of salt-tolerant crops, and improved drainage systems will be vital for mitigating salinity and ensuring long-term agricultural sustainability.

[21] It is also possible that these areas are more focused on livestock ownership than crop farming; however, this remains a hypothesis, as the available data is not sufficiently clear to confirm this pattern, and further research is needed.
[22] Data Source: https://doi.org/10.1007/978-3-031-58315-5_15

Irrigation

74% of farmers reported experiencing **shortages in irrigation water**. The sub-districts face significant challenges with irrigation infrastructure that go beyond overall water availability. A **lack of lined canals** is causing substantial water loss through **evaporation**, while rampant **plant overgrowth** in the canals further hampers effective water delivery. Additionally, **network violations** through overuse exacerbate these issues, contributing to intermittent distribution interruptions that leave some areas under-irrigated and negatively impact crop growth.

Representatives from the Water Directorate point to several **structural and management challenges** undermining the system's functionality. Key informants highlight that without regular canal maintenance—such as clearing overgrowth, addressing network violations, and reducing evaporation—the system's efficiency remains compromised. Poor pumping systems and the absence of adequate cleaning equipment further limit the reliability of water delivery. In particular, there is a shortage of proper appliances available to effectively clean the equipment, and the cleaning tools that are available are in poor condition.

At the consumer end, many farmers and livestock owners have adopted alternative irrigation methods. While drip irrigation is predominant in Al-Gharraf and gravity flow or surface irrigation is more common in Al-Dawaya, these approaches all rely on mechanized, pump-based systems. **High electricity and fuel costs**, compounded by **irregular maintenance** that leaves broken pumps unrepaired, remain critical barriers.

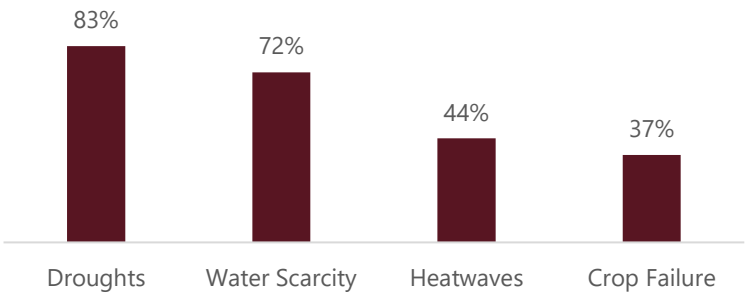
In response to these persistent irrigation challenges and overall water scarcity, some farmers and livestock owners have attempted to dig wells. However, these wells tend to be too shallow, often yielding water that is too saline to be of practical use.

Climate-Related Challenges

Drought and Other Climate-Related Events

All respondents reported being affected by at least one climate-related event between November 2023-2024, with **drought** and **water scarcity** being the two most reported events. Key informants noted that water scarcity is the root cause of many challenges; they attributed climate change not only to driving water scarcity through factors such as drought and extreme heat-induced evaporation, but also to triggering issues like livestock disease and other related problems.

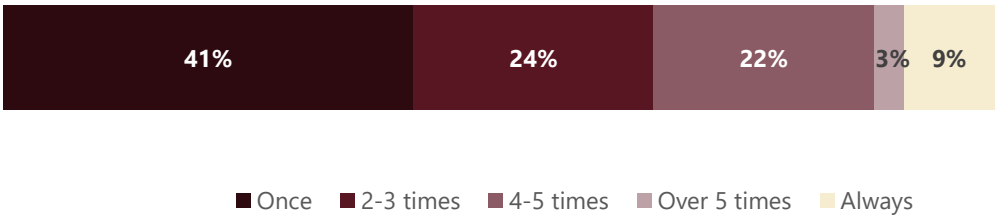
Figure 18. Most reported climate-related events impacting agricultural activities (n=399)



"The drought that has caused some areas to completely migrate."

– Representative from Agricultural Directorate

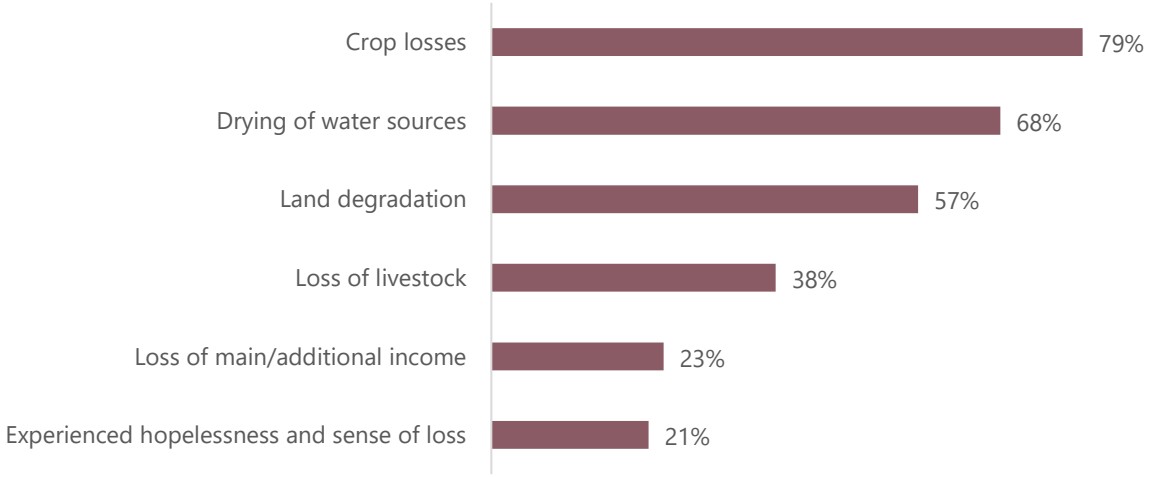
Figure 19. Number of times agricultural activities have been affected by climate-related events (n=397)



While **41%** of respondents who have experienced climate-related events reported encountering them once over the last year (n=397), key informants indicated that the duration of these events is **prolonged** and **cause for concern**.

85% percent of respondents reported experiencing drought at least once in the last 5 years. Drought reduces plant growth and yields, leads to crop failure, and disrupts nutrient uptake—posing a major threat to agricultural livelihoods in the sub-districts. The **impacts of these droughts are broad,** including crop losses, land degradation, loss of income, feelings of hopelessness, further declines in water levels, loss of livestock, and more.

Figure 20. Reported impacts of droughts (n=334)

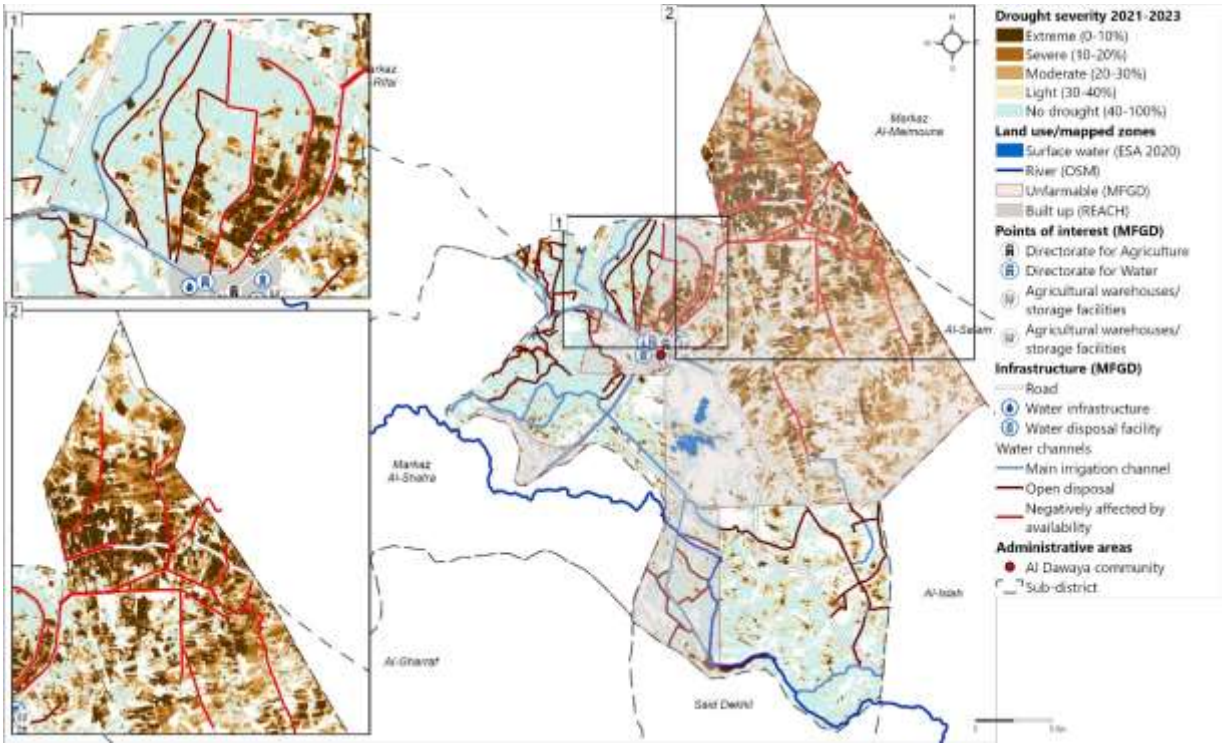


To elucidate the spatial variability of drought severity across the sub-districts, remote sensing maps were generated. These maps allow us to examine drought severity on a sub-district basis, providing valuable insights for targeted intervention and resource allocation.

The VHI (Kogan, 1995) is the weighted sum of the Vegetation Condition Index (VCI) and Temperature Condition Index (TCI)[23]. Lower VHI values indicate higher vegetation stress due to drought or extreme temperatures, while higher values suggest healthy conditions. VCI was calculated for the last three growing seasons 2021-2023, using the mean NDVI for the months of November to June, and a historical baseline from 2002 to 2020. TCI was calculated for the last three growing seasons 2021- 2023 using months from November to June, and a historical baseline from 2002 to 2020.[24]

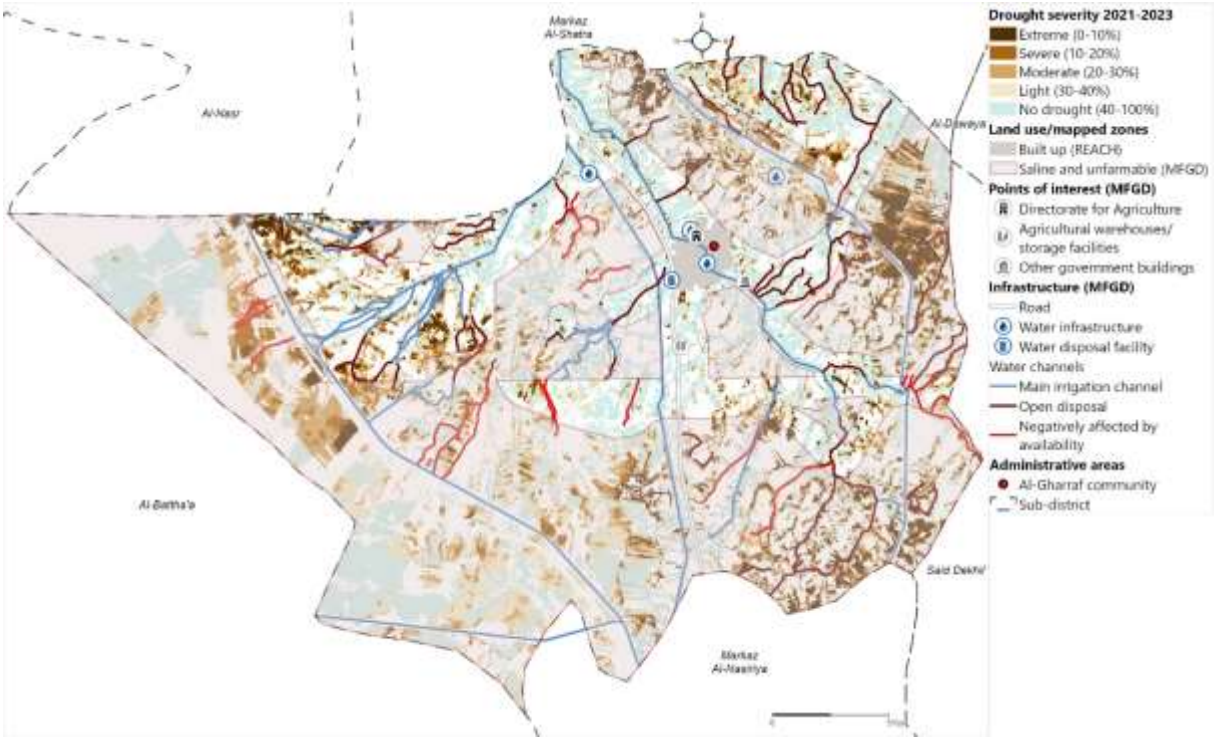
[23] VHI = a * VCI + b * TCI. For the purpose of this analysis, the weights were equally weighted with 0.5.
[24] Data Source: USGS Landsat 8 and 9 Level 2, Collection 2, Tier 1

Map 6. Drought severity, Al-Dawaya



High concentrations of extreme and severe drought conditions were observed in the northern and eastern areas of Al-Dawaya. Zoomed-in images of these regions—and the area northeast of the Al-Dawaya community—clearly depict lands suffering from extreme drought, with water channels showing signs of reduced availability. Key informants identified these lands as unfarmable for at least the past two seasons, and community leaders emphasized that these water shortages are persistent, typically lasting from three months to entire seasons.

Map 7. Drought severity, Al-Gharraf

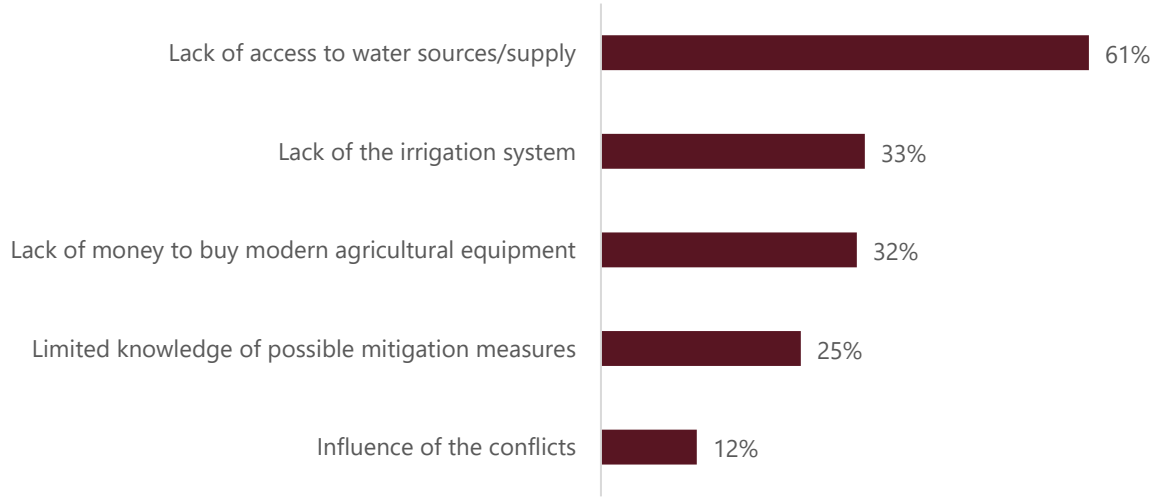


Remote sensing reveals that Al-Gharraf differs from Al-Dawaya in that **extreme and severe drought conditions are dispersed throughout the sub-district**. Most areas marked by severe or extreme drought in Al-Gharraf were identified in FGDs as unfarmable—largely due to water scarcity and soil salinity—except for one area in the northwest. This particular area, along the southern borders of Al-Nasr and Markaz Al-Shatra, exhibits widespread extreme and severe drought but is still being farmed, likely due to the presence of major irrigation channels and a shift to drip irrigation.

Along with these issues, there are many barriers to effective drought mitigation that need to be addressed. Barriers to drought risk mitigation include **limited water access (61%), lack of irrigation systems (33%), and insufficient funds for agricultural equipment (32%).**

12% reported that **conflict is a barrier to drought mitigation**. Among respondents who felt negatively impacted by climate change (n=376), 67% reported involvement in water disputes, and key informants noted a critical **deficiency in cooperative efforts** among farmers. This **lack of community cohesion** may explain how **conflicts or disputes over land and water hamper efforts to mitigate drought**. These challenges amplify the effects of prolonged droughts and water shortages, highlighting the need for stronger support and resources.

Figure 21. Most commonly reported barriers to drought mitigation (n=398)

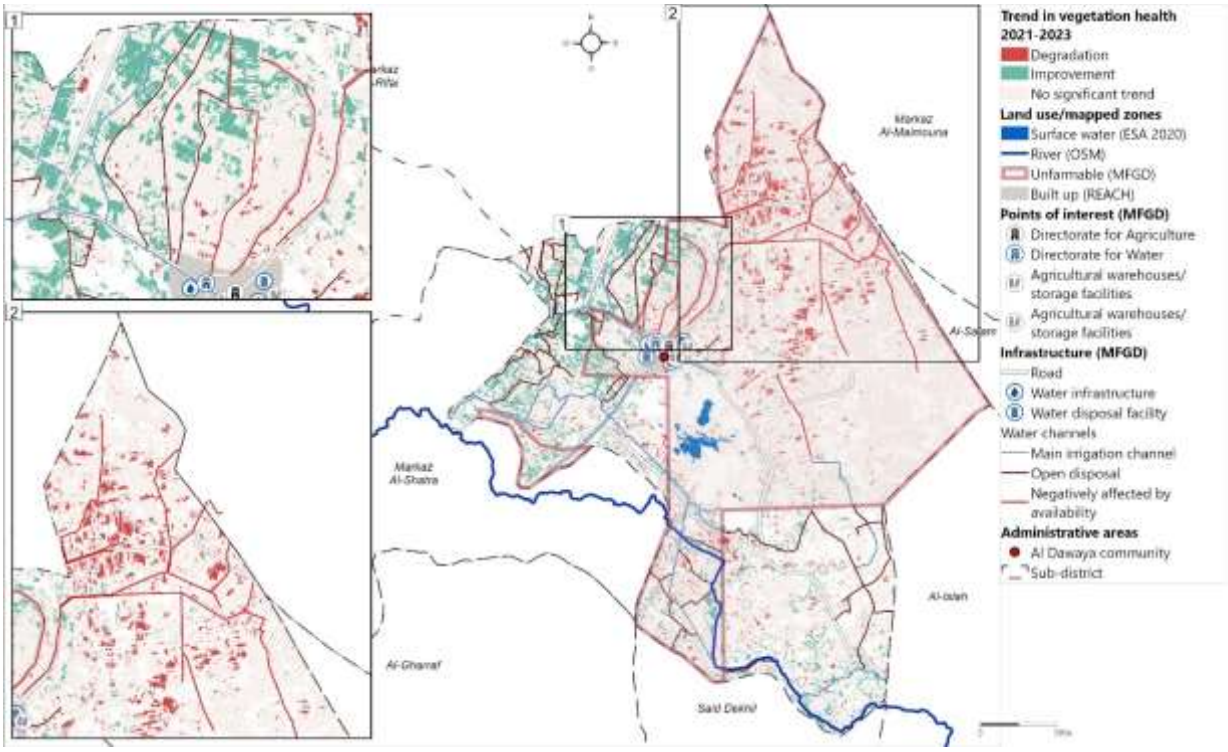


Vegetation Health

Both sub-districts are experiencing **degraded land and reduced vegetation health**. To assess land degradation at the sub-district level, remote sensing maps were generated. Here, degraded land is defined as pixels showing a significant decline in vegetation health over the past 10 years. A linear regression analysis was performed on NDVI values over time, using the seasonal mean Normalized Difference Vegetation Index (NDVI) (November-June) for the period 2013-2023. A p-value corresponding to a 95% confidence level ($p<0.05$) was used to assess the statistical significance of the trend.[25]

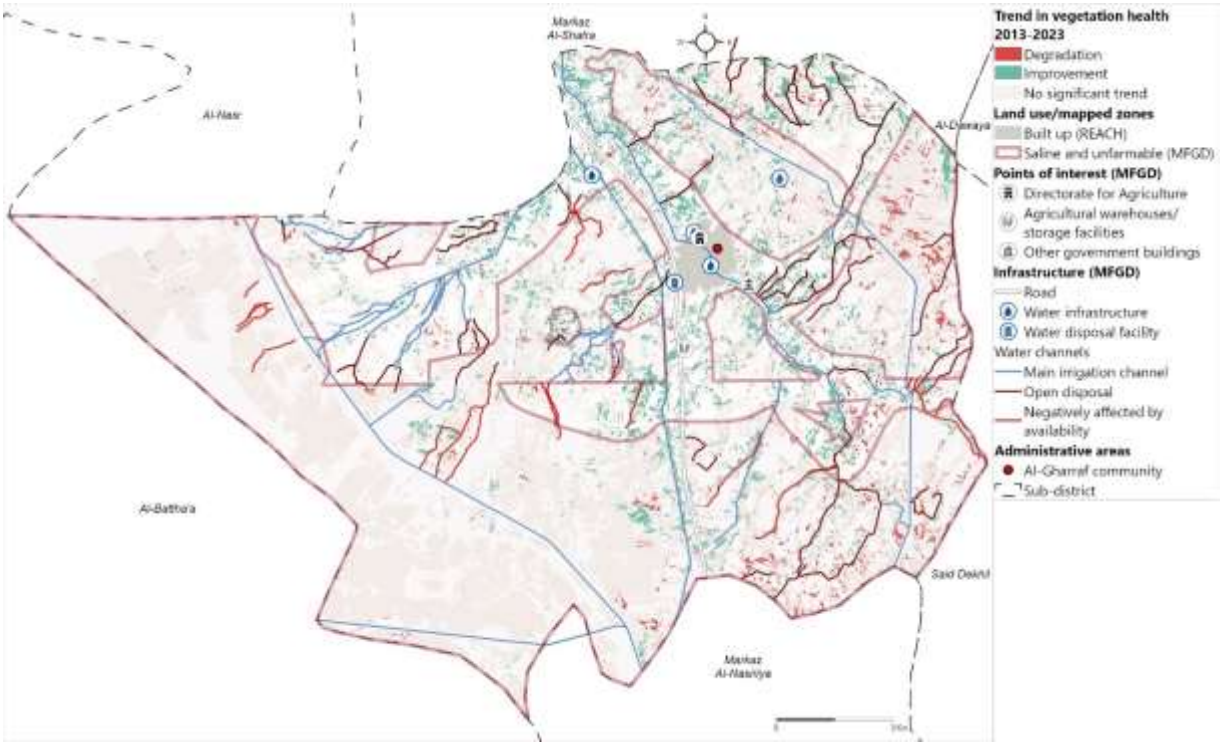
[25] Data Source: USGS Landsat 8 and 9 Level 2, Collection 2, Tier 1

Map 8. Vegetation health and land degradation, Al-Dawaya



The northeastern region of Al-Dawaya, as seen in the bottom left close-up of the map, features large pockets of land degradation where farming has ceased, leading to barren conditions. In contrast, the northwestern part of the sub-district is still actively farmed and shows improved vegetation health. Despite challenges such as reduced water availability affecting irrigation channels, the continued cultivation—bolstered by a shift to mechanized irrigation—supports healthier vegetation. Minimal soil salinity and low drought risk in this area further contribute to the positive effects of active farming practices on vegetation health.

Map 9. Vegetation health and land degradation, Al-Gharraf



Al-Gharraf presents a more complex pattern. Many areas are no longer being farmed, showing no significant trend, with the exception of the eastern corridor where patches of land degradation are evident. Overall, the **actively farmed zones account for most of the observed vegetation improvement**, despite a few small patches within these areas still exhibiting signs of degradation. Interestingly, some parts of the south-central sub-district, although marked by MFGDs as not being farmed, display improvements in vegetation health—likely due to their proximity to main irrigation channels.

When comparing both sub-districts, it becomes clear that the phenomenon of **improved vegetation in areas labelled as unfarmed is not isolated.** In Al-Gharraf, these improvements are more widely distributed, suggesting a more dispersed pattern of farming, whereas in Al-Dawaya, farming appears more concentrated. This discrepancy might be due to several factors: key informants may have been indicating a dramatic decline rather than a complete stop in farming; the designation might reflect a few remaining farms within generally unfarmed areas; there could be mapping errors; or these areas might receive irrigation from water channels, serve as natural pastures or grazing lands, or benefit from irrigation spillage due to broken pipes. More data is needed to clarify the exact reasons behind these observations.

Vegetation health and land degradation are not only closely tied to farming practices and irrigation methods but also have **significant implications for livestock ownership** and overall livelihoods. In Al-Dawaya, 77% of livestock owners (n=111) keep sheep and 74% maintain cows, while in Al-Gharraf, 70% own sheep and 80% have cows (n=103). These **grazing animals rely heavily on healthy pastures** for sustenance. Key informants have highlighted that changes in agricultural patterns, increased desertification, and dwindling natural pastures are major factors undermining livestock viability. These challenges are further compounded by the high cost of fodder, limited opportunities for owners to cultivate it themselves, and a regional shift toward salt and drought-resistant crops, which in turn leads to local fodder shortages. This complex issue is evident across both sub-districts.

Ultimately, while the observed improvements in vegetation health indicate that adaptive strategies like crop diversification and more efficient irrigation are yielding benefits, this progress does not necessarily imply that overall vegetation health is now at an optimal level.

Raw Material Challenges

65% of farmers reported that their households are **unable to afford the necessary expenses** related to farming, while 55% of livestock owners (n=214) indicated similar affordability challenges in their livestock operations.

Figure 22. Most reported raw materials that farmers are unable to afford (n=205)

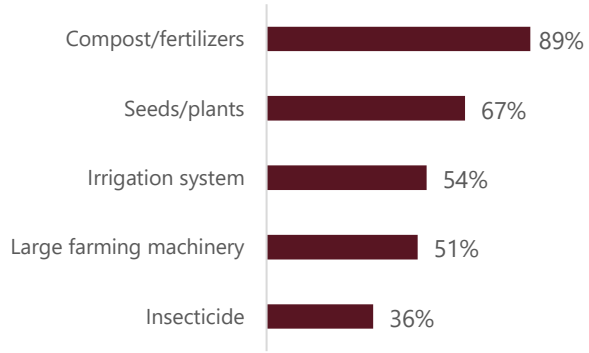
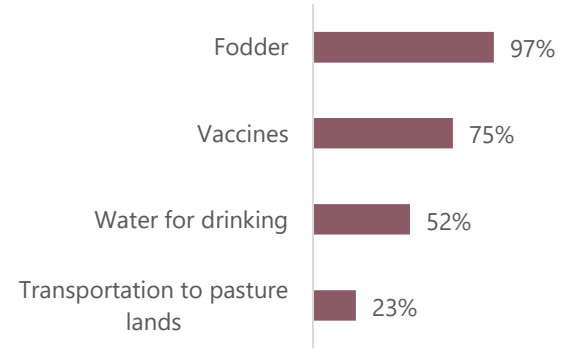


Figure 23. Most reported expenses that livestock owners are unable to afford (n=119)



Community leaders reported that one of the critical barriers to accessing raw materials for both farmers and livestock owners is the **high prices of these materials**. A higher proportion of the farmers who reported difficulty affording small farming machinery were from Al-Gharraf. Along with affordability

challenges, key informants highlighted the difficulties related to access, with most noting that there are often shortages of materials in the market. Similarly, among livestock owners facing access issues (n=119), 97% noted an inability to meet fodder costs.

Community leaders also noted **frequent market shortages** and emphasized that both livestock owners and farmers are increasingly unable to produce their own fodder due to shifting agricultural practices driven by water scarcity. This reduction in locally produced fodder has led to a greater **reliance on imported fodder**, further exacerbating access and affordability challenges.

These challenges illustrate the interconnectedness of financial constraints and resource availability, as well as the far-reaching impact of water scarcity on agricultural livelihoods in the sub-districts.

Livestock Healthcare Challenges

Livestock health management remains a critical concern for animal owners in the region. **84%** of livestock owners reported experiencing **livestock deaths** between November 2023 and 2024 (n=214), with 64% of these deaths attributed to factors other than sale for slaughter.

Table 8. Most commonly reported reasons for livestock death, November 2023-2024

Reasons for Livestock Death	Al-Dawaya (n=95)	Al-Gharraf (n=83)
Lack of water	58%	60%
Drought	39%	55%
Lack of fodder	53%	46%
Disease outbreak	31%	28%
Sale or slaughter	40%	28%
Lack of veterinary services	1%	7%

Livestock owners contend with a range of health management issues, including disease management and the high costs and limited availability of treatment and vaccines. In Al-Dawaya, key informants frequently voiced frustration over the **persistent barrier of securing adequate vaccines and treatments**, leaving animals vulnerable to outbreaks. In contrast, informants in Al-Gharraf did not focus as much on costs but were more concerned with the **overall management of livestock diseases**. Additional challenges include a shortage of pesticides, difficulties in obtaining quality fodder and feed, and inadequate veterinary services provided by the government. Long distances, poor infrastructure, and a general lack of awareness further compound these issues.

These challenges are amplified by **structural and institutional barriers**. For instance, the absence of government-provided veterinary services, particularly in Al-Dawaya, forces many livestock owners to travel long distances to access care. The limited availability of reliable information on livestock health also contributes to the overall vulnerability of the animal population. Livestock owners reported a range of specific diseases affecting their animals, including dehydration, hemorrhagic fever, foot and mouth disease, colibacillosis, with high fever, gastrointestinal infections, influenza, jaundice, poisoning, scabies, and infections from an unknown virus.

Key informants have drawn attention to the broader **impacts of climate change on livestock health**, noting that it not only creates a suitable environment for the spread of animal diseases but also weakens the immunity of animals due to heat stress and poor nutrition.

> *"Climate changes significantly affect animal activities, as drought and high temperatures lead to water and fodder shortages and increase the spread of disease."*
>
> - Community Leader, Al-Dawaya

Together, these insights illustrate that while livestock health challenges are multifaceted—encompassing economic, infrastructural, and environmental dimensions—they require comprehensive strategies and targeted support to safeguard both animal welfare and the livelihoods of local communities.

Social & Institutional Challenges

Findings revealed two primary social & institutional challenges: lack of government cooperation and financial support for agricultural activities and disputes over water and land.

Despite the severity of need across the sub-district's farmers and livestock owners, **only a small fraction receive financial assistance**. Among farmers (n=328), just 3% reported receiving support, with aid coming from a mix of farmers' associations, government, local NGOs, and international NGOs (n=9). Similarly, only 1% of livestock owners (n=214) reported receiving financial assistance, and this aid was provided exclusively by the government.

Key informants consistently highlighted the **absence of proactive government cooperation** as a critical issue, emphasizing the need for support in shifting to mechanized irrigation, securing financial resources, and establishing training programs. In Al-Gharraf, one informant also pointed to low morale as an additional social barrier, while in Al-Dawaya, government restrictions and insufficient collaboration among farmers further complicate efforts to enhance agricultural practices. These institutional shortcomings have led to pervasive feelings of neglect across both farming and livestock communities.

Climate change and ensuing water scarcity have fueled **water and land disputes among farmers and livestock owners**, exacerbating these already critical challenges. Among respondents who felt negatively impacted by climate change (n=376), **67% reported involvement in water disputes**, while 23% engaged in land disputes. Although it remains unclear whether the majority of these disputes occur within or across sub-districts, key informants suggest that some conflicts span both areas—as previously noted, the Bid'a regulator, the water distribution system, appears to favor Al-Dawaya over Al-Gharraf, further intensifying local tensions.

Given these dynamics, key informants stressed the **need for enhanced cooperation** between farmers, livestock owners, and the government, as well as increased mutual support within these communities, to address both resource allocation and environmental challenges effectively.

Informational Challenges

Although not identified as the primary obstacle, informational challenges remain significant. Both community leaders and key informants (KIs) from the Water Directorate emphasized that a limited knowledge base among farmers and livestock owners is a notable barrier. The key areas where knowledge gaps exist include:

- Drought risk mitigation measures
- Efficient irrigation methods
- Irrigation requirements specific to different crops
- Livestock healthcare management

Among these, **information on drought risk mitigation** emerged as the most pressing concern. This lack of critical information hampers efforts to build resilience and manage resources sustainably.

Additionally, KIs from the Water Directorate proposed several training topics aimed at enhancing staff expertise in irrigation efficiency and overall water management. These suggestions included training on controlling the water column, modern automated irrigation systems, and crop-specific irrigation practices. However, it is worth noting that a few informants believed that no further training was necessary.

Overall, **25%** of respondents identified the limited knowledge of possible mitigation measures as a significant barrier to effectively addressing drought risks. Addressing these informational gaps is crucial to improving adaptive capacities and ensuring sustainable agricultural practices.

Table 9. Most commonly reported knowledge needs for mitigation of drought risks (n=399)

Information	%
Information on water storage activities	53%
Information on resistant to drought crop types	50%
Information on modern technologies' usage for soil health	14%

Challenges Summary

Farmers and livestock owners in the two sub-districts face a wide array of challenges. Although these challenges interconnect, certain issues are particularly distinct between the sub-districts.

Water scarcity is a critical issue that has led to widespread crop failure, barren lands, and even livestock losses and was identified by many as the **root cause of many challenges** faced by farmers and livestock owners in the sub-districts. Water shortages are frequent in both sub-district with some farms entirely disconnected from the municipal irrigation system most notably in Al-Gharraf. While both sub-districts have moved towards mechanized irrigation to conserve water use, both areas continue to struggle with inefficient irrigation infrastructure. **Water quality is another concern**—with nearly all respondents reporting issues related to salinity and contamination—but slightly higher reports of salinated water and bad-smelling water are noted in Al-Gharraf compared to Al-Dawaya. **Soil salinity further undermines agricultural productivity**. In Al-Dawaya, high salinity is concentrated in specific zones that have become unfarmable, whereas in Al-Gharraf, high salinity is more dispersed, with some areas still being farmed through alternative irrigation methods and other adaptive coping strategies.

Both sub-districts are **heavily affected by drought and other climate-related events**. Extended periods of drought—reported by 85% of respondents in the past five years—have led to drastic declines in crop yields and forced migration in some areas, particularly in Al-Gharraf where extreme conditions have rendered large tracts of land unfarmable. Remote sensing analyses reveal that while severe and extreme drought risk is widespread in Al-Gharraf, Al-Dawaya exhibits concentrated pockets of severe and extreme drought, suggesting different spatial patterns of vulnerability.

Farmers and livestock owners face **financial and market barriers in acquiring essential raw materials**. High prices and frequent shortages of farming machinery and inputs are especially problematic in Al-Gharraf. Among livestock owners facing access issues (n=119), 97% noted an inability to meet fodder costs, which potentially indicates a significant barrier to sustaining healthy livestock populations. Livestock healthcare is another major concern—ranging from **disease management to limited availability of vaccines and veterinary services**. In Al-Dawaya, the challenge is compounded by long distances to access care and persistent shortages of vital treatments, whereas in Al-Gharraf the focus is more on managing widespread livestock diseases.

Institutional shortcomings are also evident, with both farmers and livestock owners experiencing **inadequate government support**, limited financial assistance, and persistent **water and land disputes**. These issues contribute to feelings of neglect and weaking community ties.

Informational challenges also exist, as community leaders and key informants note that **gaps in knowledg**e—particularly regarding drought risk mitigation, efficient irrigation methods, crop-specific needs, and livestock healthcare—**limit adaptive capacity**. While some informants propose additional training, others argue that current efforts may already be sufficient.

Overall, while both sub-districts share many common challenges, differences in water distribution, soil salinity patterns, and adaptive strategies underscore the need for tailored interventions.

Proposed Solutions

The survey data, key informant interviews, and Community Insights and Recommended Interventions identified four intervention types. Notably, most of these interventions are government-led or NGO-supported, with few farmer-led initiatives—aside from a willingness among farmers to adopt adaptive strategies.

Development & Infrastructural Improvement Projects

Reflecting the current state of irrigation infrastructure and the widespread view that water scarcity is the primary challenge, most proposed improvements target the water system. These improvements are aimed at expanding and enhancing water access.

Table 10. Proposed development & infrastructural improvement projects

Intervention	Description	Responsible Entity	Timeline
Government-led Deep Wells	Drill deep wells to extract fresh water, replacing shallow wells that yield salinated water.	Government	Long Term
Modern Irrigation Techniques	Transition to mechanized irrigation, emphasizing the use of drip irrigation.	Government	Long Term
Water Conservation Measures	Reduce water loss by closing and lining irrigation canals and improving maintenance of canals and pumps.	Government	Short Term
Water Supply Expansion	Boost water availability by increasing river water levels, installing pumps, and digging new channels.	Government	Long Term
Sprinkler System Implementation	Implement sprinkler systems to further enhance water distribution and efficiency.	Government	Long Term
Desalination Projects & Infrastructure Improvements	Develop desalination projects and upgrade existing water infrastructure to enhance water quality and availability.	Government	Long Term
Livestock Healthcare Management	Enhance livestock healthcare management practices to support overall agricultural resilience.	Government / Local Authorities	Long Term

While these projects are designed to address the root causes of water scarcity, most of them require significant investment, time, and political will, classifying them as long-term solutions. In contrast, **water conservation measures** stand out as a more feasible, short-term intervention that is less expensive and can be implemented more quickly.

Financial Support and Provisions

Farmers, livestock owners, and especially community leaders emphasized the **critical need for financial support and provisions**. Given the high level of need and vulnerability in these communities, strengthening agricultural resilience through government assistance emerged as a top priority. Key areas identified include support for feed/fodder, water for agricultural use, and seeds and fertilizers.

Table 11. Proposed financial support and government provisions

Intervention	Description	Responsible Entity
Feed/Fodder Support	Provide government-supplied animal feed. Among livestock owners, 97% reported being unable to afford necessary fodder and feed.	Government
Water for Agricultural Use	Guarantee government-provided water and increased water allotments for agriculture. With 83% reporting drought impacts and 74% citing water scarcity, enhanced water access is essential.	Government
Seeds and Fertilizers	Supply genetically modified seeds and fertilizers adapted to changing conditions, as 89% of farmers face challenges affording compost/fertilizer and 67% struggle with seeds.	Government

This financial support provides crucial, short-term relief, helping to sustain agricultural activities and strengthen resilience in the face of ongoing challenges.

Regulatory Improvements

Regulatory interventions are aimed at improving resource distribution and fostering trust in government oversight. While addressing issues like illegal water use is important, these measures must be carefully implemented to avoid further burdening already vulnerable farmers and livestock owners, given that water scarcity remains the root issue.

Table 12. Proposed regulatory improvements

Intervention	Description	Responsible Entity
Improved Management of the Water Rotational System	Enhance oversight of water allocation to ensure fair distribution and reduce water disputes.	Government
Stricter Enforcement of Environmental Laws through Fines and Legal Actions	Strengthen the legal framework by imposing penalties for violations while ensuring enforcement does not unduly burden vulnerable communities.	Government
Addressing Corruption & Legal Enforcement Gaps	Improve the integrity and effectiveness of regulatory processes to boost public trust and promote fair resource distribution.	Government

These regulatory measures, although they do not address the root cause of water scarcity, can contribute significantly to more equitable resource management and strengthen community confidence in government oversight.

Training and Capacity Building Initiatives

Although knowledge gaps were not identified as the most critical issue in the survey, key informants emphasized that targeted training would greatly benefit both staff and the broader community of farmers and livestock owners. These capacity-building programs are designed **to support the adoption of more efficient irrigation practices, better water management techniques, and adaptive agricultural strategies** that enhance resilience to drought and salinity.

Table 13. Proposed training and capacity building initiatives

Training	Provider	Target Audience
Modern Irrigation Techniques	Government extension services/NGOs	Farmers
Techniques to Avoid Water Wastage and Improve Conservation	Government extension services/NGOs	Farmers and livestock owners
Cost-efficient Irrigation Systems and Practices	Government extension services/NGOs	Farmers
Transitioning to and Maintaining Drought and Salt-Resistant Crops	Government extension services/NGOs	Farmers
Canal Lining and Casting	Local government/training institutes	Local government staff and network operators

These programs focus on reducing wastewater, transitioning to modern and mechanized irrigation, implementing cost-efficient systems, and adopting adaptive practices to ensure sufficient irrigation based on crop needs. By building these skills, the community can achieve more immediate and sustainable improvements in agricultural resilience.

CONCLUSION

This ABRA sought to examine how **water scarcity, soil salinity, and other climate-driven factors** are affecting farmers and livestock owners in Al-Dawaya and Al-Gharraf, to aid ACTED and local authorities in developing more **targeted and effective interventions**. The research confirmed that as climate pressures intensify, the region's agricultural livelihoods are increasingly imperiled **by inadequate irrigation infrastructure, diminishing water quality, and the cascading effects of low yields and high household debt.** These stressors, coupled **with inconsistent governmental support and ongoing land and water disputes**, are pushing some residents to migrate and leaving others in a cycle of indebtedness and heightened vulnerability.

Critically, this assessment revealed the **adaptive steps** many communities have already taken. Farmers have experimented with drought- and salt-tolerant crops, switched to drip irrigation, or relied on well-digging and water trucking to cope with shortages. Livestock owners have reduced herd sizes or opted for more resilient breeds. Yet, these **coping strategies are limited in their efficacy** as they do not resolve the **underlying structural issues**: water scarcity, soil salinity, decayed irrigation infrastructure, and severe financial limitations of farmers and livestock owners in the region. These findings underscore the need for **development and infrastructural improvements, governmental provisions and financial support, fair resource allocation, and capacity building trainings** for stakeholders and community members.

By **mapping vulnerabilities and obstacles to sustained agricultural livelihoods**, this assessment has laid the groundwork for more targeted, adapted, area-specific interventions that respond to the needs of Al-Gharraf and Al-Dawaya's remaining farmers and livestock owners. With the coordination of local stakeholders, government bodies, and international partners, there is need to prioritize repairs to the most critical irrigation channels, support farmers in deep well-drilling efforts where viable, and provide more consistent input subsidies or financial support—thus helping shift local communities from short-term survival measures **toward longer-term resilience.** Future exploration should examine the particular barriers facing female-headed or lower-income households and assess need at the village level where possible. By capturing the complexity of this evolving crisis, the ABRA offers a robust platform from which both policymakers and humanitarian actors can respond more effectively and strengthen the agricultural foundation of these sub-districts over the long term.