



Case Study Climate Change Impacts on Livelihoods Food Security and Internal Mobility in Salah Al-Din Governorate



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1 Executive Summary

Iraq is highly vulnerable to climate change and its impacts. The country's vulnerability is shaped by its physical exposure, a strong natural resource dependency and low adaptive capacity due to violent conflict, poverty, and political instability. The complex crisis in Iraq affects vulnerable groups by adding ever more stressors while also pushing other groups into vulnerability. Though climate change affects all, its impacts specially drought affects certain groups more than the other. Small-scale farmers who are dependent primarily on rain-fed agriculture are mostly affected. In particular, farmers who are located further away from open water sources, such as rivers, are faced with the need to find and pay for alternatives. The population who lives away from the river are also among the worst affected and most at risk of desertification, with no proper irrigation or access to water networks. The population who relies on agricultural-based livelihood are the most affected of all as they lack access to diversified sources of income, putting them among the most vulnerable and some of them have changed either their location of living or occupation to search of better incomes.

Climate change and mainly drought affect groups unequally and exacerbates the vulnerabilities that already exist among specific groups such as displaced populations or returnees. The survey found that returnees suffer the most among the sample, as they have lost their assets, services, and livelihood opportunities.

Drought also has particular impacts on women, who are already vulnerable and socially constrained. Such vulnerabilities are further deepened in the case of internal migration, especially from rural to urban areas, while putting more stress on the capacities of urban areas to absorb the increasing needs and demands of new arrivals.

The effects of climate change are felt in several critical sectors – agriculture, water, economy, public health, and the environment– directly affecting the lives of Iraqi citizens. However, responses to climate change have been inadequate and significantly affected by violent conflict, the lack of governmental financial and human resources, and the lack of coordination among ministries.

If left unattended, climate change impacts will exacerbate poverty and insecurity and may lead to social unrest and further instability.

2 Introduction

This paper combines a qualitative literature review with an analysis of information that has been collected from the field through different tools such as community surveys and focus group discussions/round table discussions with representatives from the community and authorities. Aid Gate Organization (AGO) has dedicated experienced local teams to survey a representative sample of citizens from six districts in Salah Al Din Governorate namely: (i) Shirqat; (ii) Baiji; (iii) Tikrit; (iv) Tuz Khormato; (v) Balad; and (vi) Sammra, to identify key impacts of the climate change on the water-food-energy-ecosystem nexus and its consequences on conflict and mobility in the governorate.



The districts selection has been made considering local team observation about climate change impacts on local communities and local economies. These districts are also known for their reliance on agricultural activities, their reliance on river water for livelihoods, and the social impacts of the conflict, population displacement, and returnees' load. The survey and focus group discussions have taken place in October 2022.

The research methodology adopted a qualitative approach, whereas qualitative data collection was used to be able to capture more nuanced views of local dynamics and perspectives on climate change impacts on the environment and livelihoods of people in these marginalized districts. It is meant to enable people to speak in a less constrained way in their own words on climate change issues and impacts. The data collection tools were: (i) a survey of a representative sample of all districts' populations; (ii) Focus group discussion/ roundtable discussions with a group of representatives of civil society, farmers cooperatives, and governorate level officials to gain more insights into broader dynamics and policy responses.

AGO team aimed at exploring the:

- Environmental climate conditions: main environmental changes that the area faces and how they are evolving, the impact of these changes on water-food-energy, livelihoods, social interactions, and security, causes of these changes and authorities' response, and equality of access to natural resources at present
- Social dynamics: major social concerns facing community including their emergence and evolution, authorities' responses to these concerns, major social tensions in the community and parties involved, the most vulnerable in the community, and whether or not rural dynamics connect with cities in the governorate
- Economic dynamics: main economic challenges the area faces and how they have impacted the community, adaptations people have made in this regard, authorities' response to these challenges, and participation in agriculture and small business
- Dispute and conflict resolution: if disputes and conflict is related to climate change impacts and relevant resolution mechanisms
- ISIL conflict impact and return of population: level of returning and the ability of returnees to reintegrate back into local communities, and related challenges and opportunities

The main objective of the questionnaires is to:

Find ways to adapt to climate change that indicates the need to rationalize water use and shift to growing less water-consuming agricultural crops because of its impact on food security as a priority. The questionnaires would not focus on preserving biodiversity and increasing health care to combat diseases arising from climate change.

The questionnaires also would give weight to the community's perception of the use of environmentally friendly techniques, and regarding the importance of reaching agreements with the neighboring countries on water distribution and shares. The questionnaire will not get into political discussions, just need to find the priorities of the local communities.

The questionnaire that was designed for the community members aimed to give the individuals the space to address how they see the climate change impacts them at the individual level, to see if the public feels responsible to play a role in addressing it and if they are willing to contribute to mitigating climate change.

As for measures to mitigate climate change impacts in Salah Al-Din, the focus would be to test the public priorities regarding energy efficiency, using renewable energy and climate-smart irrigation techniques, as well as working to increase vegetation cover.

The questionnaires would also check if the perception of communities on the effects of climate change influences the state of displacement and forced migration from rural areas to either city centers and/or suburbs. And how this would potentially have pushed the inhabitants of rural agricultural areas to move to urban areas due to the deterioration of the means of living based on agricultural production, animal husbandry, and fishing.

3 Background and Context: Climate Change, Drought, and the Water Crisis in Iraq

Iraq is highly vulnerable to climate change and its impacts. The country's vulnerability is shaped by its physical exposure, a strong natural resource dependency, and low adaptive capacity due to violent conflict, poverty, and political instability. Iraq is particularly exposed to droughts and dust storms, increasingly linked to temperature and precipitation variability. The increasing temperatures, decreasing water availability, and greater inter-annual variability in rainfall negatively affect agriculture, reduce household income and food availability, and exacerbate livelihood insecurity. Women and girls are disproportionately affected by the adverse effects of climate change, due to pre-existing gender norms and persisting inequalities. The effects of climate change are felt in several critical sectors – agriculture, water, economy, public health, and the environment – directly affecting the lives of Iraqi citizens. However, responses to climate change have been inadequate and significantly affected by violent conflict, political competition and lack of financial resources.

The negative Impacts of climate change are resulting in low agriculture yields and loss of livelihoods, which contributes to increased rural migration, with urban challenges including the risk of social unrest and protests in host cities. The armed groups and militias are capitalizing on the climate change impacts and are leveraging the economic hardships for recruitment and support. Climate change in Iraq is resulting in effects that are making Iraq's environmental, security, political, and economic challenges worse. Therefore, Iraq is very vulnerable to climate change and needs to address several issues regarding climate resilience, the management of natural resources and ecosystems, and environmental protection.¹ Food scarcity is likely to increase, impacting both health and livelihoods.

3.1 The Politics and International Treaties on Climate Change in Iraq

In December 2021, Iraq has officially joined the Paris Agreement just after the Conference of Parties (COP26). Although the Climate Pact cites several areas of cooperation relevant to Iraq, perhaps the most important action was Iraq's formal submission of its Nationally Determined Contribution (NDC) – the country's general policy for addressing climate action. Iraq announced that \$356 million USD would be designated to the Adaptation Fund, "which will increase the resilience of vulnerable communities on the frontline of climate change. This commitment is just a starter that paves the way for more resources to avert, minimize and address loss and damage in Iraq."

Despite the fact that a new government eventually has taken office in October 2022 after a long period of political vacuum, it is not clear yet how climate action will receive the high-level support and funding that it requires. Nonetheless, it is important to highlight that some important voices are making the case for climate investment, including those at the very top of Iraqi politics. On the initiative of President Barham Salih, in November 2021 the federal government adopted the Mesopotamia Revitalization Project. This project maps out for the first time an ambitious plan for addressing the most critical impacts of climate change in the country. Mr. Salih's proposal includes a water management initiative, a reforestation program, and plans for investing in green energy.

At the same time, the minister of finance, Ali Allawi, has also released an economic reform white paper that seeks to place the Iraqi economy on a more sustainable footing, freeing up public funds for investment in climate change responses. It is hoped that the new leadership would maintain the momentum by raising awareness of the issue among the political elite.

Despite these two important initiatives from the former leadership, the political will of the new cabinet to support climate action would be tested through the budget negotiation in the near future.

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¹ <https://reliefweb.int/report/iraq/wash-clustersector-iraq-strategic-operational-framework-sof-2022>

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Despite these two important initiatives from the former leadership, the political will of the new cabinet to support the climate action would be tested through the budget negotiation in the near future. However, the Mesopotamia Revitalization Project and initiatives such as Allawi's show that climate change is finally receiving some attention at the highest level of Iraqi politics.

3.3 Water-Food-Energy Nexus, the Russian-Ukraine War and Social Impacts

In May 2021, the Iraqi Ministry of Water Resources (MoWR) announced that over the past year water supply from both the Tigris and Euphrates rivers, Iraq's two primary water sources, had decreased by 50%. In addition to climatic conditions, as a downstream country Iraq is vulnerable to upstream water use and damming in other countries.² It has one of the lowest water productivity rates with the highest water withdrawal for agricultural use per capita. According to the National Strategy for Water and Land Resources in Iraq 2015–35, freshwater resources per capita are likely to fall to 1,000 cubic meters per person per year by 2030. The strategy states that by 2016 Iraq would not have water in sufficient quantity or quality and called for significant reforms to change this 'alarming' trajectory. It also forecasted that, by 2050, a decrease of 10% in precipitation and an increase in temperature of 1°C would cause a 20% reduction in the availability of fresh water, which means that nearly one-third of irrigated land in Iraq will have no water by that date.³

Due to water scarcity conditions, Ministry of Agriculture (MoAg) has introduced reforms to improve the irrigation water efficiency per unit water. While scarce water resources affect agricultural production, food also requires energy to produce. No data specific to Iraq are available but FAO estimates show that 4 to 8 percent of the final energy consumption was taken-up by agriculture in developing-

countries in 2000.⁴ Therefore, water is considered an important central sector, acting as a binding constraint for both energy and food production.

In addition, the insufficient water to farm agricultural land causing a collapse of rural employment opportunities, which is a primary internal rural-to-urban migration driver. The World Bank calculates that a 20 % decrease in Iraq's water supply could depress demand for agricultural labor by 11.8 % and reduce the country's GDP by \$6.6 billion, or around 4 %.

What makes the situation worse is the outdated and poor water and sewage infrastructure and irrigation systems, as well as the lack of adequate water management policies and practices.⁵ Tribal tensions have emerged over water competition and may further escalate inter-communal disputes if policies are not implemented.⁶

These environmental difficulties raise social stress levels and put an already-weak state under pressure. They contribute to unrest in depopulating rural areas, raise demands on service provision in urban areas, and heighten local anger towards governing elites.

Iraq's complex water crisis is expected to persist, with the potential for implications at different levels, including the humanitarian, economic, security and social levels, and the risk of population movement.

In water supply, priority is always given to public water consumption and to other vital sectors such as agriculture. However, with population growth the demand for food has grown, making the agricultural sector the largest consumer of water.⁷

In a situation like this, farmers, among many other groups, are facing multiple challenges that affect their livelihoods and their ability to cope with different shocks and crises. Farmers who took part in the research for this paper indicated that they had seen a gradual deterioration in their livelihoods and in their capacity to sustain their incomes from agriculture and also deterioration in their ability to cope with the different shocks they are facing. During the data collection process many challenges were identified by farmers, farmers' representatives, and government officials from different directorates. These challenges are being driven by different factors, including a deterioration in economic conditions and the impacts of climate change and drought; they are explored in greater detail in the sections below.

2 OCHA Iraq. (2021). Humanitarian Bulletin: May 2021 https://reliefweb.int/sites/reliefweb.int/files/resources/may_2021_humanitarian_bulletin.pdf

3 World Bank Group. (2021). Iraq Economic Monitor: The Slippery Road to Economic Recovery, op. cit.

4 <https://erf.org.eg/publications/challenges-to-iraqs-environment-applying-the-water-energy-food-nexus-framework/>

5 HRW (2019). Basra is Thirsty: Iraq's Failure to Manage the Water Crisis; Netherlands MFA (2019). Climate Change Profile: Iraq.

6 Al Hasan, S. (2020). Drought Ignites Tribal Conflicts in Southern Iraq. Planetary Security Initiative.

7 A.H. Elaiwi, K. Hasan and M. Al-hadithi. (2020). Management of Natural Iraqi Water Resources, Aims and Challenges. IOP Conference Series: Materials Science and Engineering 881 012181. <https://iopscience.iop.org/article/10.1088/1757-899X/881/1/012181/pdf>

3.4 Climate Summary and Future Trends

Because it is difficult to cover Salah Al Din governorate separately from the country trends, this section would summarize the country situation and trends. It will also refer to any relevant up-t-date research in Salah Al Din governorate and use it as a baseline to AGO current field research.

Iraq has three major climate zones, primarily delineated by rainfall quantities: a largely uninhabited and extremely arid lowland desert, a semi-arid steppe, and a moist Mediterranean region in the sub-humid upland and mountainous north and northeast.

The Iraqi desert is extremely hot and arid, with average diurnal temperatures ranging from 4°C to 17°C in the winter and rising to 25°C to 43°C in the summer months. Extreme temperatures ranging from -8°C in the winter to over 48°C in the summer can occur. Annual rainfall is negligible. The Iraqi steppe is also very hot, though rainfall is substantially higher than it is for the desert floor.

The average diurnal temperature in Baghdad, located in the steppe, ranges from 5°C to 18°C in the winter. In the summer, temperatures increase, rising from 26°C to 46°C daily. The steppe receives 200–400 mm of precipitation per year, with nearly all of that falling between November and April. In the mountains, the climate is considerably wetter but only marginally cooler than the steppe. In the northern city of Kirkuk, the diurnal winter temperature ranges from 4°C to 15°C, while the summer range is from 27°C to 44°C. Rainfall in the mountains varies by location, but ranges from 400 mm to more than 1,000 mm, falling mostly between November and March.⁸ The south/southeasterly sharqi winds and the north/northwesterly shamal winds result in significant dust storms from April to June and from September to November. Evaporation is high, particularly in the arid lowland region, where annual evaporation is approximately 2,100 mm. Temperatures exhibit little year-to-year variation nationwide.⁹

HISTORICAL CLIMATE ¹⁰	FUTURE CLIMATE ¹¹
<ul style="list-style-type: none"> • Key climate changes since the 1950s include: <ul style="list-style-type: none"> • Increases in mean annual temperature at a rate of approximately 0.7°C per century. • Variable changes in annual rainfall: • In the northeast, annual rainfall has increased at a rate of 2.4 mm/month per century. • In the southeast, annual rainfall has decreased at a rate of 0.88 mm/month per century. • In the west, annual rainfall has decreased at a rate of 5.93 mm/month per century. 	<ul style="list-style-type: none"> • Projected changes include: <ul style="list-style-type: none"> • Increase in mean annual temperature by 2°C by 2050. • More frequent heat waves and fewer frost days. • Decrease in mean annual average rainfall by 9 percent by 2050, with the greatest reduction (-17 percent) expected during December, January, and February. • Decrease in the maximum amount of rain that falls in any 5-day period, but overall increase in rainfall intensity. Decrease in runoff of 22 percent (countrywide average).

⁸https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3_GEMS_Climate%20Risk%20Profile_Iraq_FINAL.pdf

⁹ Ibid

¹⁰ World Bank. n.d. Climate Change Knowledge Portal: Iraq

¹¹ Ibid

4 Sector Impacts and Vulnerabilities

4.1 Agricultural Sector

Although Iraq's economy is dominated by oil, agriculture is the second largest contributor to the country's GDP (approximately 5 percent) and serves as an important source of livelihood for 25 percent of the population. Small-scale farming dominates the sector and typically it uses traditional farming methods, which depend on surface irrigation and have a high dependency on farmers and low usage of technology, with minimal capital investment, which results in low levels of productivity.¹² Main crops include wheat and barley, with dates as a cash crop and livestock as an integral part of farming systems. The decline of the agricultural sector (due, in part, to environmental drivers) has been evident in the continued loss of arable land, losses in productivity, and reduction in agriculture's overall contribution to GDP. Decreased rainfall and runoff have contributed to widespread desertification (estimated to threaten 92 percent of the country). Sand and dust storms further threaten cropland and productivity by causing soil loss, decreasing soil fertility, and removing organic matter. Currently, dust storms sometimes occur at a rate of over 100 times annually but could occur up to 300 times annually in ten years. Further reductions in arable land and productivity could also result in loss of livelihoods and increased food insecurity.^{13 14}

In the winter of 2021, the Government of Iraq (GoI) had approved an agricultural plan to reduce the planting of winter crops in irrigated areas by 50% because of water scarcity and low water revenues,¹⁵ further cutting production. With the reduction in cultivation activities, there has been a direct decline in food production. The UN Food and Agriculture Organization (FAO) estimates that wheat production had been 70% lower by the end of the season, while barley production was minimal. This has already been reflected on food security and the availability of food.

In 2018 the GoI launched its five-year development plan (2018–22).¹⁶ In relation to the agriculture and water resources sector, the strategy included the following objectives:

- Increase the agricultural sector's contribution to GDP (for non-oil activities) from 4.5% in 2015 to 5.2% in 2022 and achieve growth in the sector in the target year of up to 8.4%.
- Achieve sustainable food security
- Secure water supply to meet annual demand for sustainable use in the agricultural, industrial, and municipal sectors and achieve water balance, with the possibility of reducing demand by 500m cubic meters annually
- Work toward providing sustainable water resources

The plan also identified a number of challenges facing the sector, including trans-boundary water governance by upstream countries and the impacts of climate change. However, the list of challenges appeared to be more in number and magnitude as a result of the severe climate conditions and the Russian-Ukraine war implication of food availability and prices in 2022 and beyond. This would require a review of the strategic objectives and relatively more realistic targets and urgent policies.

The 2021 was also hard on population displacement. By the end of 2021, the number of internally displaced persons (IDPs) in Iraq whose primary income before displacement came from agriculture was 1.4 million. However, they cannot return to their sources of livelihood without a considerable amount of assistance to ensure that their lands are safe and productive.^{17 18} Climate stressors and climate risks that are affecting the agricultural sector are demonstrated in Figure 1

Climate Stressors and Climate Risks AGRICULTURE	
Stressors	Risks
Increased temperatures	Decreased agricultural productivity
	Loss of arable land due to desertification and sand and dust storms
Greater Frequency and Intensity of drought	Increased soil salinization
	Migration from rural to urban areas due to crop failures and loss of livelihoods
Increased intensity of rainfall events	

Figure 1: Climate Stressors and Risks for Agricultural Sector

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12 FAO. (2021). Agricultural value chain study in Iraq: Dates, grapes, tomatoes and wheat. <https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000125470.pdf>

13 UN Iraq. 2013. Sand and Dust Storms Factsheet.

14 UN Iraq. 2013. Sand and Dust Storms Factsheet.

15 Shakir, L., Iraq to reduce winter crops area by half: ministry. (2021). <https://www.rudaw.net/english/middleeast/iraq/18102021>

16 https://www.iraqjcmep.jp/pdf/archives/nationaldevelopmentplan2018_2022.pdf.

17 FAO. (2021). Agricultural value chain study in Iraq: Dates, grapes, tomatoes and wheat. <https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000125470.pdf>

18 FAO. (2021). Agricultural value chain study in Iraq: Dates, grapes, tomatoes and wheat. <https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000125470.pdf>

19 https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3_GEMS_Climate%20Risk%20Profile_Iraq_FINAL.pdf

4.2 Water Resources

The Euphrates and Tigris Rivers supply more than half of Iraq’s freshwater resources. Both rivers originate in Turkey, and Iraq’s water supply relies on Turkey and other upstream consumers (Syria and Iran). There is a lack of formal agreement among these countries regarding riparian rights. This is a potential source of conflict, as the rivers have been in decline, and water demand has been increasing due to population growth and economic development, particularly in Turkey. The ongoing Syrian conflict effectively precludes the establishment of enforceable international riparian agreements in the short term. Despite this significant supply vulnerability and existing scarcity, Iraq has a water withdrawal rate that is almost double the world average, due to a lack of adequate national water management policies. This inefficient water use is a critical threat to Iraqi agriculture, which accounts for as much as 90 percent of water consumption nationally. By 2020, the average estimated water demand (72.07 km³/yr) is expected to surpass estimated water availability (63.46 km³/yr), with river discharges potentially running dry by 2040.²⁰ Yearly fluctuation in annual discharge has caused severe flooding, and these fluctuations are projected to further intensify flood occurrences in the future. Yearly variability in river flow has partly contributed to prolonged droughts, which are also expected to worsen. Drought and low rainfall have also compromised the water quality of the rivers, making the shallower waters more prone to pollution from sources such as wastewater and petroleum industry waste. Coastal areas in the south are more vulnerable to saltwater intrusion and salinization of groundwater sources, and future sea level rise could exacerbate this issue.^{21 22} Climate stressors on the water resources are presented in Figure 2

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Increased temperatures	Source water depletion
Decreased average rainfall	Increased lack of access to safe drinking water
Increased drought	Increased conflict over water
Sea level rise	Saltwater intrusion into groundwater sources

Figure 2: Climate Stressors and Risks- Water Resources²³

20 Al-Ansari, N. 2013. Management of Water Resources in Iraq: Perspectives and Prognoses
 21 Janabi, H. 2013. Climate Change Impact on Iraqi Water and Agriculture Sectors. MEES Vol. 56. No. 10
 22 World Bank. n.d. Climate Change Knowledge Portal: Iraq
 24 https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3_GEMS_Climate%20Risk%20Profile_Iraq_FINAL.pdf
 25 ibid

4.3 Energy and Infrastructure

The Iraqi power supply is inconsistent, and improvement has been hampered by years of war. Iraq predominantly depends on fossil fuels for domestic electricity generation, but 7.6 percent of its electricity originates from hydropower especially in Kurdistan region. With the continued decline of major rivers, Iraqi hydropower seems likely to decline. A study conducted on the effects of climate change on hydropower generation at Iraq’s third largest dam concluded that by 2050, power generation would decrease by 5–10 percent. Increased high-intensity rainfall events are expected to aggravate the damage to Iraq’s infrastructure especially water infrastructure and assets.²⁴ Climate stressors and risks are presented in Figure 3

Climate Stressors and Climate Risks ENERGY AND INFRASTRUCTURE	
Stressors	Risks
Decreased average rainfall	Reduced hydropower generation
Increased drought	
Increased intensity of rainfall events	Damage to and destruction of infrastructure (e.g., levees, dams, and roads)
Sea level rise	

Figure 3: Climate Stressors and Risks- Energy Sector²⁵

5 Overview of Climate Change Impacts in Salah Al Din Governorate

Salah Al-Din is one of Iraq’s governorates that seriously facing water shortages due to a decrease in rainfall in the Tigris and Euphrates River catchment in the 2020-2021 rainy season, coupled with the insufficient release of water from source countries such as Iran and Turkey. Water scarcity and drought increase the occurrences of sand and dust storms in Iraq, especially in the Salah Al Din governorate. The frequency of the occurrence has increased drastically in the last decade, and it is increasing continuously due to environmental changes, such as drought, land degradation, and increased soil salinity due to traditional irrigation methods (flooding), leading to land abandonment and increased desertification.

5.1 Previous Relevant Research Conducted by Other Institutions in Salah Al-Din Governorate

In their collective research in the last quarter of 2021, Oxfam, and World Vision along with Save the Children have conducted their assessment on agriculture and climate change in Iraq entitled: "Unfarmed Now, Uninhabited When?" Salah Al Din governorate has been surveyed, among others. The research methodology was similar to AGO. Institutions conducted focus group discussions (FGDs), with farmers in agricultural communities with separate FGDs for women, key informant interviews (KIIs) with representatives of local and federal authorities, and with mukhtars (community leaders, who can also be the head of village or tribe) and farmers' associations.

6 Field Survey Summary

6.1 Citizens Survey

AGO has conducted a citizens' survey for a statistically representative sample of 573 persons of which 14% are women. The survey has been conducted in the target districts of (i) Shirqat; (ii) Baiji; (iii) Tikit; (iv) Tuz Khormato; (v) Balad; and (vi) Sammra. The sample has represented the social fabric in the surveyed districts of Salah Al Din Governorate with 23% of the surveyed citizens are from host communities' members, 61% of returnees and 16% of IDPs.

The sample represented all educational level of around 3% are illiterate population. The remaining part of the sample has a diver's level of education that contains university graduates and post-graduate degrees, diploma level graduates, in addition to a mix of different school levels (primary, middle school and secondary levels). Age wise, the sample covered a wide span of which the majority where in the age category of 26-45 years forming 63% of the surveyed, followed by 21 % of population in the age of 46-65 years old. Population in the age of 17-25 years were 14 %, while above 65 were approximately 2 %.

The surveyed population is coming from all walks of life, of which 24% are employed by governmental institutions. Majority of the sample members (73%) are relying on agricultural activities such as plant production, animal husbandry and fishing for living, while the remaining 3% are employed by industrial and trade sectors.

Majority of the surveyed have complained about the negative impact of climate change on their health, income, and agricultural-based livelihoods. For example, 74% of the men and 73% of women who are engaged in the plant production have reported the negative impact of climate change on their livelihood due to drought and scarcity of water. In the animal husbandry activities 59% of the men versus 64% of women have reported that their livelihood has been negatively impacted by climate change. **This alone gives an indication on the active involvement of women in the animal production more than the plant production.** While 36% of the surveyed sample (all men) has reported that their livelihoods have been affected by climate change.

The perception of the 94% of the sample surveyed show that extreme climate change conditions exist. According to the sample perception, rise in temperature comes top on the list as an indicator of climate change with 58%; followed in descending order by (i) lack of vegetation cover; (ii) air pollution; (iii) water scarcity, lack of rain and drought; (iv) sand storms; (v) deterioration of quantity and quality of the rivers water; (vi) soil pollution and deterioration and (vii) increased water and soil salinity.

The surveyed population who relies on agricultural-based livelihood, depend heavily on groundwater wells as the main source for irrigation followed by the river water and irrigational canals as a transporter. Majority of the persons who use ground water wells find that the water level is getting lower by the season due to lack of annual rainfall, which costs them more for water pumping. Overall, the majority thinks that they can mitigate the impacts of climate change in their agricultural activities by the rationalization of the use of fresh water for irrigation, followed by changing their irrigation techniques and by switching to other crops that consumes less water.

Half of the surveyed population who relies on agriculturally based livelihood understand the value of drip irrigation and other climate smart irrigation techniques to rationalize the water consumption and protect the soil, and/or the cultivation of trees for food and to green the open spaces in order to reduce the impact of sandstorms.

Majority of them (89%) are not adopting it due to lack of financial resources and governmental support. The rest of the sample they do not use climate smart techniques due to lack of awareness. Another (36%) of the surveyed population were relying on rain-fed agriculture and have abandoned their land due to drought and lack of water.

Approximately 6% of the sample has changed their farming profession due to climate change. Another 50 % have changed occupation because of the conflict's (ISIL attacks among others) impacts resulting in damaged infrastructure and land mines that limits accessibility to land and markets. When it comes to place of living, 2% has changed location of living due to climate change alone, while 9.5% has changed location because of the combined negative impacts of conflict and climate change. The impacts of the conflict and climate change have been translated into deterioration in security situation, displacement, lack of jobs and income. All these together have forced the population to change occupation and/or place of living as a mean of adaptation.

Since Salah Al Din governorate is situated nearby the Tigris River, it was necessary to check the importance of the river to livelihoods of population in the surveyed districts. It has been found that 28% of the sample relies on the river water for their economic activities such as farming, fishing, and others. Approximately 10% of the surveyed believe that climate change impacts the quality of the rivers' water, while 16% believe that it affects both the quality and quantity of climate change.

Majority thinks that that river water quality and quantity is under continuous deteriorations due to climate change, mainly the reduction in annual rainfall, the dams of the neighboring countries and the bad condition of public irrigation infrastructure that needs rehabilitation and expansion.

As a result, to the climate change stress on resources such as water and land approximately 9% of the sample had conflicts with their neighbors, adding other destabilization factors to vulnerable population living in a post-conflict area.

On the priority actions and strategies needed to mitigate climate change impacts, 55% of the sample has seen combating desertification as top priority, followed by 36% who believe the construction of dams and other water infrastructure would be essential, the third priority was given to overcome water and soil salinity and air pollution with 29% score each. Despite this, only 22% of the sample has discussed the climate change impacts on their livelihoods and their priorities to overcome them with decision makers in their locality and district level.

The population sample has shown high responsibility and they perceive themselves having a role in addressing climate change with 50% see themselves have an important role to play in their communities, another 31% have a desire to contribute but they do not know how, while only 20% believe that they do not have to do anything since they did not contribute to the problem.

6.2 Summary of the Focus Groups/Round Table Discussions (FG/RTDs):

6.2.1 Groups' Composition

Gender balanced FGDs/RTDs that represent the 6 districts (Baiji, Tikrit, Balad, Samra, Tuz khormato, Shirqat) were conducted. (i) **RT1:** farmers, CSOs representatives, volunteering team and community leaders of 13 women and 12 men; (ii) **RT2:** 6 women and 11 men representatives from Directorates of: Agriculture; Water and Water Resources; Environment, and Health (DoA, DoW, DoE and DoH), in addition to deputy governor, mayor's representatives, municipality representatives, as well as Directorate of Forests and Combating Desertification in Baiji.

RT2 discussion was focused on the following topics:

- The governmental role in climate change
- The possibility of smoothing the process amongst the local authorities
- The environmental challenges and suggested solutions as perceived by communities

6.2.2 Summary of RT1 Outcomes

Members of the first-round table have stated that ten-years ago, agriculture was seen as a prestigious occupation in Salah Al Din governorate. The government helped farmers with fertilizers, seeds, and loans from the agricultural bank. Some people were even moving from urban to rural areas to take up farming in the area. Some of this support was available up until 2014 – for example, loans to fund modern irrigation systems. **However, this level of support is no longer exists, leaving farmers behind and alone.**

According to the group, the impact of drought is affecting individual farmers in different ways. One main difference noted at the individual level derives from the location of lands and farmers' access to water resources, either open water or underground resources.

Discussions found that farmers most affected are those who are located a long distance away from open water resources and who have no means of accessing efficient irrigation infrastructure. Farmers who are financially insecure are also among the worst affected, as they do not have the financial means needed to secure alternative access to water, such as by digging wells. Many farmers reported that digging wells was one of their immediate coping strategies when affected by water scarcity. However, this always carries the risk of either finding no water or finding water with a high level of salinity, which can only be used for specific crops. Another burden is the high capital cost of digging a well and the ongoing running costs that need to be covered, including maintenance and fuel. Fuel-powered pumps are a necessity, however, with power cuts identified as being one of the main challenges facing farmers they became out of reach. Respondents said that they are now digging deeper wells than they did before to reach underground water. In the Salah Al Din governorate, for example, farmers used to dig-up to 100 meters down; now they are digging to a depth of 150–180 meters and more.

Salah Al-Din governorate has been a subject for ISIL attacks, which has caused drastic damages to the environment and local ecosystems, in addition to waves of population displacements putting the governorate at the crossroads of climate and political challenges. It is one of the most agriculture-dependent areas of the country. The drought and the ever-decreasing water flow of the Tigris and Euphrates rivers putting a stranglehold on local efforts to push on from the conflict.

The following sections summarizes the RTDs’ perception on climate change indicators, impacts and coping strategies:

6.2.3 Most Prominent Indicators of Climate Change

Given that the participants came from different districts and were Involved in different issues in the Salah Al-din governorate the majority agreed on the following indicators of climate change in Iraq.

1. Water scarcity due to drought (lack/ reduction of rainfall)

100% of the participants agreed that water scarcity due to drought is the most prominent indicator of climate change, as they have been noticing the reduction of rainfall in the governorate since the last 15 years. They also have expressed their observations on the impact of climate change on the movement of people from the rural areas to-

nearby cities seeking jobs and new livelihood means as they have lost their agricultural-based livelihood sources due to drought. This has been particularly impacting farmers who live far from rivers.

2. Sandstorms

100% of the participants agreed that sand storms have increased in the last 10 years in Iraq, they reflected on this issue as: lack of support to farmers make them leave farming reducing the green areas which were controlling the movement of the sand area and reduce the sand storms. In addition, the conflict in Iraq from 2003 onward was one of the challenges, government start to hiring people to armed forces and due to good salaries the majority of the farmers left the work as farmers to get recruited by armed forces to secure their livelihoods on the expense of their farming business.

3. Air pollution

80% of the participants agreed that air pollution is one of the noticeable indicators for climate change is in Baji whereas the oil industry is flourishing reducing the quality of the air and increasing respiratory diseases. The pollution also has infiltrated to water and effected the farms in the surrounding area causing serious losses to farmers who unfortunately are not compenstaed by the government for their lost crops. In addition, they reflected on a few sulfur factory accidents that happened in the past years negatively effecting the agricultural sector.

4. Soil pollution and deterioration

The participants agreed that soil deterioration as a result to increased drought, lack of rainfall and the increased salinity of irrigation water is getting worse year after year. Add to this mismanagement of waste especially plastic and the chemical, the participants reported unauthorized factories in the living areas of the rural areas without control or authorization from the government lead to mismanagement of the waste from these factories negatively impacting the livelihood of farmers due to the deterioration of soil and agriculture in addition to the death of livestock. Participants reported that there is no proper sanitary landfills in districts which causes the spread of many random open dumpsites everywhere leading to more soil pollution as well as air pollution due to the burning of waste.

5. Deterioration of the quantity and quality of river waters

80% agreed that the the quantity is fine so far in Salah Al-din governorate while maybe quantity is low in southern Iraq due to irresponsible usage of the water in the northern governorate and the Turkish control on the water supply to Iraq but Salah Al-din governorate is not affected by the quantity of the water.

However, all have agreed that quality of the water is deteriorating, especially for drinking purposes. The water treatment plants are very poor and it has no Reverse Osmosis (RO) systems to clear the water. In addition the ones that have RO system, are in need to be rehabilitated and regularly maintained, however, are not due to lack of governmental budget. The direct discharge of untreated industrial and domestic wastewater into the river water adds more pollution.

Directorate of Health (DoH) representative raised that there are no onsite separation of hazardous waste (solid and liquid) at hospitals, and that all waste is disposed through the domestic wastewater networks and dumpsites systems and then to rivers. Only one hospital in the Salah Al Din governorate has a medical waste management system.

6. **Increased water and soil salinity**

70% agreed that it is clear how the water and soil salinity are getting more saline, to the extent that farmers can see salt at the soil top layer, especially for those who are using the groundwater wells.

6.2.4 **Climate Change Effects on Livelihood and Source of Income**

This section summarizes the outcomes of the two RTDs.

6.2.4.1 **Farmers: Plant Production**

Participants agreed that climate change impacted the farmers the most due to a lack of support from government and a lack of awareness about climate change in the governorate this led to a drop the farming work. Though this has been affecting women and men farmers, women farmers have been disproportionately affected more than men. Participants raised the following challenges:

1. **Government import policy of agricultural products from neighboring countries**

This affected the income generation of the farmers and has led to leaving the farming business since it does not worth the suffering and hard work due to the aggressive competition of the the imported food products in the local market. The low cost of imported products and the high cost the farmers pay has pushed farmers to abandon their farming business to other occupations and even places of living, resulting in contraction of the green coverage in the governorate.

2. **Conflict and displacement**

Due to the conflict in Iraq, the government recruited many people for the armed forces depriving the agriculture sector from potential farmers if no work was available. The good salary of workers in the armed forces attract many young people on the expense of their farming activities. While the recent conflict due to ISIL invasion has damaged the farming business and left farmers with no resources to revitalize and restore their agribusiness.

3. **Lack of awareness**

Most of the farmers are using traditional irrigation system by flooding the land because they cannot afford new climate smart irrigation technologies which leads to losing a lot of water resources and increase the salinity of the ground and decrease the river waters. as well as using crops that are consuming a lot of water and required more attention.

4. **Lack of fuel and/or high cost of fuel for water generators**

The high cost of generators' fuel and the lack of governmental subsidies for alternative green technologies such as solar panels and drip irrigation

6.2.4.2 **Farmers: Animal Husbandry**

90% of the participants reported challenges of animal husbandry especially cows, sheep, and chickens due to a lack of farmers and food for the animal and the majority of the farmers dropped out from the sector and have lost their livelihood and income due to the following challenges:

- The high cost of animal feeds due to drought and the ongoing Ukraine conflict. This is accompanied by the Reduction in the available rangeland and natural pastures due to lack of rainfall
- The spread of animal diseases and the death of livestock due to the improper disposal of plastic waste
- The rise in temperature which requires additional cost for air conditioning of the animal barn

All this has forced farmers to sell their cattle because they cannot feed them and/or they need to use the revenue as a start-up fund for other business. Many farmers have relocated to cities in search for other jobs for living.

Women forms the overall majority of farmers in this sector, therefore, they have been hardly hit by the above challenges.

Add to this usually women do not have the freedom to relocate to cities as their men counterparts which limits them from seeking alternative income generations opportunities to support their families.

6.2.4.3 Fishing

100% reported that the fishing from rivers is not feasible as before because fish are getting smaller due to the climate change and nonorganized and/or illegal fishing, as well the impacts of climate change on water quality and quantity. Pollution of the river water adds another challenge to the climate change and is reducing the fishing yield and accordingly affecting the livelihoods of a large segment of population who used to rely on fishing as a food security mean.

6.2.5 Adaptation to Climate Change Impacts

The adaptation mechanisms as per the majority of the people who attended the roundtables are :

- 30% reported displacement from rural areas to urban areas due to the climate challenges and lack of support to the agricultural sector
- 50% reported that in some areas, limited number of farmers have to invest in climate smart techniques such as drip irrigation and solar panels. However, for the majority of farmers this is not an option because of the needed financial resources that they cannot afford.
- 80% responded that an average of 30% of total farmers changed their occupation from farming to other sectors in the last 10 years including employment in government and opening shops.
- Majority of the farmer in the rural areas which are far from rivers are increasingly relying on groundwater wells, which is resulting in spending too much money on digging illegal groundwater wells that sometimes are saline and not suitable for traditional crops that they used to cultivate.

6.2.6 Mitigate the impact of climate change

The majority of the participants agreed on the following actions to mitigate the impacts of climate change in their areas:

- Increase the governmental support to promote new strategies in response to climate change
- Decentralize the decision-making process and provide the necessary resources to equip directorates with budgets, workers and delegation of authority to actively respond to climate change

- Increase the governmental budget in order to support farmers adaptation and mitigation of climate change impacts by introducing them to climate smart techniques such as the introduction of new irrigation techniques to rationalize the water consumption and/or by introducing new climate resistant crops as a mean of adaptation and mitigation
- Increase the awareness and environmental education of the community about climate-related issues
- Create and enforce the environmental rules and regulations to control essential stressors of climate change impacts such as the illegal factories and the mismanagement of generated wastes
- Rehabilitating of the water treatment plants in all the districts or establishing new ones
- Launch and adopt a national and sub-national plans to respond to the needs and address climate change

6.2.7 Summary of RT2 outcomes

The discussion with authorities' representatives during RT2, has shown the following:

- Majority of the government official reported the need to develop plans to adapt and mitigate the climate change impacts in Iraq
- Majority agreed on the lack of budgets and support from Baghdad to the agricultural sector and farmers in general
- There has been a consensus about the impact of the centralized decision-making process from the ministries in Baghdad on the slow operations of the directorates' on the governorate's level which makes it difficult for them to respond to the people's concerns to climate change impacts in a timely manner
- Focal points from Directorate of Agriculture (DoA) reported the absence of technical experts as they have only 20 contracted people in the governorate which does not allow them to respond to technical issues
- Almost no coordination between the different directorates on the governorate level and each directorate work on its own without coordinating with each other

7 Conclusions

The discussions have shown that the different stakeholders are emphasizing the importance of tackling drought impacts as the most important climate change factor in the governorate. However, despite the clear impacts of drought and its magnitude, majority of the surveyed sample do not feel the urgency to solve the problem now. They still talk about future planning and better management as if they have the luxury of time. While future changes are indeed important, action is needed now to prevent the collapse of communities and further increases in the vulnerability of affected groups.

The survey showed that the development of agricultural sector to become more resilient against climate change is crucial to maintain the governorate population livelihood, resilience and their food security and local economy. All actors are important and are responsible for addressing current needs and for designing more tailored and sustainable interventions that build the resilience of the agricultural sector while making the most of Iraq's diminishing water resources. The evidence shows that needs are already greater than the available resources.

During the research process, it became clear that most farmers assume that if the government supports them with agricultural inputs and finance, they will move to smarter and more modern methods of irrigation, all the issues relating to drought and climate change will be solved.

It is also clear that there is strong agreement in official circles on the impacts of drought and climate change and on current and future needs. However, it was not obvious if there is a solid political will to adopt the strategies and actions needed in either the short or the long term.

The situation is predicted to worsen in the coming period especially if the government continues to ignore the transboundary river water issues and rights. During data collection, many respondents said that unless there were diplomatic efforts to engage with upstream countries and political will on the part of the government to take action and allocate resources for strategic interventions, the situation will continue to deteriorate, affecting all groups across communities.

Year after year, more farmers are seeing agriculture as unviable. As climate change and drought in the region worsen, agriculture will be directly affected. Without the interventions needed in both the short and long terms, the sector's ability to respond to food needs and to generate employment will be at risk. Many farmers are already at risk of being no longer able to farm their lands, and this in turn affects the availability of food in the market and contributes to the escalation of prices. This could potentially mean increased dependency on imported food, further affecting local production.

With resources becoming scarcer, there could potentially be an increase in disputes over resources and civil unrest, especially if the government is unable to provide improved access to services, including water and electricity. This was also perceived as a priority by the surveyed sample. Migration from rural to urban areas is already happening, with people in search of better incomes. These trends seem likely to accelerate in the near future if the situation remains as it is or gets worse.

8 Recommendations

8.1 General Perspective

1. The inter-relationships and conflicts between Water, Food and Energy sectors require special attention to maintain food security, sustainable livelihoods, and stability especially in Salah Al Din governorate that stands at the crossroads of climate and political challenges. It is one of the most agriculture-dependent areas of the country. The drought and the ever-decreasing water flow of the Tigris and Euphrates rivers putting a stranglehold on local efforts to push on from the conflict.
2. For Iraq as a country, the declining levels of water quality and quantity pose grave dangers to Iraq's agriculture as well as oil and gas industries, necessitating radical rethinking and restructuring. Agriculture, while declining, still employs one in five to one in six Iraqis, and oil contributes most of GDP and almost all government revenues.

3. In Iraq, water use in agriculture remains wasteful and subsidy policy irrational, adding to the water shortage; gas flaring in oil production adds to Iraq's already polluted natural environment. Technical solutions—drip irrigation techniques, changes to crop subsidies and hence output mix, water desalination, improved environmental controls in the oil industry, better wastewater treatment, increased use of solar power, rainwater and wastewater harvesting, which is relatively inexpensive and less capital intensive than desalination and more—are needed. This requires investments in new technologies in sustainable green solutions, in efficient and effective modern systems of water resources management to mitigate and adapt to climate change, and in re-claiming land and expanding green areas and wetlands.
4. As stated in a recent government white paper on economic reform,²⁶ approved by cabinet in 2020,²⁷ the Government of Iraq (GOI) needs to build trust with farmers while aiming to modernize laws in the agricultural sector, including institutional reforms and the revision of current regulations. The white paper also points to the need for comprehensive rural development and increased allocation of resources for irrigation systems, and stresses the need to protect local agricultural produce, based on the agricultural calendar. In addition, it recommends improving the entire agricultural value chain and working to increase the contribution of the agricultural sector to Iraq's GDP.
5. In addition to technical, there are administrative measures that might be useful, such as improved coordination between regulatory and administrative units at the national and provincial levels. Given Iraq's present financial difficulties, ongoing conflict, and long-term institutional decline, including that of its key ministries, these technical and administrative measures will not be easy to undertake.
6. Policies that are geared towards overcoming external barriers require Iraq to constructively engage with neighbors, notably Turkey, in discussions over the drastic downstream declines in water flow from the Tigris and Euphrates. The UN ratified Law of Non-Navigational Uses of International Watercourses came into force in 2014; although Iraq and Syria have ratified the convention, Turkey has continued to oppose ratification.²⁸ Representatives of these countries have met but have yet to reach formal agreement on rights to water. Even with Turkey's political and economic upstream leverage over water rights, it is possible, albeit difficult, for Iraq and Syria to engage with Turkey on the basis of joint interests.

8.2 Federal Government of Iraq and Kurdistan Regional Government Specific

- Adopt a clear national strategy for adaptation and mitigation, with a clear vision of current needs and future forecasts of the impacts of climate change. Such a strategy requires commitment, political will, and allocation of resources by the GoI. This would capitalize on previous cabinet initiatives and plans to promote green growth and to establish and implement a framework for economic diversification to ensure that the contributions to GDP of the agricultural and other sectors are increased and that dependency on oil revenues is reduced
- Increase agriculture's contribution to GDP by allocating resources for development of the sector, supporting rural communities, and helping farmers to boost their productivity and resilience against climatic shocks. This would require the strategic support through the agricultural value chain, from production to marketing. This can include allocation of resources for storage and processing facilities to utilize produce and reduce product loss and dumping in local markets. Necessary governmental support is essential to broaden the access to finance window and by strengthening the governmental extension services to support farmers with incentives to respond positively.

²⁶ Emergency Cell for Financial Reform. (2020). White Paper: Final Report. <http://iraqieconomists.net/en/wp-content/uploads/sites/3/2020/10/Iraq-White-Paper-Complete-En.pdf>

²⁷ Government of Iraq. (2020). Cabinet approves the White Paper for economic reforms. <https://gds.gov.iq/cabinet-approves-the-white-paper-for-economic-reforms/>

²⁸ Giovanis, Eleftherios and Ozdamar, Oznur (2021). 'Dams as Drivers of Droughts and Water Pollution: Evidence from the Euphrates-Tigris Basin in Turkey and Iraq.' ERF Policy Brief No. 61. Available at <https://erf.org.eg/publications/dams-as-drivers-of-droughtsand-water-pollution/>, accessed April 10, 2022.

- Formulate policies to protect domestic products against competition from imports from neighboring countries. Such policies need to be adopted and implemented
- Rehabilitate and expand the public infrastructure to cope with the increasing stress induced by climate change and population growth. Complement this with a clear plan establishing pricing systems for the electricity and water sectors, to increase efficiency and reduce overconsumption. Such a plan will contribute to increasing the revenue needed for the management of these sectors.
- In order to improve the management of the public services and resources, the Government is advised to follow an active community participation to engage more closely with the local actors to identify the needs and priorities. Ensure increased accountability and transparency in decision-making and make sure that national/local civil society organizations have a role in decision-making processes for both response planning and implementation of accountability mechanisms.
- Address current and potential migration from rural to urban areas with political will and by allocating resources to support wellbeing and living conditions in rural areas and to help generate economic opportunities both on and off the farm.
- Promote and implement a comprehensive national environmental awareness and educational program to address climate change impacts and to find solutions. This might be supported by the establishment of early warning systems within affected communities to mitigate drought threats at the local level. Such systems can enhance preparedness, improve water management, and reduce crop loss.
- Implement policies addressing efficient water management in order to reduce water loss resulting from overconsumption, poor infrastructure, traditional irrigation and agricultural practices and water evaporation, especially from open water surfaces.

8.3 Future Programing Recommendations

The following section present a list of recommendations that would be translated into programs:

- Employ nexus approaches to programming by addressing urgent needs while also investing in longer-term programming and addressing the root causes of the crisis. Adopt a socio-economic plan to address issues of inequality in Iraq. This plan should be used to design holistic programing, taking account of the exacerbated inequalities that exist between different groups and communities.

More effort is needed to strengthen the resilience of the most vulnerable groups through tailored interventions that benefit those most in need those most in need. Emphasis should be put on encouraging the greater engagement of women in decision-making processes and help challenge social norms that define women's role in all sectors, especially the agricultural sector. Providing additional funding and technical support for longer-term outcomes, e.g., communal watershed management and the use of solar energy to operate wells and water pumps, can do this.

- Increase the financial support to farmers to adopt longer-term sustainable agricultural practices rather than investing in farming practices that maximize short-term returns. This includes supporting farmers in a transition to adopting climate-smart irrigation systems and practices such as modern irrigation systems and agricultural methods such as ecosystem approaches to conserving water. In rain-fed conditions, ecosystem approaches aim to maximize water stored in the soil within the root zone of crops, for example by minimizing tillage, managing biodiversity, and using organic mulch to prevent losses to evaporation. On-farm water harvesting, and water run-off management can also support farmers in maximizing scarce water resources. The change to more drought resistance crops might also be adopted.
- Support the rehabilitation and modernization of irrigation and land drainage systems to manage water usage and challenges of soil degradation and soil salinity. Small-scale solar-powered pumps would potentially be an effective solution to water pumping needs for many farmers, and consideration of long-term operation and maintenance is also vital.
- Provide farmers with awareness raising, capacity strengthening and technical support to implement activities relating to climate-smart agriculture and agricultural extension services that are tailored to emerging needs associated with drought.
- Enable different platforms, including farmers' associations, to amplify farmers' voices for accountability and participation in consultations and decision-making spaces. Such engagement will ensure the sharing of knowledge and will encourage locally led initiatives to support the sector. This would ensure their effective participation in responding to needs and decision-making processes.

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