



# **IMPACT OF WATER SCARCITY IN BASRA**

SHRIVELING LIVES AND LIVELIHOODS

2022, IRAQ.

## FOREWORD

We learned in history class that Mesopotamia witnessed the emergence of one of the first urban human civilizations, thanks to the invention of agriculture. Our ancestors took advantage of the fertility of the land. They realized how precious is the treasury beneath their feet to announce the beginning of a new era for humankind. This urban settlement would not exist without the Euphrates and Tigris Rivers. Unfortunately, the nourished life in the area that lasted for millenniums is shriveling from climate change and unsustainable use of natural resources.

In 2021 Iraq witnessed unprecedented drought and low water levels in the Euphrates and Tigris Rivers due to multiple reasons; 1) deficient rainfall, 2) less amount of water released by neighboring countries, and 3) overuse of water domestically. The impact is devastating on livelihoods that primarily depend on water availability, such as agriculture, finishing, and livestock rearing.

The agriculture sector is the largest employer of the rural population, providing a source of living for the poor and food-insecure families. While the country was recovering from one of the most brutal conflicts in recent years against the so-called Islamic State in Iraq and Levant (ISIL), COVID-19 pandemic worsened the performance of the already crippled economy of Iraq. Hence, drought threatens livelihoods and pushes more Iraqis into the poverty cycle.

In this report, you will find more details on the impact of drought on livelihoods in the southern governorate, Basra, where the two rivers collide into Shatt Al Arab River. Caritas Czech Republic's team in Iraq sheds light on the human factors contributing to exacerbating water scarcity, like inappropriate irrigation practices and overgrazing. We believe that NGOs, CSOs, and donors can play a vital role by tackling human contributing factors to water scarcity through awareness-raising and enhancing sustainable agricultural practices. Furthermore, we believe academics, agrarian experts, livelihood advisor, and humanitarian workers' recommendations provided in the report would serve NGOs and CSOs to design informed projects addressing the root causes of water scarcity in Basra.

CCR's team in Iraq is thankful for our partner, Smithon, and stakeholders who contributed to the completion of this assessment. We are looking forward to receiving the feedback of experts to enrich this report. CCR is also ready to extend its technical support to partners and stakeholders who may have the capacity to reduce the impact of water scarcity.

Muhammed Hammady



Country Director Iraq/Syria & Turkey



## CARITAS CZECH REPUBLIC

Following the mission of the Catholic Church, Caritas Czech Republic aims at serving the poor, promoting charity and justice around the world, and offering aid to poor people affected by natural disasters, violence, and conflicts. Present in Iraq since April 2015, Caritas Czech Republic supports internally displaced persons and vulnerable returnees to rebuild livelihoods and communities so that they recover from the crisis and live in a safe and secure environment by implementing various projects in different areas in Iraq, including Anbar, Dohuk, Kirkuk, Ninewa, and Salah Al-Din governorates.



## SMITHSON

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# ABBREVIATIONS

|              |                                       |
|--------------|---------------------------------------|
| <b>BCM</b>   | Billion Cubic Meter                   |
| <b>CSO</b>   | Central Statistical Organization      |
| <b>CCR</b>   | Caritas Czech Republic - Iraq         |
| <b>CSs</b>   | Civil Societies                       |
| <b>DoA</b>   | Directorate of Agriculture            |
| <b>DoAU</b>  | Directorate of Agriculture Unit       |
| <b>FOs</b>   | Farmers Organization                  |
| <b>FU</b>    | Farmers Union                         |
| <b>KII</b>   | Key Informant Interviews              |
| <b>MoONR</b> | Ministry of Oil and Natural Resources |
| <b>MoP</b>   | Ministry of Planning                  |
| <b>NGOs</b>  | Non-Profit Organizations              |
| <b>RO</b>    | Reverse Osmosis                       |
| <b>SQM</b>   | Square Meter                          |
| <b>TDS</b>   | Total Dissolved Solids                |

# INTRODUCTION

## WATER SCARCITY IN IRAQ

Water scarcity refers to insufficient amount of water for human and for the ecosystem to function effectively. In the case of Iraq, factors like drought, reduction in surface/ground-water resources and slow-onset of environmental change are contributing to the water scarcity situation<sup>1</sup>. Among these factors, drought is considered the costliest natural disaster affecting the ecosystem in the country. It significantly affects the food production and livelihoods of the rural and semi-urban populations<sup>2</sup>. Lack of water in Iraq, particularly in the middle and south, is currently classified as a national crisis and has severe negative consequences on the livelihoods of agrarian smallholders.

A large portion of arable land in Iraq is located in the north and northeast, where rain-fed agriculture dominates. The middle and southern arable lands –the valleys of the Tigris and Euphrates rivers- are irrigated lands. This makes the middle and southern regions water-stressed and prone to drought. Along with the natural factors, both regions face multitude of complex challenges like economic and political issues, traditional agricultural systems and mismanagement of water resources which make both regions to be societally vulnerable<sup>3</sup>.

Irrigation in the middle and south of Iraq uses the largest volume of fresh water. Farming, livestock and fishing systems in rural and semi-urban areas depend on canals of water diverted from the Tigris, Euphrates and discharge rivers. However, these canals as the main sources of irrigation water continue to dwindle either because of excessive use or due to deterioration of water quality, drought has exacerbated the situation as it causes to reduce the discharge water to Tigris and Euphrates rivers and these canals. Without these canals the region would be arid fields<sup>4</sup>.

These rivers and canals used to feed the ecosystem in the area with fresh water, but much has changed in the volume of water in the past two decades, and there have been no effective national plans for the agriculture, livestock and fishing sectors<sup>5</sup>. Moreover, water supplied to the agricultural sector in these areas –or in Iraq as a whole- has a low priority compared to public water supply<sup>6</sup>.

During the past decades, the agricultural sector in Iraq has been systematically undermined by conflict and negligence. Investments improving availability and access to irrigation water has been insufficient<sup>7</sup>. Many rural and semi-urban areas in the middle and south share emerging issues of climate change and water governance issues that harm the population's social assets and livelihoods. Farming activities, livestock herding and fishing –as traditional income sources- have become ever less sustainable due to water scarcity and deterioration of water quality<sup>8</sup>.

Basra governorate is by far the largest governorate among the southern governorates and is considered the most prone to water scarcity vulnerability. The agricultural sector in Basra is a vital component source of household income among vulnerable groups who currently are experiencing food insecurity<sup>9</sup>. Agrarian communities in rural and semi-urban areas depend on rainfall in winter and on rivers and canals in summer for cropping, livestock rearing and fishing.

Due to water scarcity, agrarian families tend to stop their livelihood activities and relocate in search of alternative sources of income. The emerging water-scarcity-induced displacement has become a phenomenon in many rural and semi-urban locations<sup>10</sup>. Other structural issues such as lack of education, widespread poverty and lack of infrastructure make these agrarian communities more susceptible to the effects of water scarcity<sup>11</sup>.

1. USAID, Climate Change Risk Profile Factsheet-Iraq, 2017. [https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3\\_GEMS\\_Climate%20Risk%20Profile\\_Iraq\\_FINAL.pdf](https://www.climatelinks.org/sites/default/files/asset/document/2017Mar3_GEMS_Climate%20Risk%20Profile_Iraq_FINAL.pdf)
2. A. A. Mohammed Mali, Assessment of Drought Conditions and their Impacts on the Environment of the Udham River Basin, Iraq, Ph.D Dissertation submitted to University of Warsaw, 2017. Page 18. <https://depotuw.ceon.pl/bitstream/handle/item/2463/1900-DR-GF-07001100170.pdf?sequence=1>
3. H. H. Ali, Study the Effects of Reduction of Water Levels of Tigris and Euphrates Rivers and Climate Change on Salinization and Desertification in Middle and South of Iraq, Arts Journal, 2014, (108). <https://www.iasj.net/iasj/article/97753>
4. N. Sidiqui & others, IOM/Social Inquiry, Reframing Social Fragility In Areas Of Protracted Displacement And Emerging Return In Iraq. February 2017.
5. H. H. Ali, Study the Effects of Reduction of Water Levels of Tigris and Euphrates Rivers and Climate Change on Salinization and Desertification in Middle and South of Iraq, Arts Journal, 2014, (108). <https://www.iasj.net/iasj/article/97753>
6. IOM Iraq/Deltares, Water Quality and Water Quantity in Central and South Iraq: A Preliminary Assessment in the Context of Displacement Risk. June 2020. P4.
7. J. Jongerden & others. The Politics of Agricultural Development in Iraq and the Kurdistan Region in Iraq, Sustainability (11) 5874, 2019, doi:10.3390/su11215874. (KRI). <https://www.mdpi.com/2071-1050/11/21/5874/pdf>
8. N. Sidiqui & others, IOM/Social Inquiry, Reframing Social Fragility In Areas Of Protracted Displacement And Emerging Return In Iraq. February 2017.
9. R. Attafi. Comparative analysis of NDVI and CHIRPS-based SPI to assess drought impacts on crop yield in Basrah Governorate, Iraq, University of Tehran, Caspian J. Environ. Sci. (19) 3. pages. 547-557. [https://cjes.guilan.ac.ir/article\\_4941.html](https://cjes.guilan.ac.ir/article_4941.html)
10. IOM, Assessing Water Shortage-Induced Displacement in Missan, Muthanna, Thi-Qar and Basra, April 2019. <https://iraq.iom.int/publications/assessing-water-shortage-induced-displacement-missan-muthanna-thi-qar-and-basra>
11. N. Sidiqui & others, IOM/Social Inquiry, Reframing Social Fragility In Areas Of Protracted Displacement And Emerging Return In Iraq. February 2017. [https://iraq.iom.int/files/publications/IOM\\_Iraq\\_Reframing\\_Social\\_Fragility\\_in\\_Iraq.pdf](https://iraq.iom.int/files/publications/IOM_Iraq_Reframing_Social_Fragility_in_Iraq.pdf)

## Why this study was produced?

Water scarcity is a socio-environmental hazard that affects the lives and livelihoods of millions in Iraq. With its arid climate, the middle and southern parts of Iraq are expected to be the most vulnerable in the world due to the high impact of climate change. These regions suffer from higher temperatures, intense heat, water reduction from upstream sources, salinity, and water pollution.

Caritas Czech Republic (CCR) and Smithson Company for Consultancy and Learning produced this report with the purpose of providing comprehensive and unbiased assessment of unfolding water scarcity crisis in the central and southern region and its impact on farming activities, livestock rearing and fishing in Shatt al-Arab, Al Qurna and Al Madina sub-districts. The study focused on two overarching objectives, namely:

- To assess trends of impact in the level of local agrarian communities in rural and semi-urban areas in the study areas.
- To provide technical input and measurements to prevent and/or reduce the impacts of water scarcity at the level of local communities

On the level of local agrarian communities, the study has recognized different patterns of impact on physical and biological systems like cropping, livestock and marine ecosystems.

Main trends of impact on the lives and livelihoods of agrarian populations are the decline of production, displacement, the emergence of disputes and health issues.

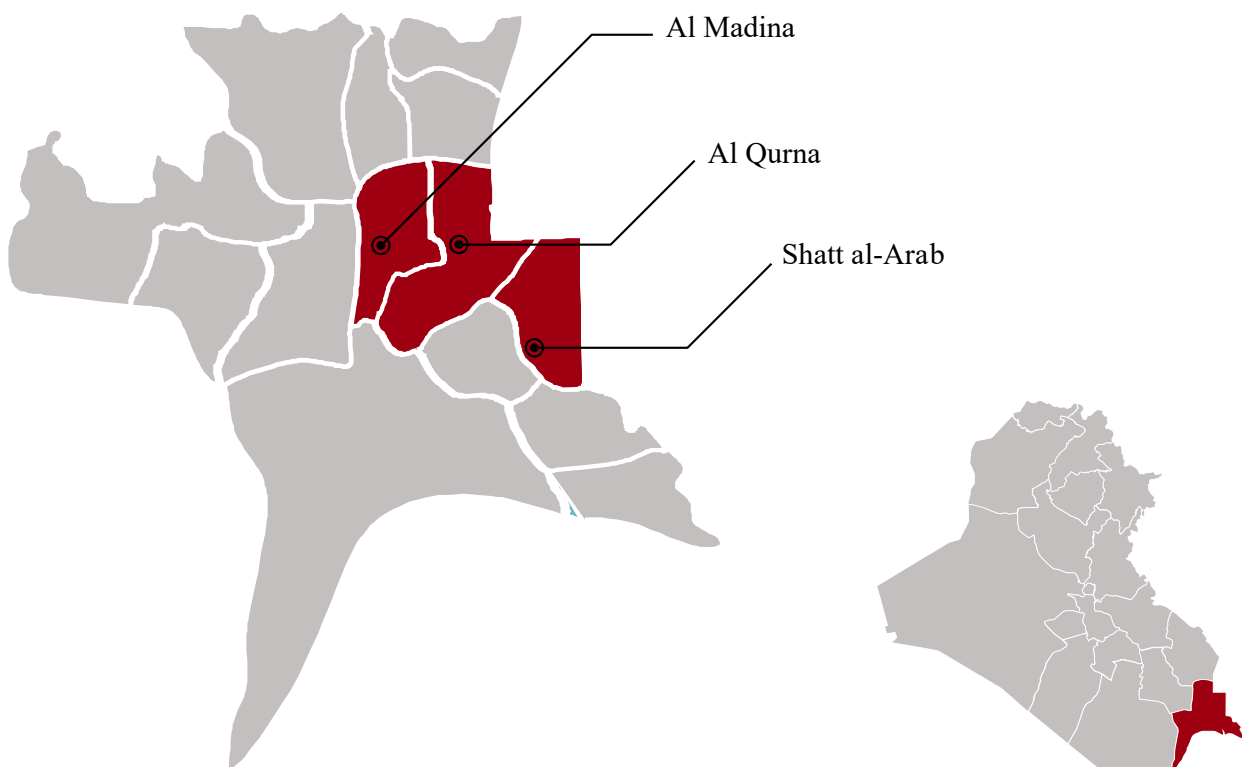
## How this study was produced?

The report is a product of extensive review of available assessments, studies, opinions and interviews with key stakeholders including officials, directorates, universities, farmers and others. The study was conducted from October 2021 to January 2022 in Basra Governorate.

Three districts (Shatt al-Arab, Al Qurna and Al Madina) were prioritized for the study based on the discussions with academic groups in the University of Basra and the Directorate of Agriculture in Basra.

The report is structured around three main subjects: 1) general overview of impacts of water scarcity in the middle and south of Iraq and 2) impacts of current water scarcity on rural and semi-urban areas in Shat al-Arab, Al Qurna and Al Madina districts' of Basra governorate and 3) Recommendations on how to minimize the impact of water scarcity in the abovementioned areas. The results of the research provide information on the factors causing water scarcity, trends of impact on rural and semi-urban agrarian communities, poor farming practices and mismanagement of water sources.

## STUDY AREAS IN BASRA GOVERNORATE



As primarily data, the study used a semi-structured qualitative questionnaire to gather data through utilizing Key Informant (KI) interviews with academics, government officials, farmers organization (FO)s and local community leaders. In the meantime, the study used secondary data sources and previous studies from Iraqi universities, government institutes and international organizations for background information about factors causing water scarcity like water issues, historical events and climate change. The primary data, in reverse, were employed to provide explanations about impacts of water scarcity on smallholders and vulnerable groups in rural and semi-urban areas in Shatt al-Arab, Al-Quran and Al-Madina.

The data collection process was conducted in different locations in the study area from the 9th to the 20th of October 2021. The lead researcher and two field researchers carried out data collection primarily through face-to-face interviews and observations; telephone calls were also used for remote locations.

Subsequently, fourteen KIIs were carried out with government officers such as mayors, officials at DoA in Basra, Agricultural Unit Managers in districts and sub-districts, experts in College of Agriculture at the University of Basra, farmer organizations and local community leaders.

## BASRA GOVERNORATE: ONSET OF WATER CRISIS

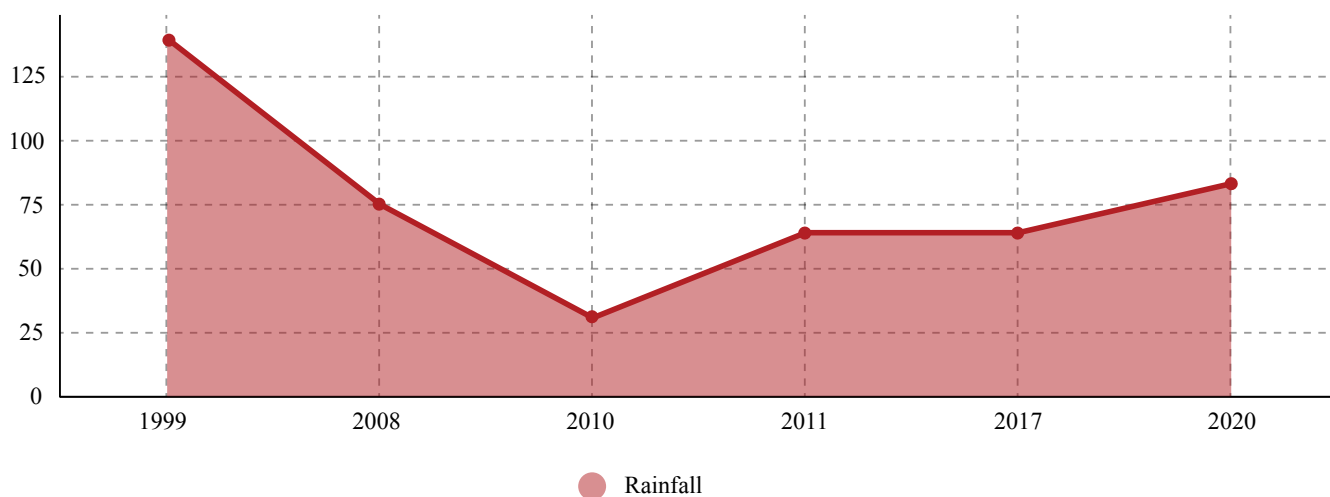
Basra is located in the very south of Iraq; it consists of 19,070 sqm (4.4% of Iraq’s total size)<sup>12</sup>. It has a continental and dry climate. According to Central Statistical Organization’s (CSO) Ministry of Planning (MOP), Basra’s population in 2019 was estimated at more than 2.985 million (8% of Iraq’s population) with about 19 per cent rural distribution<sup>13</sup>.

Basra governorate is comprised of seven districts; the Markaz of Basra in the middle, Fao and Abu Khaseeb in the southeast, Zubair in the south west, Shatt al Arab in the north west and Al Qurna and Al-Medina in the north. The three districts selected for this study are, currently and historically, prone to drought and water scarcity.

Surface water is the leading available water resource for agricultural activities in the eastern and northern parts of the Basra governorate. Euphrates, Tigris, and Shat-al-Arab waterway are the main rivers in Basra. Groundwater within the western plateau in the governorate is the leading water resource for agricultural activities. Basra has considerable agricultural areas where cereals, palm trees, fruit, and vegetables are produced<sup>14</sup>.

Studies show that seasonal drought and duration of its courses -as the most obvious driver of water scarcity- have occurred more intensified in Basra, compared to other governorates, during spring and fall seasons throughout the past five decades from 1971-2018<sup>15</sup>.

RAINFALL RECORDS FROM 1999 TO 2020



12. CSO/MOP, environmental Statistics, 2018, p6. <http://cosit.gov.iq/documents/AAS2020/1.pdf>  
 13. CSO.2019.<http://cosit.gov.iq/documents/population/projection/%D8%AA%D9%82%D8%AF%D9%8A%D8%B1%D8%A7%D8%AA%20%D8%B3%D9%83%D8%A7%D9%86%20%D8%A7%D9%84%D8%B9%D8%B1%D8%A7%D9%82%202019.pdf>  
 14. R. Attafi. Comparative analysis of NDVI and CHIRPS-based SPI to assess drought impacts on crop yield in Basrah Governorate, Iraq, University of Tehran, Caspian J. Environ. Sci. (19) 3. pages. 547-557. [https://cjes.guilan.ac.ir/article\\_4941.html](https://cjes.guilan.ac.ir/article_4941.html)  
 15. A. Al badry & O. Al Shujaery, Analysis of drought characteristics and spatial patterns in Iraq using SPEI, Journal of Basic Education, Al Mustansarian University, August 2020. <https://www.iasj.net/iasj/search?query=%D8%AA%D8%AD%D9%84%D9%8A%D9%84+%D8%AE%D8%B5%D8%A7%D8%A6%D8%B5+%D8%A7%D9%84%D8%AC%D9%81%D8%A7%D9%81+%D9%88%D8%A7%D9%86%D9%85%D8%A7%D8%B7%D9%87+%D8%A7%D9%84%D9%85%D9%83%D8%A7%D9%86%D9%8A%D8%A9+%D9%81%D9%8A+%D8%A7%D9%84%D8%B9%D8%B1%D8%A7%D9%82>

Basra is considered the most vulnerable region among the southern governorates, as it lies in the lowest reaches of the Tigris-Euphrates basin. The landscape of Basra is crisscrossed with canals that divert water from the Shatt al-Arab waterway and Tigris and Euphrates rivers to remote agricultural lands. The massive availability of fresh water in the past had helped the region -including the whole middle and south of the country- to become the food basket for Mesopotamia’s civilization. Nevertheless, the Basra case has been today’s showcase for the tragic degradation of water and agriculture.

The Tigris, Euphrates and Shatt al Arab waterway feed the area with plenty of water. Nevertheless, the ecosystem is unable to provide adequate clean water for humans, farming, livestock, and marine systems.

A decrease in water from upstream and recurring droughts in the past two decades -in 1999-2001, 2007/08, 2010/11, 2018, and 2021- have taken a toll on rain-fed crops, which has put a high risk on livelihood sources for farmers, livestock keepers and fishers in rural and semi-urban areas. Moreover, this has

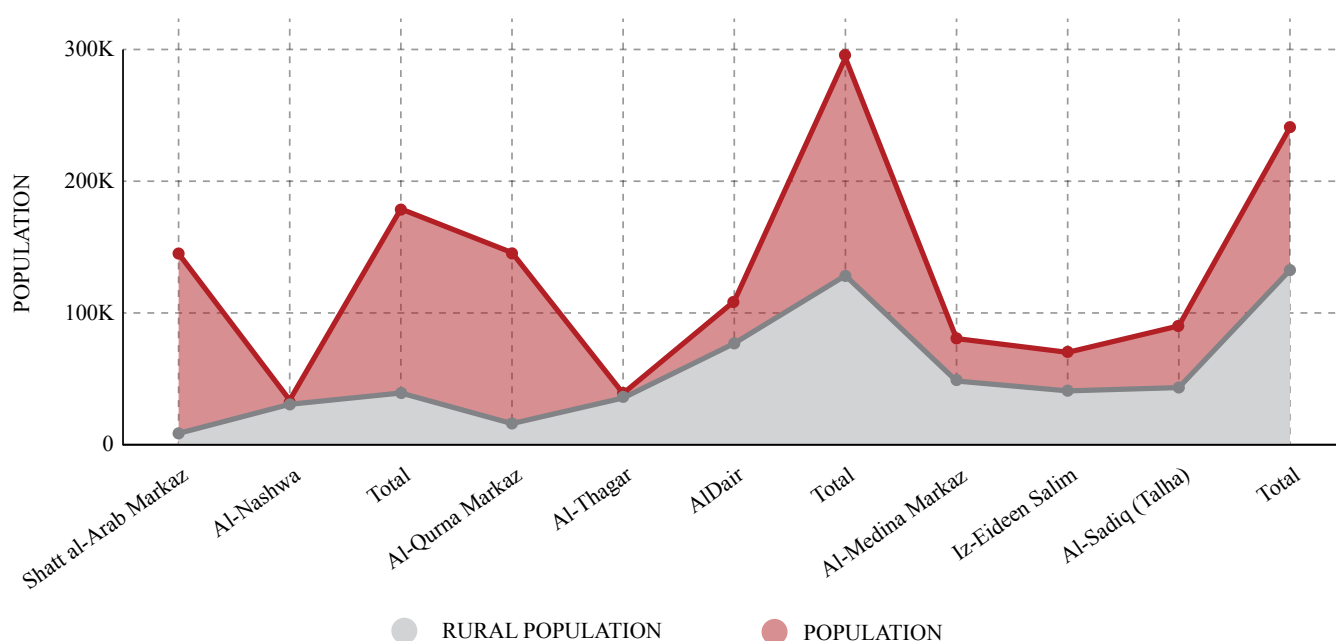
disrupted the access to sufficient and clean water for the entire population at the governorate level.

Subsequent issues driven by water scarcity in Basra -in the form of drought- are; displacement, depletion of water in the rivers, declining marshlands, land degradation, increased salinity, and surface water/groundwater deterioration<sup>16</sup>.

Salinity in Basra has shrunk the cultivated areas and reduced agricultural production. Inappropriate farming practices that have exacerbated the situation include lack of crop rotation, overgrazing, and mismanaging of water resources -mainly lack of drainage canals to reduce salinity-<sup>17</sup>. It has been reported that in 2013, a total of 467,130 date palm trees died because of salinity<sup>18</sup>.

Basra’s total suitable agricultural land is 55,000 hectares, of which only 8,633 hectares are irrigated, and 5,668 hectares (a total of 26%) receive water from wells<sup>19</sup>. Hence, non-developed irrigation means and poor farming practices are also magnifying the crises<sup>20</sup>.

POPULATION AND RURAL DISTRIBUTION IN STUDY AREAS IN BASRA GOVERNORATE



16. Attafi. Comparative analysis of NDVI and CHIRPS-based SPI to assess drought impacts on crop yield in Basrah Governorate, Iraq, University of Tehran, Caspian J. Environ. Sci. (19) 3. pages. 547-557. [https://cjes.guilan.ac.ir/article\\_4941.html](https://cjes.guilan.ac.ir/article_4941.html)

17. S. J. Faraj & T. Q. Muhammed. Desertification and Stalinization in Iraq’s economic and raised with particular reference to the province of Basrah, for the period (2004-2015), 2017 (33), Pages 51-81. <https://www.iasj.net/iasj/article/136272>

18. S. J. Faraj & T. Q. Muhammed. Desertification and Stalinization in Iraq’s economic and raised with particular reference to the province of Basrah, for the period (2004-2015), 2017 (33), Pages 51-81. <https://www.iasj.net/iasj/article/136272>

19. Water wells in Basra governorate are exist only in Zubar district where underground water is fresh. Number of water wells in Zubar district are about 1200 to 1400 wells that are used for irrigation purposes as well, particularly tomato crop.

20. CSO/Ministry of Planning.Environmental Statistical Data/Agricultural Indicators, 2020. <http://cosit.gov.iq/documents/environment/stat/Full%20Report/%D8%AA%D9%82%D8%B1%D9%8A%D8%B1%20%D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1%D8%A7%D8%AA%20%D8%A7%D9%84%D8%A8%D9%8A%D8%A6%D9%8A%D8%A9%20%D9%84%D9%84%D8%B9%D8%B1%D8%A7%D9%82%20%D8%A7%D9%84%D9%85%D8%A4%D8%B4%D8%B1%D8%A7%D8%AA%20%D8%A7%D9%84%D8%B2%D8%B1%D8%A7%D8%B9%D9%8A%D8%A9%202020.pdf>

Initiatives from the Iraqi government to restore agricultural lands are insufficient and progress slowly. According to MOP's statistical data, of the 46,250 hectares feasible for restoration, only 26.5 per cent have actually been restored<sup>21</sup>.

Other studies exploring the impacts of drought in Basra have shown that the northern parts of the governorate possess the highest susceptibility to drought<sup>22</sup>.

Another issue induced by water scarcity in Basra is the drying of marsh lands and displacement of its population. Marshes that have been affected by water scarcity in the past few years are Al Hwiza Hour, Al Hmar Hour and Middle Hour. Moreover, the people who lived in marshlands [Al Ma'adan in Arabic] are displaced and dispersed into different areas seeking alternative livelihood sources. They are struggling to adapt to the culture of their host communities due to their unique nomadic lifestyle culture<sup>23</sup>.

### Inappropriate agricultural practices in Basra include lack of farming rotation, overgrazing, mismanaging of irrigation water, and lack of drainage canals to reduce salinity

Recurring water scarcity is more of a concern for agrarian smallholders in rural and semi-urban areas. Besides lack of water from upstream sources, climate change, deterioration of quality of water and increase of water demand have made a huge negative impact on the water quantity available for farming and livestock production.

Lastly, in addition to the impacts of water scarcity on farming, livestock and fishery, there is also pressure on the natural resources in the form of intensive farming, overgrazing, and overfishing.

### Shatt al Arab District

In summer, farmers and livestock keepers face challenges with Insufficient and poor quality water in Shatt al-Arab waterway, rendering it unsuitable for human use, farming or animal husbandry; this is caused by the decrease of water flow from upstream sources. However, in winter, moderate quality water is abundant.

Fishing is the most affected sector compared to cropping and livestock rearing due to the degraded water quality in Shatt al-Arab waterway and canals. The affected crops are orchards of date trees, fodder crops like clover, corn and soybeans, vegetables and leafy vegetables.

On the other hand, livestock also suffers from a lack of feed and clean water; many of them have sold their herds because they no longer could sustain feeding and watering their animals due to the high cost of fodder and trucked water.

Some of the most affected locations captured by this study are Al Salihya, Al Kibash al-Kabeer, al Kibash al-Sagheer, the four islands quarters, Al Hota, Al Katban, Al Kibasy, and Al Zerjy. Crop yields in these locations have decreased by up to 60 per cent, as indicated by the local farmer organization's president, Mohammed Al Ghalay.

### Al Qurna District

Villages located on both sides of Al Ezz River and the west Tigris River are the most affected areas. This is due to a decrease in water from upstream sources. During the time when this report was prepared, Al Ezz River was utterly stagnant, and all villages located on both sides either halted their farming, animal rearing and fishing activities or were relying on trucked and tap water. Farmers of Bani Malik villages located adjacent to Al Ezz River on the west side of Tigris did not have access to water for irrigation. About 80 per cent of livestock keepers at the district level were purchasing water from reverse osmosis plants to water their herds, as explained by the Directorate of Agriculture Unit of Al Qurna District. Also, due to water scarcity, there have been many displacement cases in locations like Al Haylajiya, Al Rotah and Al Huwaidy.

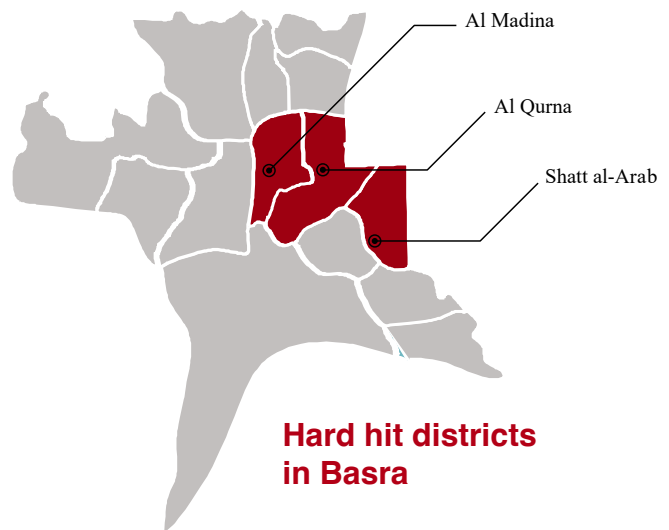
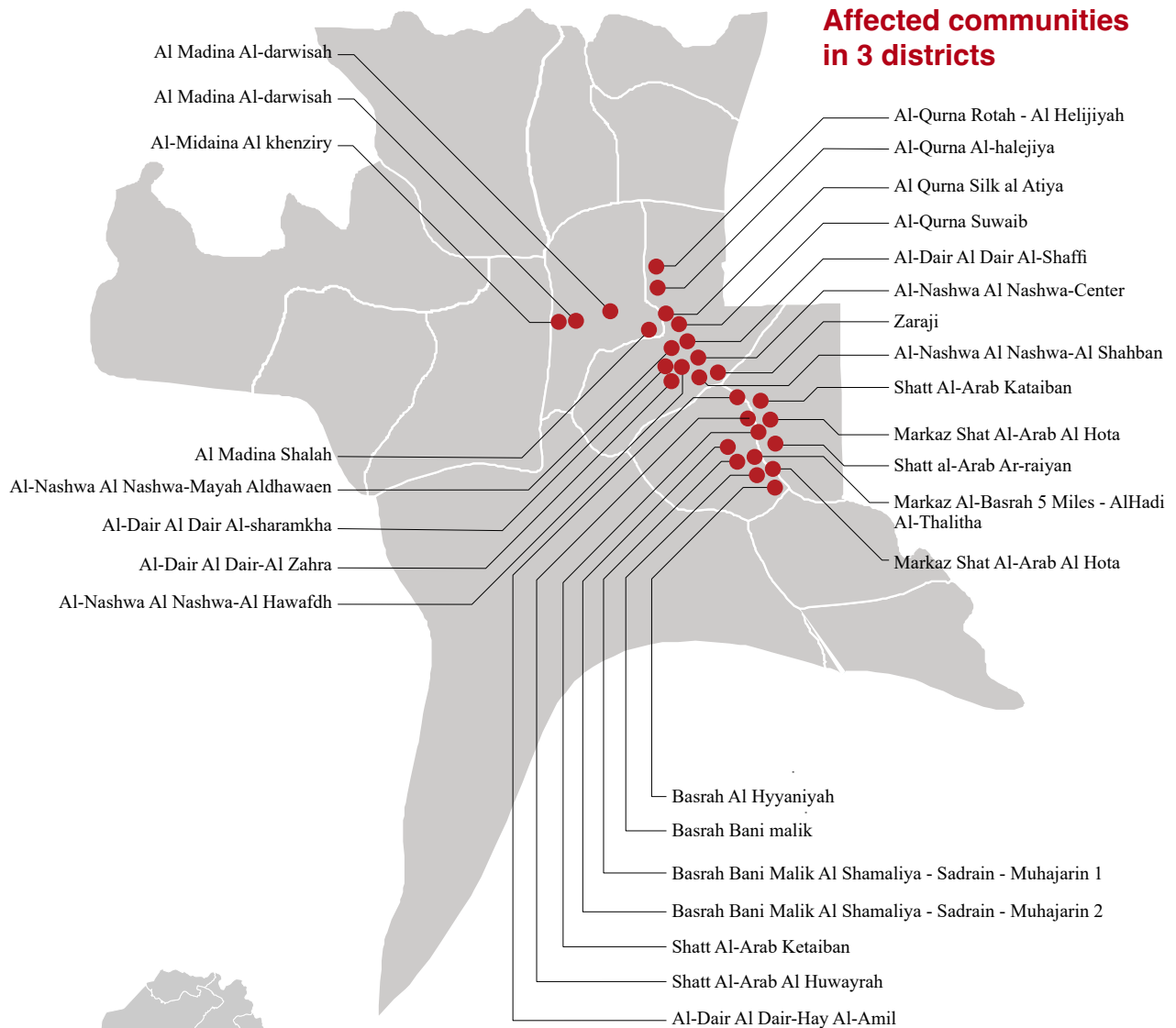
### Al Madina District


Farming, animal husbandry and fishing activities in Al Madina District mainly depend on the Euphrates and the wetlands of the marshes. Wheat, barley, corn, soybeans, clover, vegetables and leafy vegetables are the main affected crops. In addition, Reed fodder crop in marshlands is affected by overharvesting, as other fodder crops are not grown.

Buffalo is the most raised animal in Al Madina; therefore, damage to this sector is detrimental to the livelihoods of buffalo keepers. Salinity levels are still not considered a significant issue in the district compared to Shatt al-Arab and Al Qurna; despite this, during the summer, inadequate quantities of water are still a challenge for farmers and livestock keepers to maintain their activities. Water polluted with waste, sewage and runoff of untreated wastewater is undermining agrarian livelihoods. Locations most affected are marshlands, Al Soura, Al Mahyan and Al Khanziriyah villages.

21. CSO/Ministry of Planning, Environmental Statistical Data/Agricultural Indicators, 2020. <http://cosit.gov.iq/documents/environment/stat/Full%20Report/%D8%AA%D9%82%D8%B1%D9%8A%D8%B1%20%D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1%D8%A7%D8%AA%20%D8%A7%D9%84%D8%A8%D9%8A%D8%A6%D9%8A%D8%A9%20%D9%84%D9%84%D8%B9%D8%B1%D8%A7%D9%82%20%D8%A7%D9%84%D9%85%D8%A4%D8%B4%D8%B1%D8%A7%D8%AA%20%D8%A7%D9%84%D8%B2%D8%B1%D8%A7%D8%B9%D9%8A%D8%A9%202020.pdf>
22. Attafi. Comparative analysis of NDVI and CHIRPS-based SPI to assess drought impacts on crop yield in Basrah Governorate, Iraq, University of Tehran, Caspian J. Environ. Sci. (19) 3. Pages 547-557, July 2021. [https://cjes.guilan.ac.ir/article\\_4941.html](https://cjes.guilan.ac.ir/article_4941.html)
23. Information received from Dr. Jaseem Al Malaki/Marsh Development Director at Ministry of Agricultural and Water Resources Directorate in Basra.

# HARD HIT LOCATIONS IN BASRA



A man with a beard, wearing a grey and blue work jacket and black pants, stands in a dry, rocky landscape. In the background, there are several tall palm trees and some sparse, dry vegetation. The ground is uneven and appears to be a mix of dirt and rocks.

During the summer of 2021, Shatt al-Arab farmer Hasan A. Abbas from Al Huta Village struggled with water scarcity and lost most of his production from intercropping and date palm trees. He recalled about how his family's income was largely generated on farming in the past. However, the scarcity of fresh water for farming has made things difficult for him in recent years. As a result, he has been forced to sell a portion of his farm in order to meet the ends.

Shortage of freshwater for farming activities is caused by a variety of factors, including dumping untreated sewage into rivers and irrigation canals and illegal pumping from open irrigation canals to factories. "We ran out of fresh water last summer when the amount of water in the upstream river decreased, factories illegally pumped from open canals and salinity increased," stated Abbas.

“

Growing cucumber, melon, okra and leafy vegetables is no longer a reliable source of income for my family due to a lack of irrigation water.” Said Abbas.

## LIVELIHOOD SOURCES IN SHATT AL-ARAB, AL QURNA AND AL MADINA

Study results showed that livelihood sources are similar in all three districts; however, certain locations may vary. Farming, livestock, fishing, wage labor, small scale businesses, and employment in the public sector are the most common livelihood sources in the villages. In semi-urban areas, livelihood sources are extended to taxi driving, jobs -mostly guard or labor- in oil companies, and employment in small and medium scale business centers.

**Female household members are engaged in herding, milking, fishing, farming and household responsibilities; to that end, their contribution to household income is a supplement to the general household income**

Female household members are engaged in herding, milking, fishing, farming, and household responsibilities; their contribution is supplementary to the general household income. Traditional sources like farming, livestock, and finishing no longer generate enough income for the household; therefore, most families in rural and semi-urban areas look for alternative sources to make up for the deficiency. To that end, most male members are involved in more than one income-generating activity ranging from agricultural to non-agricultural sources.


Many farmers also engage in more than one activity; animal raising, farming, and fishing in a hybrid system. This model of livelihood activities was common across the study

Main farming activities that were indicated by key informants were related to cultivating wheat, barley, corn, clover, soybean, vegetable and leafy vegetable crops. Livestock, on the other hand, is considered an important livelihood source for many rural households. Sheep, goats, cows, buffalos and camels are raised for meat and dairy products. Many households who rely on farming for their livelihoods, also own a few heads of cow and/or sheep. They generally do not sell meat and milk or other dairy products. They would rather use the products as a household diet supplement. In case the milk production is larger than the consumption needs of the family, fresh milk, clotted cream [Qaymar in Arabic], yogurt, or cheese is sold to local traders or local grocery stores to complement their household income. Domestic birds –similar to animal husbandry- like chicken and geese, are raised for egg and meat for household consumption.

Fishing also is considered an important livelihood in all the three districts, particularly in villages located in marshes and nearby rivers. Households undertake fishing for both household consumption and income. Raising fish in suspended cages has declined due to high salinity in the river water; however, many fishermen use earthen ponds to continue with their fishing business.



Picture 1: Surface irrigation from an irrigation canal to a Farm near to Al-Quran City



Our agriculture is reliant on irrigation. When the canals are dry, our crops can only survive with the purchase of trucked water,” Abady said. Large areas of marshlands heavily depend on upstream water sources. The ecosystem of Al Medina district has been altered as marshes have dried up and water bodies have been drained. In Al Medina districts’ rural areas, many family farmers depend on drawing water directly from local streams by small submersible pumps. Yet, neither the local streams provide sufficient quality water nor the pumping equipment’s working efficiently.

“We require water treatment plants to ensure the safety of our crops; we require submersible pumps to extract water from streams,” said Abady. “Many of the pumping equipment’s had broken down and families could not afford to repair them.

Many farmers have skipped planting summer crops to avoid losses incurred by lack of adequate water and heatwaves, despite the fact that they have become unemployed. “Now, I am a taxi driver,” said Abady.



**We require water treatment plants to ensure water for our crops; we require submersible pumps to extract water from streams.”**

# COMMUNITY DRIVEN FACTORS CONTRIBUTED TO WATER SCARCITY

## POOR FARMING PRACTICES

In most parts of the middle and southern Iraqi governorates, traditional surface irrigation methods such as furrow and basin irrigation are used, which suffer from a high evapotranspiration rate<sup>24</sup>.

They allow a considerable amount of water loss through the land and air. Moreover, these irrigation methods are responsible for leaching salts from the soil profile into deeper groundwater. Furthermore, overgrazing by livestock owners is another issue that can lead to changes in land surface conditions contributing to desertification<sup>25</sup>.

All Key Informants in the three targeted areas have expressed concerns with the lack of water and poor-quality water. However, in responding to questions about irrigation methods farmers employ to irrigate their crops, they pointed out that the vast majority of farmers use old conventional surface irrigation where water flows down to small trenches to run

through the crops. The KIs have indicated that squandering vast amounts of water through these methods does not irrigate their lands adequately, particularly during summer. In addition, these irrigation methods highly degrade the soil through rising salt into the topsoil; the methods also reduce soil nutrients via the backflow of the irrigated water into the rivers.

The study results also showed that using new irrigation methods like dripping systems is limited or only used in greenhouse farming. Further, water harvesting is utterly absent in rural and semi-urban areas in all study areas.

Overgrazing is another harmful practice that has caused the decline of natural rangelands. Similarly, the depletion of fish populations and many economic species is caused by overfishing, and the discharge of polluted water into the rivers further exacerbates the situation.

## MISMANAGEMENT OF WATER RESOURCES

Poor practices that contribute to water availability and access to quality water include dumping raw sewage into Tigris, the Euphrates, and the Shatt al-Arab waterway, in addition to traditional irrigation methods, and lack of water-efficient agricultural practices like dripping, sprinkler, and hydroponic systems.

Water pollution is particularly prominent in Basra, which comes from many sources. Contaminations like harmful chemicals and toxins are observed across the governorate. Organic materials include human and animal sewage, garbage and liquid waste from households, runoff from soil contaminated

with agricultural fertilizer and pesticide, untreated wastewater from different industries and other forms of waste discharged into rivers and water canals. This waste contains harmful chemicals and toxic elements that make the water poisonous for crops, livestock and aquatic life. Furthermore, conventional filters and other equipment used by farmers for water treatment cannot clean the water.

Water pollution is a challenge in all districts in the study areas. It undermines the production and physical and environmental health for all activities in the agricultural sector. This issue has also worsened the water crisis in the entire governorate.



Picture 2: Contaminated stagnant water in irrigation canals

24. The process of loss of water from the soil both by evaporation from the soil surface and by transpiration from the leaves of the plants growing on it.

25. A. A. Mohammed Mali, Assessment of Drought Conditions and their Impacts on the Environment of the Udham River Basin, Iraq, Ph.D Dissertation submitted to University of Warsaw, 2017. Page 6-10. <https://depotuw.ceon.pl/bitstream/handle/item/2463/1900-DR-GF-07001100170.pdf?sequence=1>

Lafta S. Ali, a young farmer from Al Rayan village near Shatt al-Arab, quit farming to work as a construction laborer. “I used to have a big farm with palm trees and vegetables,” Ali said. “The land was very filtered, and freshwater was abandoned. However, due to drought and pollution, access to irrigation water has become significantly more difficult in recent years,” he added.

Ali explained that he was shocked when he saw his palm trees and vegetable crops dying. He later found out that it was happening due to salty and polluted irrigated water.

“Canals had run dry, earth had cracked and crops have disappeared. I had to leave farming because my income was insufficient to cover my costs; now I work as a construction laborer,” Ali said.

Lack of adequate initiative by the government has limited adaptation options for farming practices. The deterioration of rural livelihoods caused by water scarcity has forced many farmers to choose between investing in adaptation or look for other income sources, in most cases to non-agricultural.



**We are unable to purchase trucked RO water to irrigate our crops due to a lack of funds”**

## WATER SOURCES USED FOR FARMING AND LIVESTOCK

|              |                                       |
|--------------|---------------------------------------|
| Shat Al Arab | Shate al- Arab waterway, Tigris river |
|              | Tap water and trucked water           |
| Al Qurna     | Tigris, Euphrates and Souayb rivers   |
|              | Tap water and trucked water           |
| Al Madina    | Euphrates rivers                      |
|              | Marshes                               |
|              | Tap water and trucked water           |

In addition, the decrease in freshwater flowing from upstream has led to seawater from Arab-Persian Gulf pouring into the Shatt al-Arab waterway, which increases the level of total dissolved solids (TDS) in the irrigation canals. This phenomenon of salty seawater progressing upstream is well known in Basra as ‘salinity intrusion’ [Lisan Al Milhi in Arabic].

Dr Jassem H. Abdulla, Head of Research Committee at DoA, has illustrated that 150 kilometres of saltwater from the Gulf

have infiltrated the Shatt al-Arab waterway and canals. This leaves farmers with no choice but to use saline water to irrigate their crops.

The plight is the same for livestock owners; they rely on alternative water sources for watering their animals. The local community and Key Informants explain these issues as burdensome to the production costs, particularly for greenhouse farmers and livestock keepers.

## LAND DEGRADATION

- Traditional surface irrigation methods used are an effective way of leaching salts from the soil profile into the deeper groundwater
- Overgrazing by herd owners is another issue that can lead to changes in land surface conditions contributing to desertification.

The impact of salinity has also halted fishers; many fish species, like Al-Zubidi, Al-Bunni, and Al-Sabour, have disappeared in the Shat Al Arab waterway due to increased salinity and poor quality of its water, as explained by Agricultural College professors at the University of Basra (UoB).

Experts in UoB explained that about 40% of intercropping, 70% of fishing, and 50-60% of animal husbandry activities in Shatt al Arab District have declined due to polluted water. This has caused a dramatic decrease in farming, livestock and fishery productions.

It is worth mentioning that salinity is more detrimental in Shatt al-Arab District than Al Qurna and Al Madina. The two later districts’ salinity levels are still low and acceptable for

farming, especially in Al Madina. Despite that, the water in many marsh areas -in both Al Qurna and Al Madina- remains generally unsafe for human use. Due to pollution and salinity, it is also less suitable for agriculture and other income-generating uses.

Shatt al-Arab District mayor pointed out that salinity is poisoning the soil for rural and semi-urban livelihoods. He also stated that about half of farmers tend to avoid summer farming activities or reduce it to half due to fear of unpredictable high salinity in the water. These findings in Shatt al-Arab District are also parallel with IOM’s Labour Market Assessment results<sup>26</sup>, which indicate that salinity is the most common challenge that farmers face in the district.

26. IOM, Labour Market Opportunities and Challenges, April, 2019. <https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/2019/05/LABOUR-MARKET-OPPORTUNITIES-AND-CHALLENGES-Basra-District%2C-Basra-Governorate.pdf>

### CONTAMINATION SOURCE OF WATER POLLUTION

- human and animal sewage
- garbage and liquid waste of households
- run-off of soil contaminated with agricultural fertilizer and pesticide
- untreated wastewater from different industries
- other forms of waste discharged into rivers and water canals

Based on the study findings, 2018 was the worst drought among all drought cases in the past two decades; nevertheless, several key informants in Al Qurna and Al Madina indicated that the 2021 drought left the most impact on their farming

and livestock activities. And, many key informants –in all three districts- pointed to 2019 heavy rain that has reduced the high salinity levels, however the rain brought major flooding to the area.



Picture 3: polluted irrigation canal near a residential area

## DROUGHT INDUCED VULNERABILITIES

Water shortage impacts the lives and livelihoods of the communities in the middle and south of Iraq, who are already vulnerable due to lack of service provision and poor infrastructure. They rely on rivers, canals and rained agriculture to generate food and income for their families.

The Significant decrease in fresh water in rivers and canals, in addition to drought, have halted the primary livelihood source of rural families in many locations. Study results showed that loss or decrease of income sources and displacement are the most apparent impacts of water scarcity on smallholders. In combination with these issues, there is a lack of proper running

water (tap water) used for human purposes, putting the rural populations' health at risk. Key Informants we interviewed have revealed that dehydration, hair loss, gastrointestinal issues, skin diseases and other water-borne diseases were the most common health issues associated with lack of access to clean water.

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**Loss or decrease of income sources and displacement are the most apparent impacts of water scarcity on smallholders. Water scarcity's direct economic effects are; less cultivated lands, decreased yield, and sale of assets like a piece of land or a portion of the herd.**



Picture 4: Date palm orchard becomes an arid field

## ENVIRONMENTAL RISKS OF WATER SCARCITY

- Water scarcity (drought/low precipitation/decrease of water volume from upstream sources)
- Salt water contamination of irrigated water (salinity intrusion by seawater progress toward upstream)
- Water pollution (upstream human activity, and run-off of fertilizers and pesticides, untreated wastewater and other contaminants)
- Soil salinity (irrigation water contaminated with salt water and surface irrigation)
- High temperatures and heatwaves (climate change)
- Insufficient rainfall for winter crops (climate change)

## ADVERSE EFFECTS OF WATER SCARCITY ON COMMUNITIES AND HOUSEHOLDS

Factors contributing to water scarcity vary, like decrease of water from upstream, climate change, pollution, salinity, recurring droughts, mismanagement of water sources and inappropriate farming practices. Their impacts on the socio-economics of rural and semi-urban areas are interrelated, though according to the study findings, they can be categorized into the following:

### A) THE DECLINE OF FARMING, LIVESTOCK AND FISHING ACTIVITIES IN RURAL AREAS

Key Informants explained that a decrease in production and/or crop failure had become a phenomenon in the past several years in the study areas. Livestock keepers depend on expensive fodder from the central and northern governorates because the local fodder supply is no longer sufficient to cover the need. Traditional fodder cropping like corn, soybeans, and clover has declined across the region. In Ezzedine Salim's sub-district of Al Madina, for instance, cultivated areas with fodder crops like corn and clover have reduced by more than 90 per cent in the past five years, explained by the Directorate of Agriculture Unit (DoAU) of Ezzedine Salim Town.

Production of summer crops has decreased like vegetables, leafy vegetables and dates. Khalaf M. Hamid, Al Tasadi Farmers Union (FU) leader, has indicated that crop yields have reduced in his village Al Salihiya. He mentioned that he used to harvest about 150 kilograms from each of his old palm trees of Dsa'eer and Halawi date types, but he has harvested only 50 kilograms from each tree this year. He also referred to the lack of feed and poor-quality water that caused the reduction of cows from over 1000 to only 250 heads in his village.



Picture 5 Polluted Canal Water

The fact that many farmers, especially greenhouse farmers and livestock keepers, rely on trucked water processed through reverse osmosis (RO) plants -which adds additional costs to production- summer cropping and livestock rearing has been very difficult. This makes Basra's agricultural and livestock products to be less competitive to the other governorates' products –namely Najaf and Erbil- as explained by Shatt al-Arab District mayor.

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**Regarding human health, dehydration, hair loss, gastrointestinal issues, skin diseases and other water-borne diseases were the most common health problems associated with lack of access to clean water**

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Similarly, many households who make a living on fishing also are facing challenges with polluted water. The high saltwater intrusion into rivers and overfishing have negatively impacted the marine ecosystem. Fish populations in all study areas have sharply decreased, and many commercial species have either reduced in size and number or disappeared entirely. This impact on fish is undeniable in the areas that lie in the lowest reaches, as the salinity level becomes very high. For instance, species like Al-Zubidi, Al-Bunni, and Al-Sabour, have disappeared from Shat al Arab waterway's ecosystem, as indicated by experts at the College of Agriculture at UoB. This has consequently affected the livelihoods of hundreds of fishers; about 100 fishers have kept their business out of 500 from five years ago, as explained by Shatt al-Arab mayor.

Summer farming in Al Zinjy village was reliable prior to the drought, owing to abundant water from upstream sources. Falah H. Ali, a farmer in his mid-sixties, noted that throughout the summer, fresh water was abundant, and farmers harvested enough vegetable crops to sell right after harvesting.

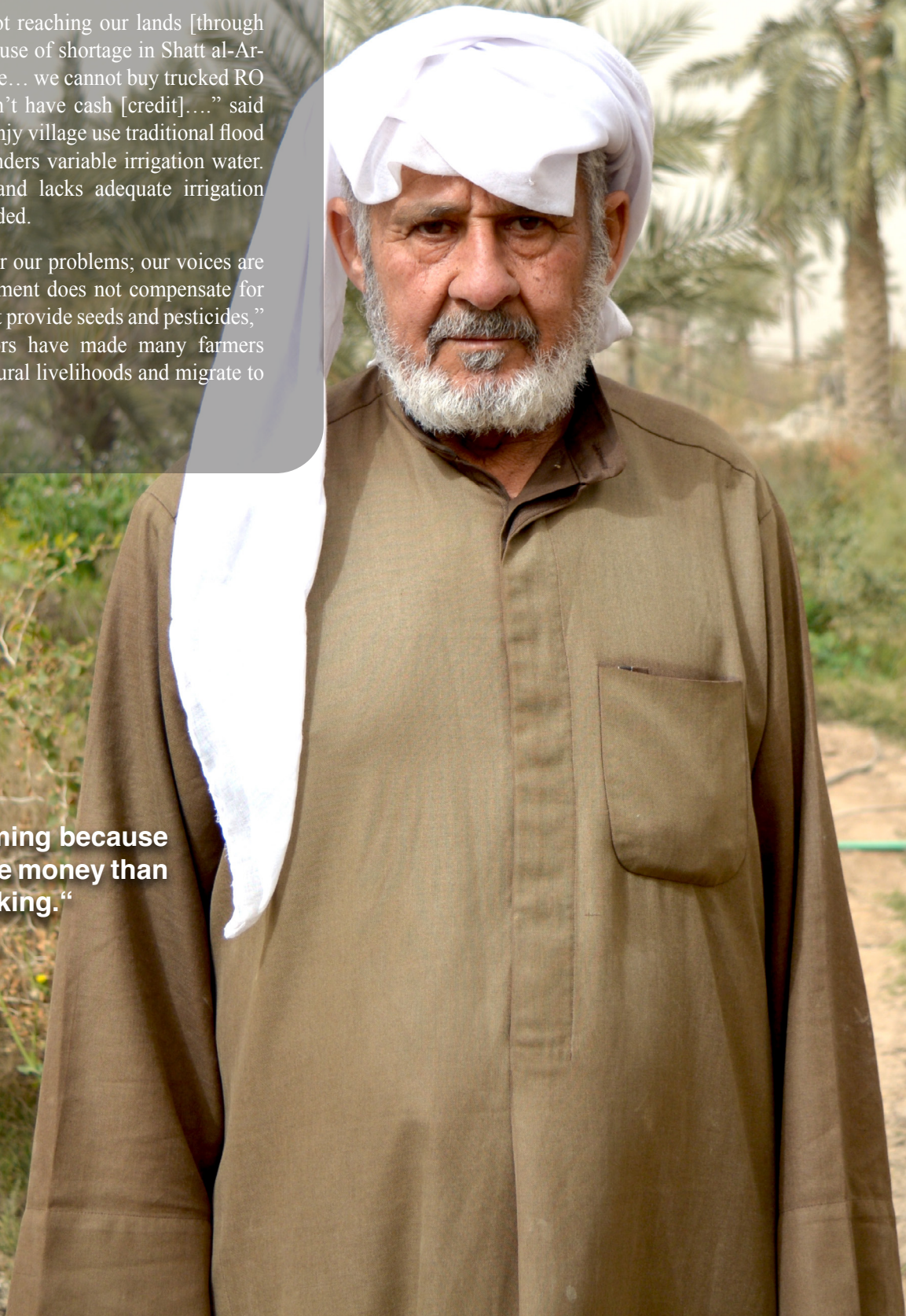
During dry seasons, a lack of water in Basra from upstream sources and the high cost of trucked reverse osmosis water have made farming activities difficult.

“Irrigation water is not reaching our lands [through irrigation canals] because of shortage in Shatt al-Arab villages’ water share... we cannot buy trucked RO water because we don’t have cash [credit]...” said Ali. “Farmers in Al Zinjy village use traditional flood irrigation which squanders variable irrigation water. The area is remote and lacks adequate irrigation infrastructure,” he added.

“No one listens to hear our problems; our voices are not heard; the government does not compensate for our losses and does not provide seeds and pesticides,” said Ali. These factors have made many farmers abandon their agricultural livelihoods and migrate to urban areas.



**I had to quit farming because I was losing more money than I was making.”**



## B) EFFECTS ON CHILDREN'S EDUCATION

One KI has pointed to the impact of water scarcity on children's education due to the high number of school dropouts from low-income families. He explained that parents in such

families whose household income is highly dependent on farming tend to take their children out of school and enrol them in daily work to help the adult males earn a living.

## C) DISPLACEMENT

Displacement induced by water scarcity has occurred in the Basra governorate in two directions in the past several years: sudden, with a large number of families -as occurred in 2018- and slow, as a continued displacement with a small number of families in different locations.

Water scarcity and displacement are understood by experts in Basra as interrelated phenomena caused by multiple factors over a more extended period, such as regional, internal, and transnational factors.

The permanent move is when the entire household moves either in search of water in another location nearby or to look for alternative livelihoods in urban areas. This displacement trend occurs in instances of a sharp decline in livelihood sources.

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**Fish populations in all study areas have sharply decreased, and many commercial species have either been reduced in size and number or have disappeared entirely.**

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Key informants interviewed for this study have explained that a large number of smallholders whose livelihoods have been halted due to ongoing water scarcity have been moving from rural to urban areas.

Nadim Al A'ly, a community leader from Silk Al Ate'eya village, explained that in the past few years -in Ezzadine Salim's sub-district of Al Qurna, about 200, 50, and 60 families have left Al Huwaidy, Al Hayjea and Al Rota villages, respectively. The study results showed that Shatt al-Arab has the worst case of displacement -compared to the other two districts- due to salinity. For instance, in Al Ray'yan village, from 120 families, about 70 have left, mentioned by Ghafil Al Rady, a community leader in the village. He also expressed that he has no hope and expects to see his village with no farmer families in the next few years. However, the strong feeling of belonging has made some farmers stay at their ancestral lands and try to maintain their traditional livelihood activities, explained by Shatt Al-Arab Mayor.

Informal rezoning from agricultural to residential areas -particularly in Shatt al-Arab District- is another factor that pushes farmers whose lands are located nearby residential areas to sell their properties and move to urban areas, which changes their habitual agricultural-based livelihoods.

Whereas in Al Madina, formally enforced rezoning from agricultural zones to oil industry areas is the most prevalent displacement factor. Farmers receive compensation and move to urban areas. The DoAU of Al-Madina has explained that 15,000 hectares -owned by 930 farmers who used to hold agricultural land contracts- were seized by the Ministry of Oil and Natural Resources (MoONR) in 2021.

## D) TENSION OVER LIMITED RESOURCES

Dispute over water sharing was less touched by Key Informants. However, a few of them pointed to the north of Basra, where most water-related tensions and violence are occurring; the disputes usually happen over allocation of irrigation water among neighbouring farms or over grazing rights.

Disputes between villagers are mostly resolved peacefully by community leaders. However, water scarcity remains a factor

leading to violence, explained by Key Informants in UoB and community leaders.

The directorate of Al Qurna's Agriculture Unit revealed that violence over water sharing is one of the outcomes of water scarcity in the north of Al Qurna. Moreover, Basra's rural and semi-urban areas -where the dispute between clans and tribes can be traced back for centuries- are considered fragile societies, mainly because of a lack of governance to enforce the law and manage water resources.

The rural and semi-urban areas of Basra -where the dispute between clans and tribes can be traced back for centuries- are considered fragile societies, mainly because of a lack of governance to enforce the law and manage water resources.

Additionally, the lack of income sources in the rural and semi-urban areas has pushed agricultural labourers to move to urban areas in search of alternative livelihood opportunities. This has created problems in urban areas because of the increased demand for employment and public services. In the interim, most displaced persons lack the needed skills to secure employment. In this regard, Marsh people [Al Mahdan] are more adversely affected; their nomadic nature makes it harder to cope with the city lifestyle and secure livelihoods.



Picture 6: Poor quality Dates in a Farm in North Al-Qurna District

## E) EFFECT ON HUMAN HEALTH

The most affected groups by water scarcity in rural communities are low-income families, particularly women, children and the elderly, as explained by most of the Key Informants. Rural women, especially in marsh areas, are considered one of the most vulnerable groups to water-borne diseases because they

are in direct contact with livestock and farming. The effects of water scarcity on people include dehydration and water-borne diseases like gastrointestinal problems, skin diseases, hair loss during the hot months of summer due to the consumption of saline water.

## UNFOLDING TOMORROW

Based on historical data and current trends it is expected that the water availability and quality in Iraq and in Basra particularly will further be reduced.

- According to UN, an estimated 250 km<sup>2</sup> of fertile land in Iraq is lost annually to desertification<sup>27</sup>.
- Due to water scarcity and the informal rezoning of agricultural land to residential area. In Shatt al-Arab, thousands of kilometers of agricultural lands are shifted to residential areas every year.
- Due to the increase of population in the middle and south of Iraq, further agricultural lands will process to residential lands, and rural migration to urban centers will increase.
- Reduction in water from upstream will be continued, in addition to the continuance in pollution and shortage of precipitation. According to UN, four million people in the middle and south of Iraq will displace from their home in next eight years because of the ongoing water scarcity<sup>28</sup>.

27. <https://www.independent.co.uk/news/world/middle-east/iraq-water-shortage-unesco-garden-of-eden-bible-four-million-people-homes-latest-a8574781.html>

28. It is a common tree in Basra can reach a height of 2-4 meters with shiny green leaves. Its edible fruit called Nabak is a round shape dark yellow.

## COPING MECHANISMS UNDERTAKING BY RURAL POPULATION

Study findings showed that the affected population in all three districts undertake several coping strategies -mostly negative-. Displacement and seeking alternative income sources have been occurring in areas where the decline of livelihood income is very sharp, caused by crop failure and animal death. In many displacement cases, the entire household moves; either in search of water in another location nearby or to urban areas to find alternative livelihood sources.

As a negative coping, many families in rural communities have sold portions of their livestock or pieces of land. Subsequently, the production of the following years will fall. As a result, many fertile lands, particularly in Shatt al-Arab District, have been under informal rezoning operations, from agricultural lands to residential areas.

Farmers also tend to leave their lands uncultivated in the summer due to the high probability of crop failure because of poor quality irrigation water.

| Coping Mechanism   | Negative Effect   | Effect of Smallholder livelihoods  |
|--|---|--|
| Displacement to urban areas and seeking alternative income sources | <ul style="list-style-type: none"> <li>Abandon agricultural/livestock/ fishery-based habitual livelihoods, reduce number of farmers and producers</li> <li>Lack of knowledge and function to facing drought</li> <li>fertile lands, particularly in Shatt al-Arab District, have been under informal rezoning operations, from agricultural lands to residential areas</li> </ul> | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> <li>Face challenges to adopt to new culture in urban areas</li> </ul> |
| Selling portions of livestock herds and/or pieces of land          | <ul style="list-style-type: none"> <li>Reduction the next acreage under cultivation and the number of animals kept</li> </ul>   | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> </ul>   |
| Skip summer farming activities due saline and/or polluted water    | <ul style="list-style-type: none"> <li>Lack of knowledge and function to facing drought</li> <li>Reduction in production</li> </ul>   | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> </ul>   |
| Skip winter farming due to the perspective of low precipitation    | <ul style="list-style-type: none"> <li>Lack of knowledge and function to facing drought</li> <li>Reduction in production</li> </ul>   | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> </ul>   |
| Rely of trucked water of reverse osmosis for irrigation            | <ul style="list-style-type: none"> <li>Lack of knowledge and function to facing drought</li> <li>Increase cost of production</li> </ul>   | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> </ul>   |
| Rely on low nutrient fodder  | <ul style="list-style-type: none"> <li>Reduction in fodder supplements</li> <li>Production in production</li> <li>Depend on poor vaccination system</li> </ul>  | <ul style="list-style-type: none"> <li>Reduce household livelihood income</li> </ul>   |

Shifting away from winter crops like wheat and barley to vegetable production in greenhouses that require less water is another coping strategy that farmers follow, especially in Al Qurna and Al Madina.

Relying on trucked water from reverse osmosis (RO) plants is another coping mechanism undertaken by greenhouse farmers and livestock keepers in Shatt al-Arab and Al Qurna districts, further increasing production costs. In some cases,

greenhouse farmers tend to use a mix of trucked water and river water [al Murashafa in Arabic] as an attempt to reduce the cost of irrigation.

Lack of state support in the form of animal feed and agricultural supplements like fertilizer, pesticide and veterinary services has added more burdens and forced both livestock keepers and farmers to use low nutrient fodder, poor vaccination services, and inadequate supplements for farming.

## RECOMMENDATIONS

The study findings showed that agrarian smallholders suffer from a significant informational gap about climate-smart practices in agricultural inputs, services, and processing. Key Informants have shared different insights about potential interventions to restore farming, livestock and fishing activities in rural and semi-urban communities affected by water scarcity and poor-quality water. Among those initiatives and climate-smart practices that can be implemented at the level of the local community are:

- Support rural communities with new agricultural technology like greenhouses and irrigation methods such as Dripping Irrigation Systems and Solar-Powered Irrigation.
- Support farmers, livestock owners and fishers with extension services, including awareness, learning and training on conservation of local water resources, crop diversification, drought adaptation and risk management.
- Support farmers and livestock owners with agricultural supplements like seeds -of both farming and fodder crops- tools, fertilizer, pesticides, and fodder, in addition, training on using of supplements.
- Support local communities by establishing small agricultural-based processing manufacturers; to act as income-generating livelihood sources, such as date molasses, date pressing and processing, vegetable processing and dairy production.

- Help Directorate of Agriculture in Basra by facilitating learning and research to introduce new salinity/ drought-tolerant farming and fodder crop varieties.
- Assist local communities to clean irrigation canals and building small earthen ponds for water harvesting.

There are other recommendations not mentioned by Key Informants; however, we believe they could be important to reduce the impacts of water scarcity on agriculture and restore livelihoods in rural agrarian communities; these recommendations are:

- Build capacity for small landholder farmers, agricultural extension agents, and local Civil Society (CS) and non- Profit organizations (NGO)s to establish networks and develop and adopt local initiatives for best water resources management practices at the local community level.
- Establish medium-size reverse osmosis plants in remote locations where large areas are cultivated and/or much livestock are raised.
- Provide livelihoods programming in the form of vocational skills training, business development training, marketing training, small agricultural-based entrepreneurship training, and small grants for rural displaced women, men, and youth in urban areas.

# CLIMATE-SMART PRACTICES OPERATIONS

## ADAPTATION TO WATER STRESS

Water availability and access to water is a key challenge to traditional farming systems in all study areas. Adopting new farming and irrigation methods to use water efficiently can help smallholders impacted by water scarcity restore their livelihoods and farming activities. Efficient water irrigation methods like drip irrigation systems and intensive farming like greenhouse farming are not common in many larger areas affected by water scarcity. Crops like okra, cucumber, tomato, melon, eggplant, radish, cabbage, chard and lettuce are the most common crops in local markets in Basra; these crops can be grown in the greenhouse and can be a source of

employment. In addition, packing and processing can be added to the value chain to improve marketing and employment.

Local farmers are aware of the potential of greenhouse farming; however, they lack access to crucial supplements and finances to establish greenhouses. Supporting small landholder farmers with greenhouses, farming equipment, drip irrigation system, seeds, fertilizers and pesticides, and agronomic skills will play a vital role in conserving water and restoring livelihoods in rural areas of Al Qurna and Al Madina districts.

## SIMPLIFIED HYDROPONIC FODDER BARLEY

Livestock production plays a vital role in the economics of rural and semi-urban areas in Basra. Rangelands as essential feed supplies for cattle and small ruminants have become less dependable for livestock owners due to drought, soil degradation, and poor water quality in the summer. Finding alternative green fodder for livestock is crucial to sustaining livestock production as a source of income for smallholders. Local green fodder produced in traditional ways can no longer cover the local needs of smallholders in rural areas.

One of the innovative ways to produce green fodder is hydroponic fodder barley. It requires much less water than all other fodder crops, including fodder barley, when cultivated in the

soil. Hydroponic barley fodder is rich in nutrients, as it contains a high rate of carbohydrates, minerals and vitamins. It can be grown anytime and regularly throughout the year. It can also grow in just one week. Hydroponic fodder is simple, does not require sophisticated equipment, and can be grown on the level of a mere family farm using family labour. It is produced by growing seeds of barley in a soilless environment and with very little water. Therefore, it is very feasible for smallholders who raise small numbers of animals in rural or semi-urban areas. Livestock owners can harvest green fodder in a very short period in the form of green leaves, roots and mats to feed their animals. Introducing this innovative programme can be integrated as training with vaccination programmes.

## ECONOMICALLY VIABLE PRODUCT DIVERSIFICATION

Strengthening the livelihoods of rural communities with diversified income sources and adopting a manner of farming that focuses on local water resources' conservation is very important to reduce the impacts of prolonged drought and water scarcity. Small or medium diversified projects -for family farmers or small groups of youth associations- like planting buckthorn [Nabak/Al Sidr in Arabic] trees aligned with beehives can be an effective way to diversify. Farmers and youth

association groups can benefit from both selling buckthorn fruit and honey. Coupling beekeeping with growing buckthorn is especially lucrative because it leads to the production of Al Seedir, a type of honey with a low supply and high demand in Basra and Iraq. Using drip irrigation systems for buckthorn orchards will, notably, add more value to water conservation. Such diversified projects will give farmers access to diverse food and cash sources for their families.

## CONNECTING SMALLHOLDERS TO MARKETING

It is evident that many organizations have been introducing new processing and marketing practices for small business holders and enterprises in the northern governorates in Iraq; however, there is little effort in southern governorates for this purpose.

One of the characteristics of smallholders' income activities is production diversity; they are bringing a wide variety of farming and animal products to the marketplace. This is reflected in the local food and non-food items available in their areas. However, not all diversified activities would be economically feasible for agrarian smallholders. Nevertheless, this diversity in production still creates a good opportunity for organizations to introduce new marketing practices to restore the livelihoods of these smallholders.

Value-adding post-harvest activities in the form of packing, processing and pressing facilities are not found in rural areas. Packing facilities or even home-based-packing/processing/pressing operations can be set up with relatively low resources; this can play a significant role in the marketing of these products like dates, buckthorn and Henna<sup>29</sup>. There is growing consumer demand for these products from the middle and northern governorates, where these products are usually imported from outside the country. Also, the demand structure -like better quality, cleanliness and attractive packaging- plays a big role in helping small landholder producers to perform better in the market. This packing process includes other post-harvest activities like proper washing, sorting, grading and treatment. In the interim, small grants targeted at local farmers and youth associations coupled with technical support for such marketing practices, can help restore the livelihoods of these communities.

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29. Henna or Hina tree (*Lawsonia inermis*) originates from the Arabic word Henna is a flowering tree 3-4 meters in height. Henna produces a dark dye from its ground leaves that has been historically used for coloring hair, skin and fingernails in Iraq. Henna leaves are reaped every 45 days, sold at local markets and used to produce the dye molecule.



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