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Makram Belhaj Fraj, Emad Al-Karablieh, Ismail Al-Sarayah, Khalida Al-Ghazaoui, Ali Ghanim, Sandra Ruckstuhl and Rachael McDonnell

Drought-affected cereals in Tafilah, Jordan, in winter 2022 (*Photo:* Emad Al-Karablieh)

Synthesis of the Rapid Drought Impact Assessment in Tafilah, Jordan

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Executive Summary

The purpose of this MENAdrought study was to assess the agricultural impacts of the drought of 2020-2021 and advise on compensation for farmers in the Tafilah Governorate of Jordan. The Drought Technical Committee (DTC), a working group set up to manage drought risks, also used the study to validate and calibrate the Jordanian Drought Monitor for *Badia* (arid rangelands) areas and develop a repeatable survey tool and process for drought impact reporters to use in the future.

We evaluated the agroecological, water resource and socioeconomic context of Tafilah, analyzed its drought history by studying precipitation and agricultural production statistics, and undertook extensive participatory research that included 13 key informant interviews with local government officials and 14 focus group discussions with 94 members of farming-related non-governmental organizations (NGOs).

The precipitation data indicate a long-term and severe drying trend in Tafilah. Precipitation has declined from an annual average of 240 mm to 155 mm over the past 43 years. However, satellite-derived precipitation products like CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) and IMERG (Integrated Multi-satellite Retrievals for GPM) do not accurately reflect these observed conditions in the governorate. The deepest droughts recorded during this period (assessed using station data to produce the agricultural Standardized Precipitation Index) include those that occurred in 1998-2001 and the 2020-2021 drought, when surface water storage infrastructure received virtually no inflows, and the little that did arrive quickly evaporated.

Cereal production (especially barley) was most affected during the droughts that occurred in 1994, at the turn of the millennium (1998-2001) and in 2020-2021. Livestock herds decreased by 16% due to the millennium drought and 5.3% during the 2020-2021 drought—though some individual herders reported losses of over 30%. The drivers of such livestock impacts included the limited grazing period, transportation costs to access water from public sources, the cost of purchasing water from private wells, and the cost of feed. Animal mortality is primarily due to malnutrition and infectious diseases causing perinatal mortality, and after droughts, herds have low fertility rates for some time.

Stakeholder groups had different perceptions on drought intensity and priority of impacts, as seen in the table below:

Stakeholder group	**Drought intensity**	**Priority drought impacts**	**Priority water source impacts**
Government officials	Moderate to severe	Livestock and forests	Dams and wells
Smallholder farmers	Exceptional/catastrophic	Rangelands	Ponds and dams
Women-led businesses	Moderate	Irrigated agriculture and drinking water availability	Dams
Youth-led businesses	Severe to exceptional/ catastrophic	Irrigated agriculture and drinking water availability	Springs
Laborers	Severe to exceptional/ catastrophic	Water resources availability	Wells
Herders	Severe	Livestock	Ponds and dams
Cereal growers	Severe	Irrigated agriculture and drinking water availability	Ponds and dams
Commercial farmers	Severe	Rangelands	Ponds and dams

We found that young people and laborers' perceptions of drought intensity were closest to the Drought Monitor maps. Smallholder farmers' perceptions were closer to the maps than those of officials, who tended to view the drought as not quite as severe. Sources of information about drought were relatively similar across stakeholder groups. Stakeholders primarily rely on media and field observations to form their views on drought. They also use surveys of rainfed agricultural systems and information on drinking water availability, pests and diseases.

Stakeholders related drought impacts to a wide range of sources of vulnerability and provided suggestions on how to address them. Overall, these related to

- economic drivers of agriculture-sector vulnerability, such as lack of access to finance and markets and energy and fertilizer costs;
- environmental degradation associated with local industrial activities as well as climate change and its impact on hydrological systems;
- grievances about inequitable distribution of costs and benefits of local industrial activities; and
- social safety nets including those related to livestock veterinary services and rural communities' food security, and in relation to Covid-19 impacts.

The findings of this study highlight the importance of triangulating drought monitoring information from satellite- and model-derived sources with information provided by local reporters representing various stakeholder groups to understand the nuances of drought impacts and sources of vulnerability. On the basis of these findings and our learnings from the process we used, we developed a refined drought impact reporting form that can be used in future impact assessments in Jordan alongside Drought Monitor information outputs.

ملخص تنفيذي

ان الغرض من هذه الدراسة لبرنامج منطقة الشرق الاوسط و شمال افريقيا للجفاف هو تقييم الآثار الزراعية لجفاف ٢٠٢٠-٢٠٢١ وتقديم المشورة بشأن تعويضات المزارعين في محافظة الطفيلة في الأردن. كما شارك في هذه الدراسة **اللجنة الفنية المعنية بالجفاف**[1] ، وهي مجموعة عمل تم تشكيلها لإدارة مخاطر الجفاف، و ذلك للتحقق من صحة ومعايرة مؤشر الجفاف الأردني لمناطق البادية (المراعي القاحلة) وتطوير أداة عملية لالمسح المراسلين المعنيين بتأثير الجفاف لاستخدامها في المستقبل.

قمنا بتقييم الأنظمة الايكولوجية وموارد المياه والسياق الاجتماعي والاقتصادي لمحافضة الطفيلة ، وحلّلنا تاريخ الجفاف من خلال دراسة إحصاءات هطول الأمطار والإنتاج الزراعي ، وأجرينا بحثًا تشاركيًا مكثفًا شمل ١٣ مقابلة رئيسية مع كبار المسؤولين الحكوميين المحليين و ١٤ مناقشة جماعية مركزة مع ٩٤ عضوًا في المنظمات غير الحكومية ذات الصلة بالزراعة.

تشير بيانات هطول الأمطار إلى الاتجاه نحو جفاف طويل المدى وشديد في الطفيلة حيث انخفض هطول الأمطار من متوسط سنوي يبلغ ٢٤٠ ملم إلى ١٥٥ ملم على مدار ٤٣ عامًا الماضية. ومع ذلك، فإن منتجات هطول الأمطار المشتقة من الأقمار الصناعية، مثل (مجموعة مخاطر المناخ بالأشعة تحت الحمراء مع بيانات المحطة[2]) و (الاسترداد المتكامل من الأقمار الصناعية المتعددة لقياسات الهطول[3])، لا تعكس بدقة هذه الظروف المرصودة في المحافظة. تشمل أعمق حالات الجفاف المسجلة خلال هذه الفترة (التي تم تقييمها باستخدام بيانات المحطات لحساب مؤشر هطول الأمطار الموحد الزراعي) تلك التي حدثت في الفترة الممتدة من ١٩٩٨الى ٢٠٠١ والجفاف الذي حدث سنتي ٢٠٢٠-٢٠٢١ ، عندما لم تتلق البنية التحتية لتخزين المياه السطحية أي تدفقات تقريبًا ، و القليل الذي وصل سرعان ما تبخر.

كان إنتاج الحبوب (خاصة الشعير) هو الأكثر تضرراً خلال فترات الجفاف التي حدثت سنة ١٩٩٤، و في مطلع الألفية (١٩٩٨-٢٠٠١) وفي ٢٠٢٠-٢٠٢١. انخفضت قطعان الماشية بنسبة ١٦٪ بسبب جفاف الألفية وبنسبة ٥,٣٪ خلال جفاف ٢٠٢٠-٢٠٢١ - على الرغم من أن بعض الرعاة أفادوا بخسائر تزيد عن نسبة ٣٠٪. وشملت العوامل المحركة لهذه الآثار على الثروة الحيوانية فترة الرعي المحدودة، وتكاليف النقل للوصول إلى المياه من المصادر العامة، وتكلفة شراء المياه من الآبار الخاصة وتكلفة العلف. تنجم وفيات الحيوانات في المقام الأول عن سوء التغذية والأمراض المعدية التي تسبب وفيات الفترة المحيطة بالولادة، كما أن معدلات الخصوبة بعد الجفاف تنخفض لدى القطعان لبعض الوقت.

كان لمجموعات أصحاب المصلحة تصورات مختلفة حول شدة الجفاف وترتيب أولويات آثاره، كما هو موضح في الجدول أدناه:

مجموعة أصحاب المصلحة	شدة الجفاف	آثار الجفاف ذات الأولوية	آثار مصدر المياه ذات الأولوية
المسؤولون الحكوميون	من معتدل الى شديد	الثروة الحيوانية والغابات	السدود والآبار
صغار المزارعين	استثنائي / كارثي	المراعي	البرك والسدود
الشركات التي تقودها النساء	معتدل	الزراعة المروية وتوافر مياه الشرب	السدود
الشركات التي يقودها الشباب	من شديد إلى استثنائي / كارثي	الزراعة المروية وتوافر مياه الشرب	الينابيع
العمّال	من شديد إلى استثنائي / كارثي	توافر الموارد المائية	الآبار
الرعاة	شديد	الماشية	البرك والسدود
مزارعو الحبوب	شديد	الزراعة المروية وتوافر مياه الشرب	البرك والسدود
المزارعون التجاريون	شديد	المراعي	البرك والسدود

[1] (DTC)
[2] CHIRPS
[3] IMERG

وجدنا أن تصورات الشباب والعمال لشدة الجفاف كانت الأقرب إلى خرائط مراقبة الجفاف حيث كانت تصورات المزارعين أصحاب الحيازات الصغيرة أقرب إلى الخرائط من تصورات المسؤولين ، الذين كانوا يميلون إلى النظر إلى الجفاف على أنه ليس بتلك الخطورة. و كانت مصادر المعلومات حول الجفاف متشابهة نسبيًا بين مجموعات أصحاب المصلحة حيث يعتمد أصحاب المصلحة في المقام الأول على وسائل الإعلام والملاحظات الميدانية لتكوين وجهات نظرهم حول الجفاف. كما انهم يستخدمون دراسات استقصائية للنظم الزراعية البعلية ومعلومات عن توافر مياه الشرب والآفات والأمراض.

ربط أصحاب المصلحة آثار الجفاف بطائفة واسعة من مصادر الضعف وقدموا اقتراحات حول كيفية معالجتها. وبشكل عام، تتعلق هذه الاقتراحات ب :

- الدوافع الاقتصادية لضعف قطاع الزراعة ، مثل الافتقار إلى الوصول إلى التمويل والأسواق وتكاليف الطاقة والأسمدة.
- التدهور البيئي المرتبط بالأنشطة الصناعية المحلية بالإضافة إلى تغير المناخ وتأثيره على النظم الهيدرولوجية.
- المظالم بشأن التوزيع غير العادل لتكاليف ومزايا الأنشطة الصناعية المحلية.
- شبكات الضمان الاجتماعي بما في ذلك تلك المتعلقة بالخدمات البيطرية للماشية والأمن الغذائي للمجتمعات الريفية، بالإضافة الى تلك المتعلقة بتأثيرات الكوفيد-١٩.

ان نتائج هذه الدراسة تسلط الضوء على أهمية الحصول على معلومات مراقبة الجفاف من مصادرمختلفة مشتقة من الأقمار الصناعية والنماذج مع المعلومات المقدمة من المراسلين المحليين الذين يمثلون مجموعات أصحاب المصلحة المختلفة لفهم الفروق الدقيقة في آثار الجفاف ومصادر الضعف. و بناءً على هذه النتائج وما تعلمناه من العملية التي استخدمناها ، قمنا بتطوير نموذج إبلاغ مُحسَّن عن آثار الجفاف يمكن استخدامه في تقييمات الآثار في المستقبل في الأردن جنبًا إلى جنب مع مخرجات معلومات مراقبة الجفاف.

1 Introduction

1.1 The MENAdrought Context

The MENAdrought project supports key stakeholders in Jordan's Ministry of Water and Irrigation (MWI), Ministry of Agriculture (MoA) and other agencies involved in the Drought Technical Committee (DTC), which is a multidisciplinary working group constituted to manage drought risk.[4,5] The DTC holds monthly meetings during the wet season from December to May to assess drought onset, progression and termination based on the Drought Monitor (DM) output maps (Bergaoui et al. 2022; Jobbins et al. 2022). This assessment, as well as any decision-making on drought management responses, is structured by the Jordanian Drought Action Plan (MWI 2022) that the DTC has developed with the support of MENAdrought[6].

The DM was initially calibrated and validated to monitor agricultural drought in the semi-arid to subhumid agroecological zones of the Jordanian highlands and the region near Amman. The DM accurately reflects drought impacts on rainfed and irrigated agriculture in these areas—as has been ascertained over the past three years by DTC members with expert knowledge of ground conditions. However, experience with the Drought Monitor of the USA indicates that effective monitoring in arid areas requires feedback and reporting from regional expert networks.[7]

In Jordan, the *Badia* and desert agroecological zones—which are arid to hyper-arid—support the livelihoods of many rural households and tribes, including some of the most vulnerable communities and people in several prominent 'poverty pockets'. The specific environmental conditions of these areas necessitate additional calibration and validation of the DM, incorporating inputs from regional experts. Such expert networks can help confirm drought dynamics and report impacts, especially on vulnerable communities. It would also support technical specialists in further calibrating and improving the DM.

1.1.1 Background to the Study

The 2020-2021 agricultural season witnessed the outbreak of a relatively localized but intense late-spring drought. According to the DM, the western part of Tafilah Governorate met the Jordanian Drought Action Plan's triggering criteria for 'severe' drought conditions in both April and May 2021 with anomalies of vegetation conditions and evapotranspiration proxies indicating a particularly intense drought, as shown in Figure 1. The Jordanian Drought Action Plan stipulates that the occurrence of two months of 'severe drought' in the late spring meet the criteria for an 'emergency drought response' to address likely drought impacts on people living in poverty and on critical sectors including agriculture and water supply.

However, local authorities stated that the drought was in fact more intense and widespread than the DM indicated, and that impacts on agriculture and water resources were reaching a crisis level across the governorate.

[4] For more information about the MENAdrought project, see https://menadrought.iwmi.org/.
[5] Note that one of the authors of this publication, Ali Ghanim, is the current chair of the DTC, and another author, Emad Al-Karablieh, is an advisory member of and facilitator for the DTC.
[6] The Jordanian DAP is available here: https://menadrought.iwmi.org/wp-content/uploads/sites/44/2023/02/combined_jordan_dap.pdf
[7] For example, the US Drought Monitor impact reporting webtool is available here: https://droughtimpacts.unl.edu/Tools/ConditionMonitoringObservations.aspx

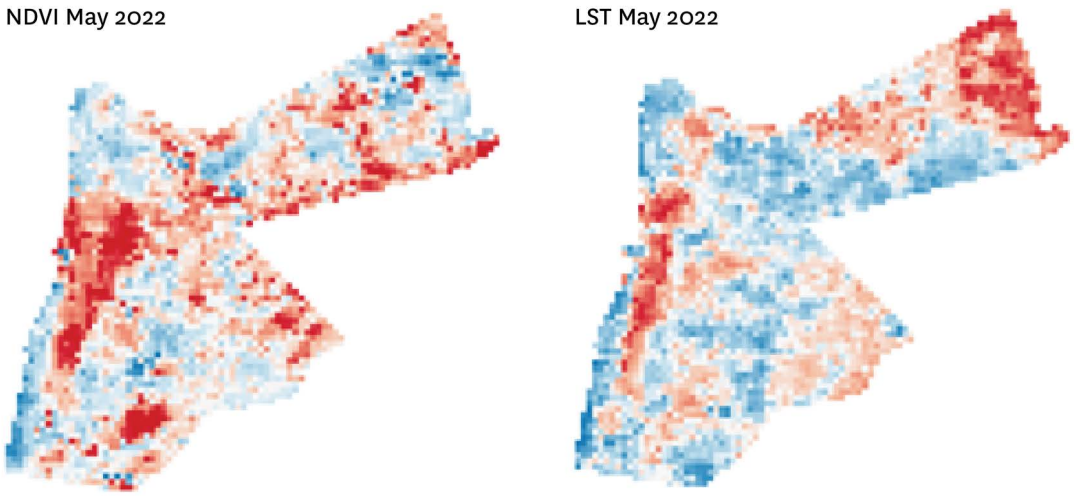


Figure 1. Normalized Difference Vegetation Index (NDVI) and day-night land surface temperature (LST) flux anomalies for May 2021. These are two of the four components in the Drought Monitor, the others being precipitation and soil moisture anomalies.

1.1.2 Purpose of the Study

At the request of His Excellency the Jordanian Minister of Agriculture, the DTC initiated a field impact assessment with the primary goals of

- assessing and informing the MoA about drought-related damage; and
- advising the MoA on compensation for farmers through the Takaful program (NAF 2020).

Further, we used the study to support the wider ongoing activities of the DTC in order to

- validate and improve the calibration of the DM for *Badia* and desert areas;
- develop a case study of drought impacts and sources of vulnerability in a *Badia* area; and
- pilot and refine a survey tool and repeatable procedure for Drought Impact Reporting (DIR) to be used more widely in Jordan on a regular basis, or at least when drought episodes occur.

To achieve these goals, the authors conducted, from March to May 2022, a rapid assessment in Tafilah of the following components:

- **The Tafilah context and stakeholders:** The government, community (farming and otherwise), and business organizations, and their relationships with the agricultural, environmental and socioeconomic characteristics of the area;
- **Drought impacts:** (a) Historical occurrence of drought and its impacts as inferred from precipitation and agricultural production statistics; and (b) recent agricultural, environmental, social and economic impacts of drought on stakeholders in the Tafilah Governorate, with impact reporting focused on agriculture-related activities inclusive of rangelands, cereal-livestock integrators and limited-area groundwater-based irrigated systems;
- **Underlying sources of drought vulnerabilities:** Underlying vulnerabilities that increase the stakeholders' sensitivity to the noted impacts; and
- **Resilience and response:** Local needs to strengthen stakeholder resilience to drought impacts.

Our initial findings were shared with the Minister of Agriculture in April 2022, who decided to provide financial relief through the Takaful program to the most vulnerable farmers (smallholder growers).

1.1.3 Structure of the Report

This report is structured as follows:

- **Section 2** describes the drought context in Tafilah Governorate in relation to water resources, agricultural production and finance, and socioeconomic characteristics;
- **Section 3** describes the methods used to assess historical drought occurrence and impacts, as well as drought impact reporting;
- **Section 4** describes the results of our assessment of drought history;
- **Section 5** describes results from the drought impact reporting; and
- **Section 6** provides brief conclusions and recommendations.

The annexes to this study include a recommended future DIR survey instrument (in English) as well as the survey instrument piloted in this study (in Arabic).

2 The Tafilah Context

2.1 Agricultural, Water and Socioeconomic Characteristics

2.1.1 Demographics

The Tafilah Governorate has three sub-districts: Qasabah (the capital district), Busera and Al-Hasa. The estimated population in 2020 was 111,217 (52.4% female) within 21,843 households. About 98% of the people are Jordanians (national ID holders) and 2% are Syrians. The majority of the population (78%) live in the 37 villages of the three sub-districts, and 66% of the total population live in Qasabah. Population forecasts for 2050 project a growth of 82%. This would put pressure on the public sector including a greater demand for water resources.

2.1.2 Labor Market and Educational Institutions

The Tafilah Governorate has the highest overall unemployment rate (43%) in Jordan, with about 59.3% of women and 16.2% of men unemployed (DOS 2019). Apart from farming, men are mainly employed in the public security, military and civil defense subsector, or in industry and manufacturing, in particular at the local cement factory. The Tafilah Technical University is the only higher academic institution in the governorate. It has no courses or activities explicitly related to water, agriculture or the environment.

Land cover and agricultural systems. About 61% of Tafilah's area is used for agriculture (rangelands and rainfed and irrigated crops). Rainfed systems including cereal areas and rangelands cover 36,700 ha (of which 37% is used for cereal cultivation), mainly in the middle and western highlands of the governorate. Irrigated cropping systems cover 2,554 ha (80% of which is used for growing winter and summer vegetables, and the rest for olives and stone fruits). Figure 2 shows the land cover map of Tafilah.

Agriculture accounts for about 25% of Tafilah's gross domestic product (GDP). The dominant farming typologies (in terms of the number of farming households) are transhumant herding systems and livestock-cereals (wheat and grazing barley) integrators. The regional livestock herd includes 150,000 heads of sheep and goats, 160 cows and 66 poultry farms. Irrigation water is mainly used in olive plantations (75% of abstraction). Vegetable production is for family consumption or sale along the main roads of the district capital town—because there is no marketplace for produce in the governorate.

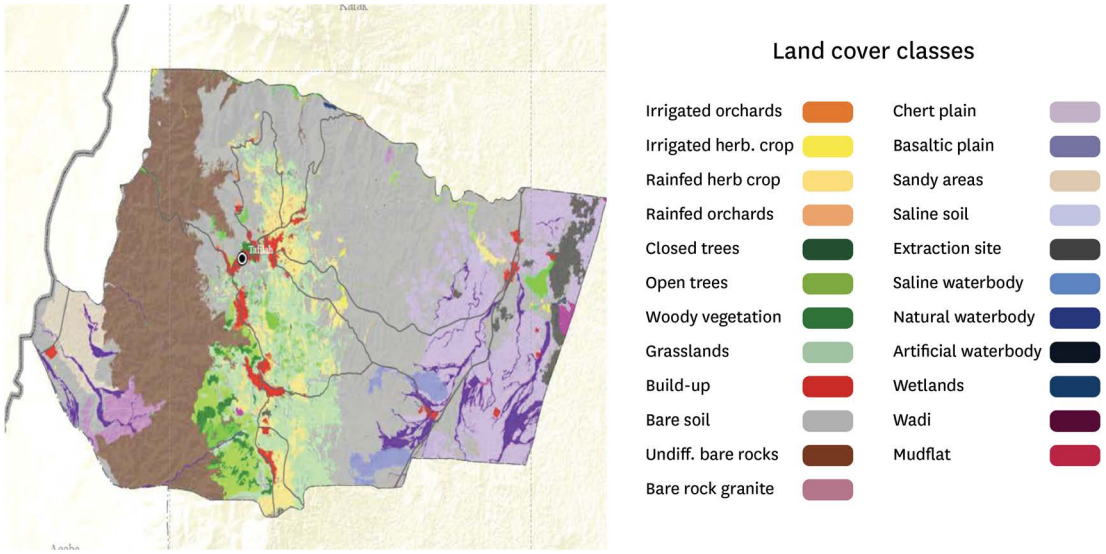


Figure 2. Land cover map of Tafilah (Franceschini et al. 2019).

Water resources. Tafilah's municipal water supply is managed by the Water Authority of Jordan (WAJ), the national utility. It includes three supply and distribution systems:

- The Tafilah main water system (5 wells and 15 reservoirs) serving Tafilah city and nearby villages;
- The Jurf Ad Darawish water system (1 well and 2 reservoirs) serving Jurf Ad Darawish village; and
- The Hasa Al Balad water system (2 reservoirs) serving Al-Hasa village.

Water supply is prioritized for domestic water. Total supply by WAJ in 2020 reached 8.3 million cubic meters (MCM), per capita consumption being 123 liters/day, which is close to the national government's target for water consumption.

Total groundwater abstraction—primarily for municipal supply and then for irrigation—is estimated to be about 7.16 MCM/year. The total capacity of the main dam, Al-Tannour, is around 16.8 MCM, though annual inflows are highly variable and in drought years can fall as low as 10% of this volume. Water from this dam is primarily destined for irrigation and mining as well as industry (3.5 MCM/year allocated for mines). Treated wastewater production is around 0.7 MCM/year, and the 12 rainwater harvesting ponds meant for livestock water have a storage capacity of 0.3 MCM.

2.2 Access to Finance and Aid

2.2.1 Agricultural Finance

The Agricultural Credit Corporation (ACC) is the main formal financial institution operating in Tafilah.[8] It provides operational credit to farmers. Nationwide, its lending totaled 53.6 million Jordanian dinar[9] (JOD) during the period 2016-2021, of which about JOD 2.66 million went to 727 borrowers (29% female) in Tafilah. Of the total amount, about 88% was for short- to medium-term loans (2-6 years on average) for food processing, livestock, inputs and land reclamation. Table 1 provides more detail on ACC loans in Tafilah and nationally.

[8] For more information on formal, semi-formal and informal agricultural finance institutions and agricultural finance market dynamics, see Belhaj Fraj et al. (2022).
[9] About USD 75.6 million.

In Tafilah, the ACC deals extensively with smallholders (farms less than 3 ha); in 2020, they constituted 80% of total lending, and landless farmers and medium-sized farmers received 2% and 6%, respectively. The ACC primarily provides small loans (under JOD 5,000) and competes with microfinance institutions, which are in turn in competition with community-based organizations that access donors' funds. Interest rates range from 4% to 9%.

The bank also finances family businesses and young engineers (37% women) with credits of JOD 3,000-5,000, primarily in the food processing and marketing category.

Table 1. ACC loans disbursed in Tafilah Governorate and nationally during the period 2016-2021.

Loan type	Tafilah (JOD)	Jordan (JOD)	Tafilah loans %
Food processing and marketing	958,900	16,124,070	5.9
Livestock	783,856	15,069,601	5.2
Farm inputs (horticulture and livestock)	739,480	10,518,394	7.0
Land reclamation	122,925	5,710,147	2.2
Water resources development/irrigation technology	25,300	3,134,645	0.8
Rural finance	5,000	1,822,600	0.3
Agricultural machinery	29,000	1,278,340	2.3
Total loans	2,664,461	53,657,797	5.0

2.2.2 Aid

The Government of Jordan operates two main potential sources of drought-related aid funding: the Agricultural Risk Management Fund and the programs of the National Aid Fund (NAF), including the Takaful program.

The Agricultural Risk Management Fund was created in 2009 and its enabling legislation was amended in 2015.[10] Since then, it has compensated farmers in Tafilah once, for frost damage to crops in 2017. The Government of Jordan has not operationalized the fund in relation to drought; in 2018 it called upon the Ministry of Planning and International Coordination to support the establishment of mutual insurance, but to date there have been no concrete developments in that direction.

The Takaful program has been operational since 2019. It is part of the National Aid Fund which was established in 1986 to support disadvantaged Jordanian families. Takaful provides cash aid to families below the poverty line (currently under 13.1% of the total population). Through mid-2020, the NAF provided a total of JOD 200 million as aid to 55,000 eligible families, with a projected additional 30,000 families supported in 2021 to recover from Covid impacts. The NAF has an overall target of assisting 0.75 million people, about 50% of the poor population of Jordan.

In Tafilah, Takaful has provided 1,493 households (5,438 people) total assistance of JOD 108,755. This is the lowest amount spent in any governorate. However, it is supplemented by Urgent Cash Transfer Fund payments to 709 households (3,600 people) totaling JOD 133,844. Also, Occasional Targeted Assistance Programs for disasters and

[10] Amended via Law No. 42 of 2015: Available at: http://extwprlegs1.fao.org/docs/pdf/jor123868.pdf

natural calamities have given, on average, JOD 7,400 per month to 35 families (175 people), and the Intermediate Aid Program, on average, gave 128 households (640 people) JOD 2,829 per month to cope with unusual circumstances for a short period. Tafilah does not have a preferential ranking for these aid programs.

2.2.3 Farmer-led Poverty Reduction

Reduction in the type of rural poverty predominant in Tafilah can be achieved through farmer-led development. Technical assistance (e.g., extension and advisory services) and access to financial instruments (credits, loans and insurance products) for smallholders and medium-sized farms can increase employment and boost incomes. Further, assistance for smallholders to aggregate into community-based organizations can improve their earning potential and resilience to negative climate change impacts such as increased frequency and intensity of droughts. Drought Impact Reporting is an opportunity to highlight the fragile status of the local agricultural-based economy and develop long-term mitigation and adaptation interventions.

3 Method

3.1 Drought History and Impacts

For the purposes of this study, we assessed the history of drought events in Tafilah during the period 1994-2021 using annual precipitation statistics and the agricultural Standardized Precipitation Index (aSPI; Tigkas et al. 2022; McKee et al. 1993). The aSPI employs the concept of effective precipitation and removes low-value precipitation events; so, it reflects the amount of water that contributes productively to plant development. Further, we assessed the history of annual barley and wheat production as a proportion of the maximum during 1994-2021. We did not, however, assess quantitatively the historical impacts of drought on water resources or human health (Fragaszy et al. 2022).

3.2 Impact Reporting on the 2020-2021 Drought

For our assessment of the impacts of the 2020-2021 drought, we undertook a staged process of participatory research, as explained below. Table 2 summarizes the participatory research components, stakeholder types and number of participants.

Table 2. Summary of participatory research for impact evaluation of the 2020-2021 drought.

Research component	No. of participants	Stakeholder type	No. of surveys completed
Group meeting 1	4	Local government	N/A
Group meeting 2	10	Local government, NGOs	N/A
Key informant interviews	13	Local government	13
Focus groups (14)	96	NGOs	14

3.2.1 Step 1: Desk Research

To start with, we conducted desk research on the agricultural, water and socioeconomic features of the study region, relying on secondary data obtained from the Government of Jordan on agricultural production and the water supply-demand balance for 20 years leading up to 2020-21. We focused on priority drought impacts as enumerated in the Jordanian Drought Action Plan (MWI 2022): Water resource degradation, declining quality of drinking water services, production losses in irrigated agriculture, rainfed agriculture and livestock, rangelands and forest degradation, and incidence of diarrheal diseases as well as social development constraints.

3.2.2 Step 2: Developing the DIR Method and Survey Form

We then developed a DIR method and survey form to collect the research participants' views on:

- drought location and intensity, with drought intensity characterized as moderate (10-year return period), severe (20 years), exceptional (20-50 years), or catastrophic (over 50 years);
- priority drought impacts;
- underlying causes of vulnerability to those impacts; and
- local needs in terms of (a) responses to the immediate drought, and (b) increasing local resilience over the longer term.

The primary participants in this research were local government decision-makers (whose perceptions were recorded primarily through key informant interviews and secondarily through the survey forms) and the impacted communities (whose responses were recorded primarily through the survey and focus group discussions and secondarily through data contextualized by a comparatively small number of key informant interviews). We also developed a work plan for the implementation of the study. See Annex A for the survey instrument we used.

3.2.3 Step 3: Administrative Arrangements

We then made administrative arrangements with the central and local governments for conducting a series of general interviews and to share our wider research plan for collecting feedback from vulnerable farming communities. Annex B describes in greater detail the process of securing these administrative arrangements and agreements.

3.2.4 Step 4: Initial Group Meetings

Following the agreement process described in Annex B, we held two group meetings in Tafilah. The first, held at the Office of His Excellency the Deputy Governor, included HE the Deputy Governor and several government officials, and focused on clarification of the work plan and discussion of strategic issues related to the water, agriculture and socioeconomic context of Tafilah.

Immediately thereafter, a second group meeting was held in the Office of the Director of the Regional Department of Agriculture (RDA). The participants included five government officials and five representatives of NGOs working on ecology and agriculture (Table 3). This meeting focused on identification of study participants and discussed underlying vulnerabilities and recommendations to reduce drought impacts in the future.

Table 3. Participants in the second group meeting held on March 1, 2022.

Tafilah participants	Gender
Bani Dhana association of herders	M
Ecology researcher of Dhana Association	M
Vet doctor of RDA	M
Director of Agriculture	M
Head of RDA	M
Head of farmers' association	M
Sakr Albil Association	M
Director of Dhana reserve	M
Head of Bisra ecology association	M
Cereal production at RDA	M

Project team	Gender
Jordan University representative	M
Tafilah survey team member	M
Ecology and gender specialist	F
MWI representative	M
USAID Project Management representative	M
IWMI consultant	M

3.2.5 Step 5: Key Informant Interviews with Officials and Focus Group Discussions with NGOs

In March and April 2022, we conducted 13 key informant interviews with local government officials (Table 4) and held 14 focus group discussions with members of local NGOs (Table 5) and key vulnerable communities, which included:

- smallholder, subsistence and poor farming families and herders;
- irrigated commercial farms and agri-food businesses;
- youth and women-led rural families; and
- refugees, immigrants and the working class.

The interviews and focus group discussions followed the structure and content indicated in the survey form shown in Annex A, and the authors filled in the survey form using data generated in the interviews and discussions.

During the focus group discussions, participants typically spoke amongst themselves and then the group leader (the characteristics of whom are shown in Table 5) provided a final consensus-based response to our questions. Thus, the survey responses generated from key informant interviews (with government officials) represent a single individual's perspective whereas the survey responses generated from focus groups (NGOs) represent a group perspective. However, the data were not treated differently in our analysis.

In all, the 27 survey respondents[11] represent the views of 13 (48%) local government officials, 6 (22%) cooperative groups, 5 (19%) commercial farming groups (18%), and 3 (11%) vulnerable and female farming groups. Only two of the government officials and three of the NGO representatives were women; we attempted to address this general gender imbalance by conducting specific focus group discussions with women-led farming families and organizations.

There were no active donors or development agencies in Tafilah during the period of our assessment (March-May 2022); so we could not elicit their perceptions as a stakeholder group. All participants included in our interviews and discussions were experienced and able to provide their perceptions on drought severity, coverage and impact, and meaningfully discuss the underlying vulnerabilities to drought impacts in the three sub-districts of Tafilah.

[11] Treating each focus group as one respondent.

Table 4. Jordanian government officials interviewed for the study.

Participants	Age	Experience (years)	Gender	Sub-district
Head of Agriculture Directorate	53	29	M	Tafilah
Administrative employee	36	15	M	Qasabah
Environmental engineer	36	5	F	Tafilah
Director of Health	57	28	M	Qasabah
Director of Tannour dam	51	26	M	Al-Hasa
Director of development	52	28	M	Qasabah
Director of water department	45	12	M	Al-Hasa
Head of municipality	68	40	M	Busera
Social Development Department	32	7	M	Qasabah
Local development directorate	37	8	M	Qasabah
Director of a directorate	56	30	M	Qasabah
Technical engineer	33	5	M	Al-Hasa
Technical engineer	31	10	F	Busera

Table 5. Key focus group discussions with cooperatives, commercial farmer groups and vulnerable groups of farmers and women.

Stakeholder category	Sub-district	No. of participants	Age	Experience (years)	Interviewee gender
Women-led farming families	Tafilah	8	41	7	F
Livestock farmers	Busera	6	54	20	M
Olive farmers' association	Busera	5	40-65	20	M
Refugee labor and foreign labor	Busera	8	20-50	20	M
Livestock producers	Tafilah	8	50-70	25	M
Livestock producers	Al-Hasa	6	40-60	20	M
Smallholder farming families	Tafilah	8	47	10	M
Medium-sized farms	Tafilah	4	35	9	M
Women-led farming families	Al-Hasa	6	25-35	10	F
Livestock producers	Busera	6	25-40	12	F
Cereal farmers	Al-Hasa	10	50-70	15	M
Smallholder farming families	Busera	5	50-70	20	M
Youth-led businesses	Al-Hasa	9	25-39	5	M
Smallholder farming families	Busera	7	50-60	30	M

3.2.6 Step 6: Survey Analysis

Qualitative analysis. We separately analyzed data collected from government officials (both from group meetings and key informant interviews) and NGOs and summarized the findings in terms of four analytical categories as indicated in Step 2: perception of the drought, priority drought impacts, underlying causes of vulnerability to those impacts, and local needs in terms of (a) immediate response to the drought, and (b) increasing local resilience over the longer term.

On the basis of these findings, we produced a list of recommendations for best fit and realistic response actions to undertake during a future drought, and suggested preparedness and mitigation measures to reduce vulnerability to drought. This list of recommendations, along with a description of the progression of the 2020-2021 drought, formed the core of the Official DTC Note to the MoA.

Quantitative analysis. We also carried out multivariate analyses of the survey data, including principal component analyses (PCA), using the packages FactoMineR and factoextra in R 4.2.0 software. These are the primary results shown in this publication. PCA analyses display the plot of factors, with vectors corresponding to variables, and the plot of individuals corresponding to stakeholder groups. Biplots are also generated with a joint projection of vectors/factors and stakeholder groups. All figures correspond to significant PCAs with the first and second components, PCA1 and PCA2, gathering the maximum variance.

3.2.7 Step 7: Outputs

In addition to the Official DTC Note mentioned above, we also produced a simplified Drought Reporting Form as shown in Annex C and an accompanying methods note.

4 Results: Drought History and Historical Impacts

4.1 Drought History and Climatology

Our assessment of drought history based on precipitation indicators showed that the dry years correspond to negative aSPI values and the wet years to positive ones (Figures 3 and 4). Moderate, severe and exceptional droughts correspond, respectively, to aSPI values of -0.1 to -1, -1 to -1.5 and below -1.5.

The drought in Tafilah that occurred at the turn of the millennium (1998-2001) demarcates two distinct periods of precipitation patterns—which suggests a long-term climate change. Annual precipitation shows a drying trend, with a decline from 240 mm/year to 155 mm/year over the past 43 years (Figure 3).

The time series of annual aSPI values indicates a frequency of dry years of about 50%. There were two exceptional droughts (with an aSPI value below -1.5): the drought at the turn of the millennium and the drought of 2020-2021.

Daily precipitation patterns from 1999 to 2021 suggest a long-term reduction in rainfall during the wet season (Dec-May). The driest winter during the period occurred in 2020-2021 (Figure 4).

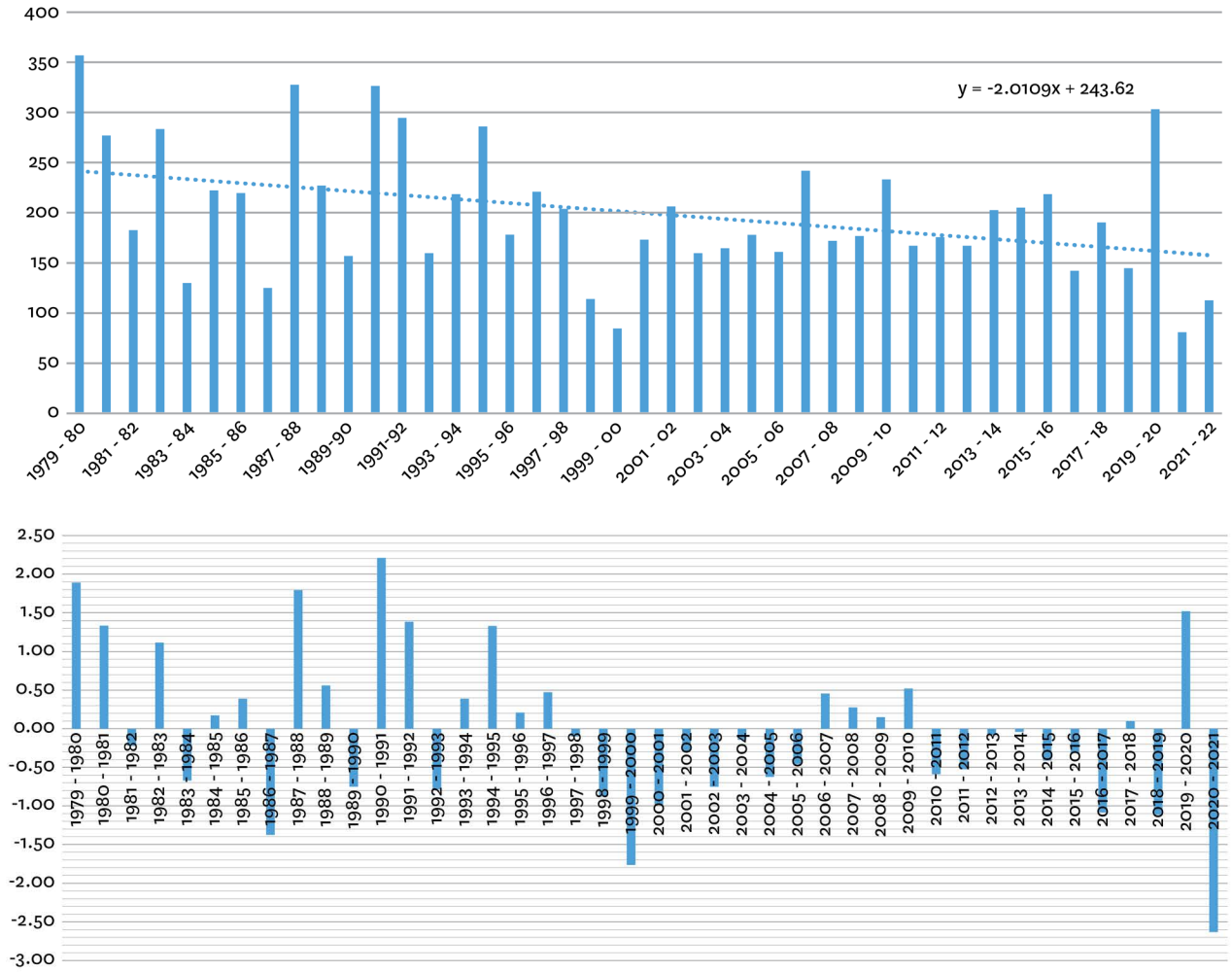


Figure 3. Annual precipitation (upper plot, mm/year) and aSPI (lower plot) values for the Jordan Meteorological Department (JMD) Tafilah station (Lat. 30.8475, Lon. 35.62694444, 1266 masl) for the period 1979-2022 and 1979-2021, respectively.

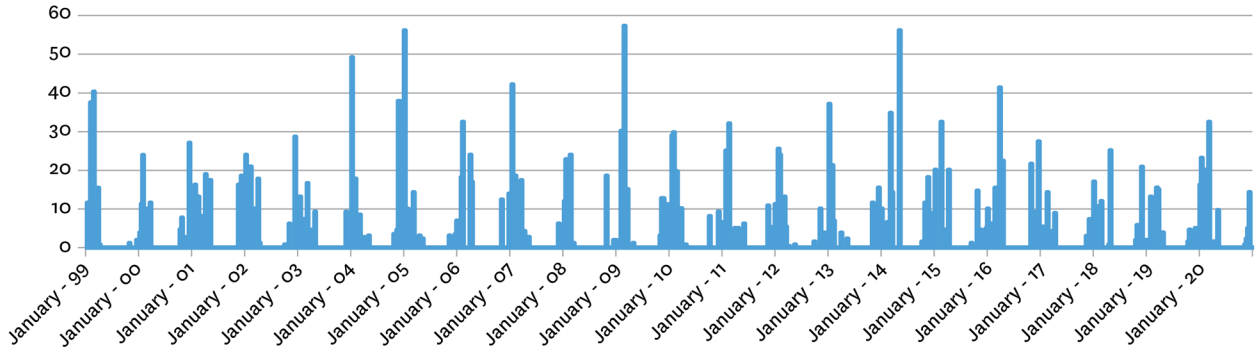


Figure 4. Daily precipitation (mm) recorded at the JMD Tafilah station for the period 1999-2021.

We also found that neither CHIRPS nor IMERG satellite-derived precipitation products accurately reflected the situation in Tafilah during this period. This finding is concordant with other studies (e.g., Nashwan et al. 2019) that have shown these products to be less accurate for arid and desert areas compared to other environments. The DM requires global data and, therefore, is reliant on satellite-derived products. This type of discrepancy is a primary reason why agencies are interested in enabling data assimilation from ground observations over time. Further, this problem highlights the need for collecting information through a DIR network.

4.2 Drought Impacts on Agriculture and Water Resources

4.2.1 Livestock

During droughts, the primary factors limiting livestock production in Tafilah include:

- the limited grazing period;
- transport costs of accessing water from the 12 water harvesting ponds of the Al-Hasa catchment and the wells belonging to the local water authority;
- the cost of purchasing water from private wells; and
- the cost of feed.

Governmental feed subsidies are given for concentrate, barley grain and bran but they are not specifically provided to mitigate drought impacts. Their distribution is mainly related to tribal influences and political measures, and irrespective of a farmer's individual herd size.

Animal mortality during drought is primarily due to malnutrition and infectious diseases (e.g., pox, brucellosis, clostridial and fungal diseases) that cause perinatal mortality. After a drought subsides, herds continue to have low fertility due to the congenital issues and hormonal imbalances caused by drought.

During the drought at the turn of the millennium, the total livestock herd in Tafilah decreased by 16%. The drought of 2020-2021 witnessed a herd mortality of 5.3%.

4.2.2 Cereals

In respect of crops, the biggest drought impact tends to be on cereal production (barley and wheat), which typically drops by 30-70% under moderate to exceptional drought conditions. Crop failure was highest in droughts experienced in the mid-1990s, at the turn of the millennium, in 2007 and 2020-2021 (Figure 5).

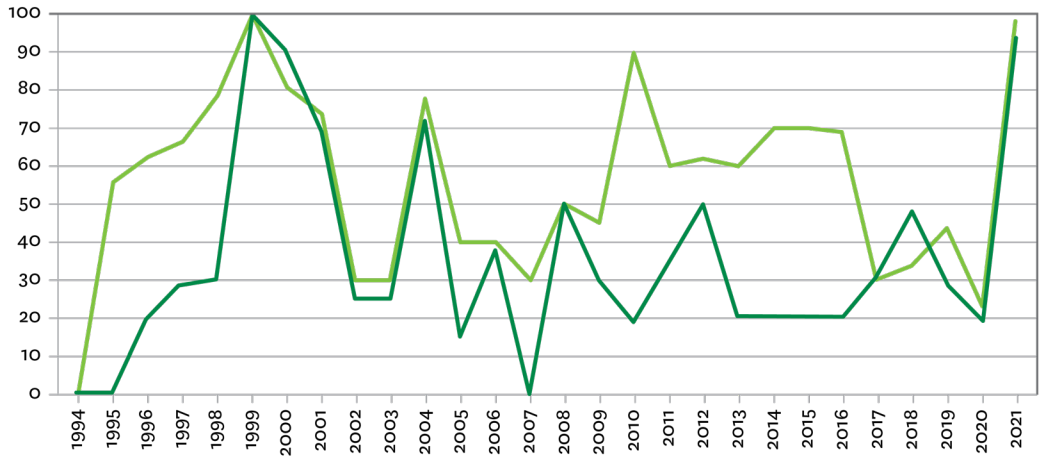


Figure 5. Barley (light green) and wheat (dark green) crop production in Tafilah Governorate as a percentage of the maximum during 1994-2021. (Note: The agricultural year corresponds to the beginning of the season [i.e., 2020 in the figure refers to the drought of 2020-2021)).

4.2.3 Water Resources

Drought significantly affects surface water storage due to reduced inflows and increased evaporation (Figure 6). Impacts in the form of groundwater depletion were noticed in several areas, but quantitative data were not available to assess this further. There was also no data available on drought-driven water, sanitation and hygiene (WASH) impacts

on human health, including diarrhea. Climate change projections indicate that water supply requirements in Tafilah will increase by 4 MCM to 9 MCM between 2025 and 2050.

Figure 6. Water storage in the Tannour dam (on wadi Hasa) seen in September 2020, following a wet year, and September 2021, following a severe drought. (*Photo:* Emad Al-Karablieh)

5 Results: Participatory Research

5.1 Group Meetings

In this section we present the primary impacts mentioned, and interventions requested, by participants in the second group meeting, listed in chronological order as mentioned.

- **Water shortages:** Farmers' associations stated a need to drill artisan wells to irrigate fodder crops, and criticized the slow government response to drought.
- **Direct financial support:** Participants felt they should be able to reschedule ACC credits more easily and wanted the individual credit amount raised above JOD 20,000 per project.
- **Combination of drought effects and Covid-19:** The 2020-2021 drought was perceived as disastrous because it occurred during the Covid-19 outbreak, and government restrictions on movement associated with Covid-19 limited transhumant herders' mobility during a critical period, March-June 2021.
- **Livestock mortality and veterinary services:** Farmers' associations wanted veterinary services to be supported by the government to help maintain a critical mass of herd size—which decreased 5% overall due to the 2020-2021 drought, with some farmers losing up to 30% of their herds.
- **Energy and fertilizer costs, and corporate social responsibility:** Irrigated systems were affected by increases in energy costs (electricity and gasoline), which limited agricultural intensification. Although Tafilah has large wind turbines, the local population feel they do not benefit from them; they want to be given preferential electricity tariffs to be able to improve their household economies and reduce marginal production costs. Further, despite Tafilah hosting phosphate factories, local farmers do not benefit from subsidies or price discounts on fertilizer.

- **Industrial activities affecting water resources and air quality:** Several participants in the group meeting said the local cement factory's use of explosives was leading to the drying up of natural springs. Both farmers and ecology associations complained about the air pollution (dust/fine particulates) caused by the cement factory and wind turbines that adds to water stress for crops, rangelands and forests.
    - The cement factory dust is perceived to accentuate degradation of rangelands and natural reserves, increase the likelihood of fires, and otherwise limit the carrying capacity for herds and harm the flora and fauna in the Dhana Nature Reserve.
    - It is also felt to exacerbate and/or cause respiratory diseases with a high prevalence of chronic pneumonia and infection among vulnerable children and elderly people. Currently, there is no dedicated healthcare program to reduce airborne infections due to dust; in the past there used to be a $35 m grant to address such issues.
- **Access to market:** Participants also pointed out the absence of a local market for produce which forces them to sell vegetables on the roadside.
- **Access to finance for resilient crop varieties:** The main barley variety used in Tafilah, Deir Alla, has weak emergence because it is poorly adapted to local biophysical conditions. Some farmers requested access to finance to procure growth chambers for raising barley. This was presented as a way to limit illegal exploitation of rangelands, which contributes to desertification.
- **Ecosystem degradation:** All the participants were aware of the importance of biodiversity protection in rangelands and forests. They requested action by the Government of Jordan to protect the natural habitat of Tafilah.

Overall, access to water, markets and finance were the priority needs stated by the participants. They proposed several potential interventions to address water resource challenges including digging new wells, maintenance of the existing wells to sustain their productivity, building new water harvesting dams and ponds for direct use and groundwater recharge, use of treated wastewater, rehabilitation of water networks and protection of the public water network from vandalism, illegal connections and trespass.

5.2 Key Informant Interviews and Focus Group Discussions

5.2.1 Perceptions of Drought Severity and Extent

Government officials from the agriculture, water, environment, municipal and social development sectors reported perceptions of drought severity that were concordant with the DM outputs[12]. Most of the survey respondents classified the drought of 2020-21 in Tafilah as exceeding 'moderate' intensity and falling in the 'severe' or above category (Figure 7). Further, most of them judged the drought episode to have had a late onset with consecutive dry spring months, an observation that is concordant with the drought progression dynamic indicated by the DM outputs.

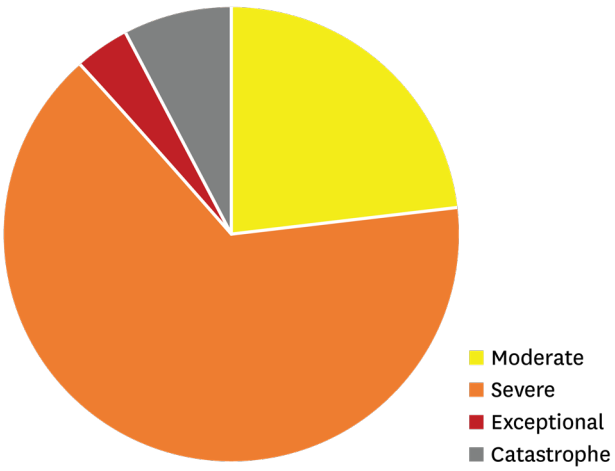


Figure 7. Perception of drought severity among interviewees.

Table 6 presents the percentage of area within Tafilah's three sub-districts that was affected by 'severe' and

[12] Among the key informant interviewees, only officials from the Ministry of Health did not comment on drought severity.

'exceptional' drought conditions in 2020-21, according to survey respondents. The sub-district Al-Ḥasa was almost completely affected by severe drought with herders in Jurf al-Darawish area suffering catastrophic effects on incomes. In Busera sub-district, Gharandal and Quadisieh were the most affected communities. The majority of survey participants said the MoA's early activation of payments under the Takaful program was justified.

Table 6. Percentage area of sub-districts that experienced 'severe' and 'exceptional' drought conditions.

	Sub-district	Area impacted (%)	Localities under catastrophic conditions
1	Al-Ḥasa	71	Jurf al-Darawish
2	Busera	59	Gharandal, Quadisieh
3	Qasabah	50	Abu Albana, Harir, Eimeh, Ein Bayda

The divergent perceptions of research participants on the percentage of area affected by severe drought leads us to conclude that future DIR must necessarily involve smallholders in each district.

5.2.2 Different Perceptions of Drought Severity Among Stakeholders

Our principal component analysis of survey responses (Figure 8) showed that the participants fell into three distinct groups, clearly differentiating into 'moderate', 'severe', and a combination of 'exceptional' and 'catastrophic' drought classes. Women-led businesses and cereal-growers tended to perceive the 2020-21 drought as 'moderate'; government officials, youth-led businesses, laborers, herders and medium-sized commercial farmers tended to see it as primarily 'severe'; and smallholder farmers perceived it as a combination of 'exceptional' and 'catastrophic' occurrence.

In terms of drought intensity, the perceptions of youth and laborers were closest to the patterns observed in the DM maps, which show more 'severe' drought classes than 'exceptional'; smallholder farmers' perceptions were closer to the DM outputs than those of officials.

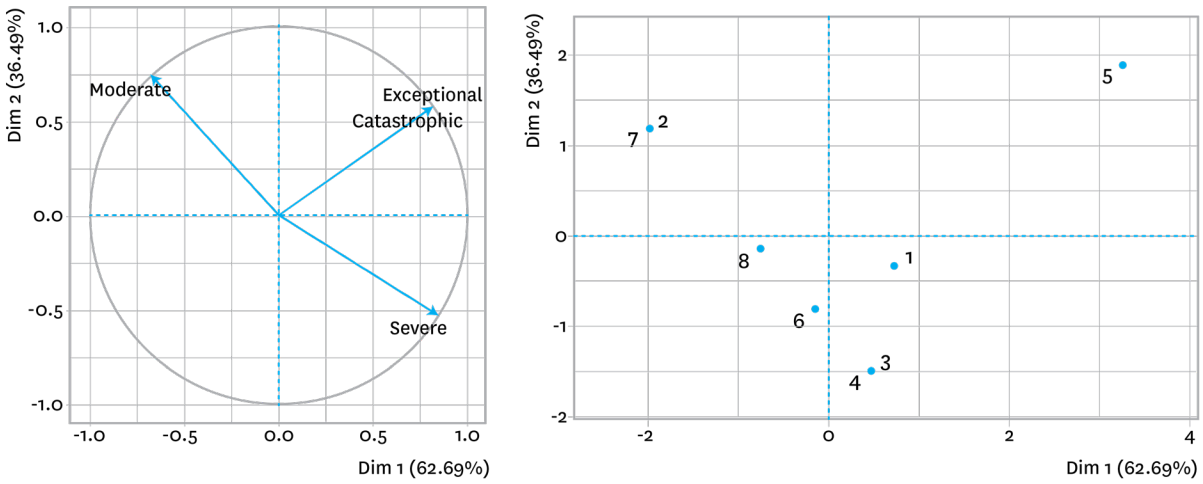
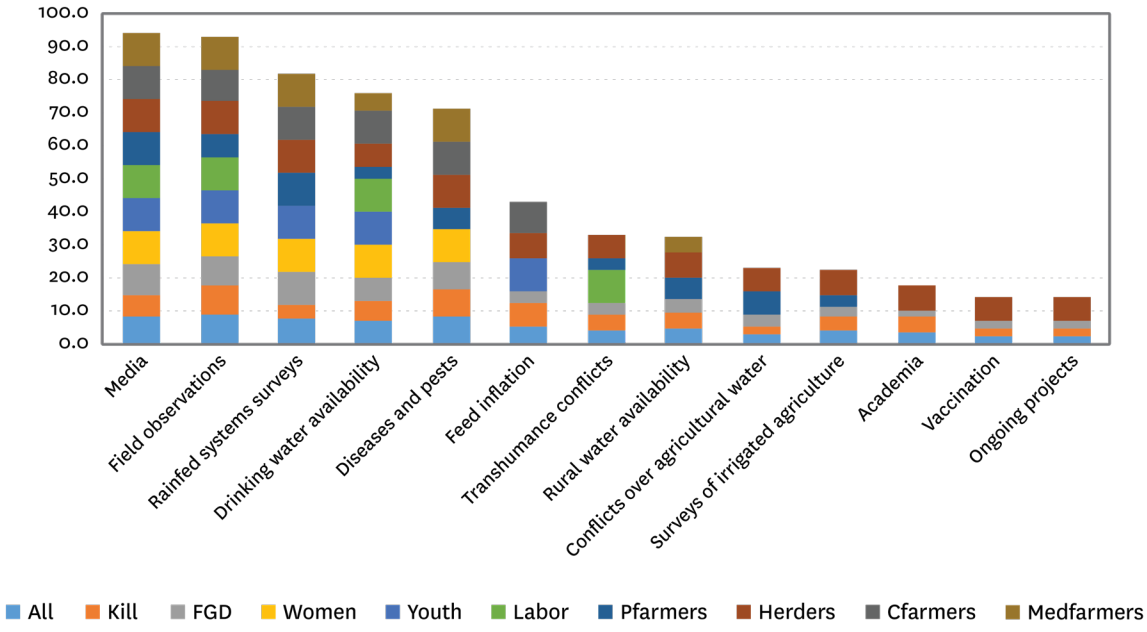


Figure 8. Principal component analysis of stakeholder perceptions of drought classes ('moderate', 'severe' and 'exceptional'). (Note: 1 = Government officials; 2 = Women-led businesses; 3 = Youth-led businesses; 4 = Laborers; 5 = Smallholder farmers; 6 = Herders; 7 = Cereal growers; 8 = Medium-sized commercial farms.)

5.2.3 Sources of Information About Drought

Stakeholders rely primarily on media and field observations to build their perceptions about drought. Additionally, they use surveys of rainfed agricultural systems and information on drinking water availability and pests and diseases

(Figure 9). Interestingly, information on feed price inflation seems not to be particularly relevant to evaluating seasonal drought impacts because the combined effects of recession and global market volatility contribute to feed price increases.



Figire 9. Sources of information on drought according to stakeholder type. (*Note:* All = all stakeholders; KII = government officials interviewed; FGD = focus group discussions; Women = Women-led businesses; Youth = Youth-led businesses; Labor = Farming laborers; Pfarmers = Smallholder farmers; Herders = Herders; Cfarmers = Cereal growers; Medfarmers = Medium-sized commercial farms.)

Information on transhumance-related and rural water-related conflicts does not seem to be particularly relevant to perception formation, nor do irrigated area surveys, academic outputs, information on vaccination campaigns and development projects. Indeed, transhumance follows agreed pathways and rural people typically have pre-established agreements on water exploitation from wells and ponds. Academic research does not play a significant role in the agriculture sector, and there are few local studies and projects. As at the national level, vaccination campaigns are not related to drought status; rather they are similar to distribution of subsidized feed in that they can act as an instrument for inter-tribal political arrangements.

These findings lead us to conclude that DIR should primarily include surveys of rainfed and irrigated farming systems as well as general rural households.

5.2.4 Priority Drought Impacts and Variations in Stakeholder Perceptions

Overall, our research participants indicated that drought impacts are greatest on drinking water services, water resource shortages and agricultural productivity under irrigated conditions. The second tier of priority impacts related to livestock mortality and rangeland degradation. Impacts on cultivated rainfed systems, ecosystems and health were considered the least important (Figure 10).

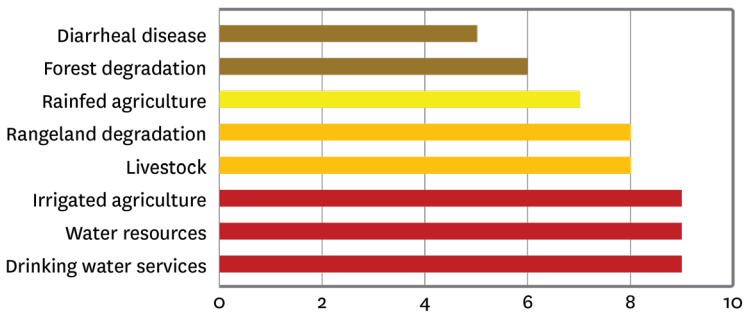


Figure 10. Scoring of priority drought impacts.

However, participants mentioned other environmental drought impacts including forest degradation, disappearance of wild plant species, increasing spread of inedible plants and invasion of unwanted plants.

Government officials ranked drought impacts on livestock and forests as most important, while herders ranked impacts on livestock as top priority (Figure 11).

As for specific priority impacts on water resources, availability in wells and ponds was the most relevant effect (Figure 12a).

All farming groups reported depleted storage in ponds and dams, while laborers reported depleted wells (Figure 12a). For example, the highest reported impact on water resources was the drying up of water harvesting infrastructure, illustrated by the depletion of water in the Tannour dam.

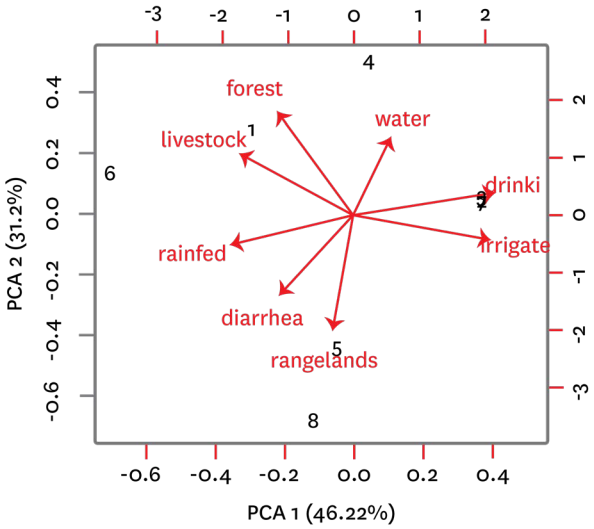


Figure 11. Biplot of stakeholders' perception of priority drought impacts. (*Note:* 1. Government officials; 2. Women-led businesses; 3. Youth-led businesses; 4. Laborers; 5. Smallholder farmers; 6. Herders; 7. Cereal growers; 8. Medium-sized commercial farms. [Groups 2, 3 and 7 have similar coordinates]).

Drinking water quality, tariffs and vandalism of pipes were the most important impacts for government officials (Figure 12b). Some female participants also reported the recrudescence of anemia due to degraded food security. Laborers reported municipal water cuts most frequently.

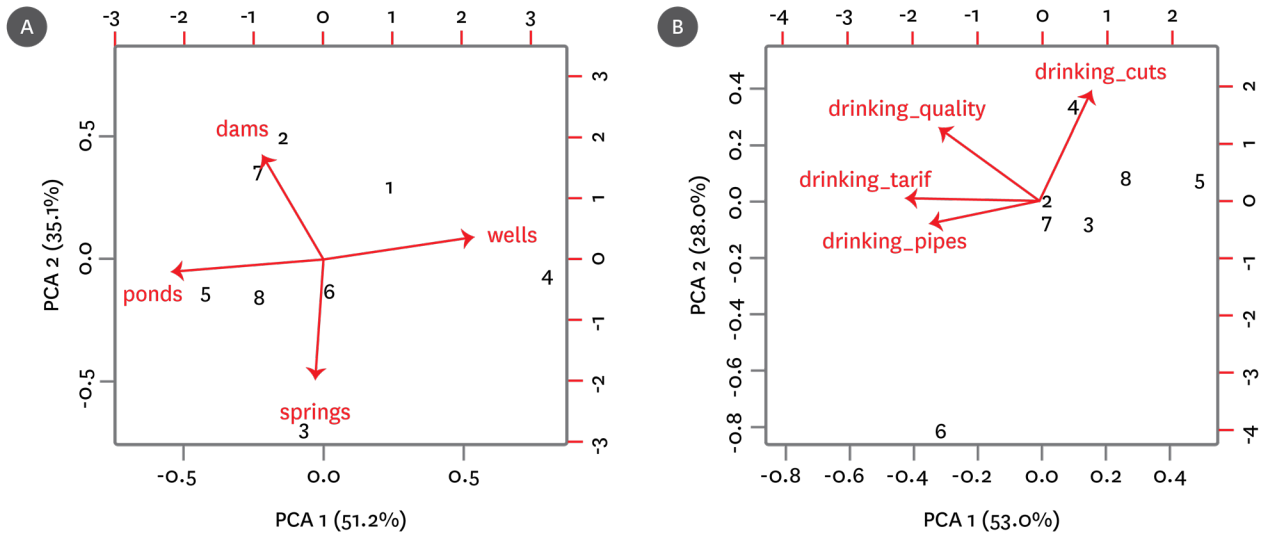


Figure 12. Biplots of stakeholders reporting impacts on (a) water resources, and (b) drinking water availability. (Note: 1. Government officials; 2. Women-led businesses; 3. Youth-led businesses; 4. Laborers; 5. Smallholder farmers; 6. Herders; 7. Cereal growers; 8. Medium-sized commercial farms. [Groups 2, 3 and 7 have similar coordinates]).

Government interviewees were the stakeholder group most familiar with water quality degradation during drought. Farmers also noticed increased salinity in irrigation water along with increased water pumping costs and irrigation requirements (data not shown). Declining water productivity especially affects poor and smallholder farmers; dry episodes are accompanied by damage to assets (e.g., clogging of irrigation pipes) that cannot be restored due to limited financial remediation mechanisms.

6 Conclusions

We assessed drought impacts in the Tafilah Governorate during 2020-2021 by analyzing long-term (43 years) precipitation and agricultural production statistics and undertaking extensive participatory research, primarily with government officials and farming-related NGOs. The precipitation data indicate a long-term and severe drying trend in Tafilah with annual averages declining from 240 mm to 155 mm. The deepest droughts include those that occurred in 1998-2001 and 2020-2021. Cereal production (especially barley) was most affected in the 1994, 1998-2001 and 2020-2021 droughts. Livestock herds decreased by 16% during 1998-2001 and 5.3% in 2020-2021—though some individual herders reported losses of over 30%.

Stakeholder groups had varying perceptions on the intensity and priority of impacts of the 2020-2021 drought (Table 7).

Table 7. Stakeholder perceptions of 2020-2021 drought intensity, priority impacts, and priority water source amelioration.

Stakeholder group	Drought intensity	Priority drought impacts	Priority water source impacts
Government officials	Moderate to severe	Livestock and forests	Dams and wells
Smallholder farmers	Exceptional/catastrophic	Rangelands	Ponds and dams
Women-led businesses	Moderate	Irrigated agriculture and drinking water availability	Dams
Youth-led businesses	Severe to exceptional/catastrophic	Irrigated agriculture and drinking water availability	Springs
Laborers	Severe to exceptional/catastrophic	Water resources availability	Wells
Herders	Severe	Livestock	Ponds and dams
Cereal growers	Severe	Irrigated agriculture and drinking water availability	Ponds and dams
Commercial farmers	Severe	Rangelands	Ponds and dams

Young people and laborers' perceptions of drought intensity were closest to the Drought Monitor maps. Smallholder farmers' perceptions were closer to the maps than those of government officials, who tended to view the drought as not quite as severe.

Stakeholders related drought impacts to a wide range of sources of vulnerability and provided suggestions on how to address them. Overall, these related to

- economic drivers of agriculture-sector vulnerability, such as lack of access to finance and markets as well as energy and fertilizer costs;
- environmental degradation associated with local industrial activities as well as climate change and its impact on hydrological systems;
- grievances about inequitable distribution of costs and benefits of local industrial activities; and
- social safety nets including those related to livestock veterinary services and rural communities' food security, and in relation to Covid-19 impacts.

The findings of this study highlight the importance of triangulating drought monitoring information from satellite- and model-derived sources with information provided by local reporters representing various stakeholder groups to understand the nuances of drought impacts and sources of vulnerability. On the basis of these results and learnings from the process, we refined the drought impact reporting form for future use in Jordan.

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Annex A. Survey Form Used as a Basis for Key Informant Interviews and Focus Group Discussions

تقرير عن الأحوال الناجمة عن الجفاف خلال موسم ٢٠٢٠-٢٠٢١ في محافظة الطفيلة

تاريخ المقابلة : _____ تمت المقابلة من قبل : _____

معلومات عامة : _____

الإسم		التلفون	
العمر		الايمل	
المهنة		عدد سنوات الخبرة	
اللواء		البلدة	

س١ : كيف كان جفاف الموسم في هذا العام ؟

تعريف الجفاف: في موقع معين، عندما يكون الطلب على المياه للأنشطة البشرية والاستدامة البيئية متوازنا مع توافر المياه العادي، نعتبر أننا في حالة "طبيعية". ومع ذلك، في حالة نقص هطول الأمطار مقارنة مع هذا "طبيعي"، ونحن في حالة من عدم كفاية المياه لتلبية الطلب. ويقابل هذا الوضع "جفافا" في هذا الموقع.

س٢ : اختر شدة الجفاف لموسم ٢٠٢٠-٢٠٢١

شدة الجفاف	تعريف لنوع الجفاف	ضع إشارة (✓) حيث تنطبق الحالة
الجفاف المعتدل	**الجفاف المعتدل** (مستوى التأهب) يؤدي العجز الكبير في هطول الأمطار في البداية إلى نقص مياه التربة. وقد تباطأ نمو المحاصيل والمراعي مؤقتا خلال فترة شهر. هذا الجفاف له آثار قابلة للعكس عندما يحدث لفترة أقل من شهرين بعد ما تسقط الأمطار إعادة تثبيت ومستويات توازن مياه التربة العودة إلى مستوياتها الطبيعية. تحدث حالة الجفاف هذه كل ١٠ سنوات.	
الجفاف الشديد	**الجفاف الشديد** (مستوى الطوارئ) إذا طال العجز في مياه التربة على مدى شهرين، فإنه سيؤدي إلى انخفاض في رطوبة التربة المتبقية التي تسبب الإجهاد المحصول / الغطاء النباتي الذي يؤدي إلى آثار لا رجعة فيها على الإنتاج الزراعي بما في ذلك نفوق الماشية وتدهور المراعي، وتهديدات صحة الإنسان. يتأثر لون المحاصيل والمراعي، وينخفض تدفق الجداول والسدود وتتدنى مستويات الآبار، وقد يكون هناك نقص في موارد المياة . تحدث حالة الجفاف هذه كل ٢٠ عاما.	عدد سنوات الخبرة
الجفاف الاستثنائي	**الجفاف الاستثنائي** (مستوى الأزمة): إذا طال أمد الإجهاد المحصولي/النباتي على مدى ثلاثة أشهر واستنزفت الموارد المائية بشكل كبير مما يؤدي إلى انخفاض في توافر الغذاء والمياه (لجميع القطاعات الاقتصادية)، وحرائق الغابات. التربة جافة، والبرك والخزانات والسدود فارغة تقريبا، والجداول تجف، والآبار تتطلب الصيانة، مع فرض قيود إلزامية على المياه. وحتى في حالة حدوث تساقط للأمطار بعدها ، يستمر النقص في الغذاء والمياه مع ما يترتب على ذلك من آثار كبيرة على سبل عيش المجتمعات المحلية الهشة وصحتها. تحدث حالة الجفاف هذه كل ٥٠ عاما.	البلدة
مستوى الكارثة	**مستوى الكارثة/ الازمة**: عندما يطول أمد الجفاف لأكثر من ثلاثة أشهر خلال موسم الأمطار (ديسمبر-مايو) مما يؤدي إلى ضغوط متعددة عبر النظم الإيكولوجية مما يخلق أضرارا جسيمة على الزراعة المطرية والمروية، ويسبب نقص المياه في النظام الهيدرولوجي (جفاف بشكل غير طبيعي في الأنهار، ومستويات في البحيرات والسدود والخزانات والمياه الجوفية)، وعدم توفر (المياه، العلف والحبوب الغذائية) ، ويسبب عدم الاستقرار الاجتماعي. تحدث حالة الجفاف هذه كل +٥٠ عاما.	البلدة

س٣: ما هي نسبة المناطق التي تعاني من الجفاف الشديد والاستثنائي؟ والإشارة إلى المناطق التي تعاني من ظروف كارثية ومنتشر فيها وجيوب الفقر

	شدة الجفاف	نسبة المساحة المتأثرة بالجفاف	ما هي القرى او التجمعات التي كان لها ظروف كارثية
١	الحسا		
٢	بصيرة		
٣	قصبة الطفيلة		

س٤: ما هو نوع الجفاف لهذا الموسم ٢٠٢٠-٢٠٢١؟ تحقق من سطر:

نوع الجفاف	ضع إشارة(✓) حيث تنطبق الحالة
الجفاف الزاحف: جفاف مستمر من الخريف إلى الربيع (من سبتمبر إلى مايو) مع فصول جفاف شديدة إلى استثنائية تحدث أكثر من +٥٠٪ من مناطق المحافظة.	
الجفاف المتأخر: يبدأ في أواخر فصل الشتاء في أوائل الربيع (الفترة من فبراير إلى مارس) بعد خريف وشتاء رطب أو طبيعي (من سبتمبر إلى يناير). وتتميز بفصول جفاف شديدة إلى استثنائية خلال الفترة من فبراير إلى مايو على أكثر من ٥٠٪ من مناطق المحافظة.	
الجفاف السريع: يحدث في شهر واحد فقط خلال الفترة من ديسمبر إلى مايو، مع فصول جفاف شديدة إلى استثنائية تحدث أكثر من +٥٠٪ من مناطق المحافظة.	
الجفاف المتخلله: يتميز بالتناوب من أشهر جافة ورطبة على مدار الموسم.	

س٥: ما نوع المعلومات التي استخدمتها لتقييم ظروف الجفاف في الميدان؟ التحقق من البنود

نوع الملعلومات	ضع إشارة(✓) حيث تنطبق الحالة
المراقبة البصرية للمراعي/المحاصيل/الغطاء النباتي الممطر (زيارات ميدانية)	
مسح منطقة الحبوب الممطرة المزروعة والحصاد في المناطق، والحمولة الرعوية فوق المراعي (حملات مسح ميداني)	
مسح المناطق المروية وسجلات مستويات مقياس المياة (حملات المسح)	
الشكاوى الرسمية من الاعتداءات على حقق الآخرين	
شكاوى من صعوبات في الحصول على موارد المياه على مستوى الأسر الريفية	
شكاوى من اضطراب مياه الشرب وخدمات الصرف الصحي	
تقارير رسمية عن النزاعات حول تخصيص المياه الزراعية (تقارير حكومية)	
تقارير تصف تضخم أسعار الأعلاف والأغذية الأساسية (تقارير حكومية)	
ملاحظة ظهور الأمراض وغزوات الحشرات والآفات (المسوحات)	
حملات تطعيم الماشية (وثائق وسجلات الاتصالات)	
بيانات من مشاريع التنمية	
بيانات من الأوساط الأكاديمية	
الإعلام/ وسائل الإعلام الاجتماعية	
آخرون (وصف)	

س٦: وفقا لتجربتك، كم كانت ظروف الجفاف في ٢٠٢٠-٢٠٢١ مثل الأحداث الماضية؟ التحقق من سطر واحد

مقدار تكرار الجفاف مثل ما حدث في موسم ٢٠٢٠-٢٠٢١ في الماضي (١ أو ٢ أو أكثر من المرات)	الوصف لتكرار الجفاف	ضع إشارة(✓) حيث تنطبق الحالة
عدد المرات (_____)	**٢٠ سنة أو أكثر** لقد رأيت هذه الظروف خلال السنوات ال ٢٠ الماضية	
عدد المرات (_____)	**١٠-٢٠ سنة** لقد رأيت هذه الظروف خلال السنوات ال ١٠-٢٠ الماضية)	
عدد المرات (_____)	**٥-١٠ سنوات** لقد رأيت هذه الظروف خلال السنوات ال ٥-١٠ الماضية	
عدد المرات (_____)	**أقل من ٥ سنوات** لقد رأيت هذه الظروف خلال السنوات ال ٥ الماضية	
٠	**لم أر هذه الظروف في الماضي**	

س٧: قم بترتيب آثار الجفاف ذات الأولوية (من ١ إلى ٧) وتقييم إجراءات استجابة الحكومة والمنظمات غير الحكومية في الفترة ٢٠٢٠-٢٠٢١، وفي السنوات العشرين الماضية (توفير ٣ إجراءات كحد أقصى لكل تأثير)

	الرتبة حسب الأهمية	الإجراءات المتخذة في ٢٠٢٠-٢٠٢١		الإجراءات المتخذة في ٢٠٠٠-٢٠١٩ (سنة جافة جدا)	
		الحكومة	المنظمات غير الحكومية	الحكومة	المنظمات غير الحكومية
موارد المياه		١_____ ٢_____ ٣_____	١_____ ٢_____ ٣_____	١_____ ٢_____ ٣_____	١_____ ٢_____ ٣_____
خدمات مياه الشرب		١_____ ٢_____	١_____ ١_____ ٢_____	١_____ ١_____ ٢_____	١_____ ١_____ ٢_____
الزراعة االبعلية		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____
تدهور المراعي		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____
الماشيه		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____
الزراعة المروية		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____
مرض الإسهال		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____
تدهور الغابات		٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____	٣_____ ١_____ ٢_____

س٨: هل يمكن ذكر او سرد تأثيرات آخرى ذات أولوية (إن وجدت

١	
٢	
٣	

س٩: تسجيل أثر الجفاف على القطاعات المختلفة

القطاعات المتأثرة	الأثر	ينطبق او لا ينطبق ضع إشارة(✓) حيث تنطبق الحالة	الترتيب او الأهمية
مصادر وموارد المياه	اصحبت الآبار الضحلة واستنفذت الابار العميقة		
	جفاف الينابيع والجداول الطبيعية في فصل الشتاء		
	جفاف حفائر الحصاد المائي		
	جفاف السدود والحفائر		
	آخرى، حدد		
	١		
	٢		
خدمات مياه الشرب	انقطاع المياة		
	انخفاض جودة ونوعية المياة		
	تسكر الانابيب وكثرة الاعتداءات		
	تغير تعرفة المياة واسعارها		
	آخرى، حدد		
	١		
	٢		
الزراعة االبعلية	انخفاض نمو النباتات		
	انخفاض الإنتاج من الحب والقش		
	انتشار أمراض النبات على المحاصيل		
	زيادة كمية مدخلات الإنتاج المستخدمة		
	آخرى، حدد		
	١		
	٢		
الزراعة المروية	زيادة مدة الري		
	قلة توفر المياة للري		
	زيادة الملوحة وتلوث المياة		
	زيادة كلفة مستلزمات الإنتاج		
	آخرى، حدد		
	١		
	٢		
تدهور المراعي	انخفاض إنتاجية المادة الجافة		
	تلوث مصادر المياة لاستخدامها في سقاية الحيوانات		
	انتشار الاصناف الغازية غي المستساغة من النباتات		
	جفاف التربة وزيادة الملوحة وانجراف التربة		
	تغير موعد الازهار للنباتات		
	انتشار الآفات والماراض في أراضي المراعي		
	آخرى، حدد		
	١		
	٢		

القطاعات المتأثرة	الأثر	ينطبق او لا ينطبق ضع إشارة(✓) حيث تنطبق الحالة	الترتيب او الأهمية
الثروة الحيوانية والماشية	انتشار الأمراض الحيوانية		
	زيادة وفيات الحيوانات		
	انخفاض الخصوبة للحيوانات		
	عدم توفر المطاعيم		
	أرتفاع أسعار الأعلاف والشعير		
	أرتفاع أسعار الأعلاف المالئة والقش		
	عدم توفر مياة الشرب للحيوانات		
	آخرى، حدد		
	١		
	٢		
الزراعة المروية على الآبار الارتوازية	جفاف الابار وانخفاض انتاجيتها		
	زيادة ملوحة المياة		
	زيادة كلفة مستلزمات الإنتاج		
	آخرى، حدد		
	١		
	٢		
الصحة العامة	زيادة امراض الاسهالات		
	تلوث الهواء وانتشار الغبار		
	انتشار الامراض المرتبطة بنقص المياة		
	انخفاض توفر الغذاء		
	انتشار امراض فقر الدم وسوء التغذية		
	زيادة وفيات الأطفال		
	الضغط والجهد النفسي		
	آخرى، حدد		
	١		
	٢		
تدهور الغابات	تغير شكل الأشجار		
	انتشار المراض والأوبئة على الأشجار		
	قلة وانخفاض نمو الأشجار		
	موت الأشجار		
	انتشار حرائق الغابات اكثر من المعتاد		
	آخرى، حدد		
	١		
	٢		

س ١٠: ما مدى استجابة المحافظة على الخصوص للجفاف في الماضي

القطاعات المتأثرة	ما هي الاستجابة في الماضي	ما هي أقتراحاتك للإستجابة في المستقبل
مصادر وموارد المياة	١	١
	٢	٢
	٣	٣
مياة الشرب	١	١
	٢	٢
	٣	٣
الزراعية البعلية والمحاصيل الحقلية	١	١
	٢	٢
	٣	٣
الزراعة المروية	١	١
	٢	٢
	٣	٣
تدهور المراعي والغطاء النباتي	١	١
	٢	٢
	٣	٣
الثروة الحيوانية	١	١
	٢	٢
	٣	٣
الصحة العامة	١	١
	٢	٢
	٣	٣
تدهور الغابات	١	١
	٢	٢
	٣	٣
آخرى، حدد		
١	١	١
٢	٢	٢
٣	٣	٣

تقريرعن حالات الجفاف – موسم ٢٠٢٠-٢٠٢١ في الطفيلة مناقشة جماعية مركزة مع الفئات الضعيفة التأثيرات الرئيسية على المجتمعات المحلية ومواطن الضعف الأساسية:

ملاحظة: سيتم تقسيم هذا الاستبيان إلى رقم يساوي عدد المجموعات المحددة وكل مجموعة تعبئ ما يخصها

١	مجموعة: الأسر الزراعية الفقيرة (المزارعون الصغار- ومربي الماشية الأراضي المروية)	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	انخفاض استخدام المياه في الأماكن المنزل	
	نضوب الآبار وتملحها وعدم توفر المياة	
	انخفاض الاستهلاك المحلي من الاغذية	
	تضخم اسعار لأغذية والأدوية ومنتجات النظافة الصحية	
	انخفاض إنتاجية المحاصيل والماشية	
	انخفاض الدخل من العمل (أيام وأجور)	
	تضخم كلفة المدخلات والأجهزة الزراعية	
	اضرار التي لحقت بالممتلكات والآلات	
	انخفاض فرص الحصول على التمويل (القروض، الائتمانات، التمويل الصغير، المعونة، الإعانات)	
	أخرى، حدد	
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	٢	
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٢	مجموعة: الأسر الزراعية الفقيرة (صغار الملاك امحاصيل والماشية او مربي الماشية في البادية	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	انخفاض إمكانية الحصول على المياه في المصادر التقليدية	
	انخفاض الاستهلاك المحلي من الغذاء	
	تضخم أسعار وكلفة الأغذية والأدوية ومنتجات النظافة الصحية	
	انخفاض إنتاجية المحاصيل والماشية	
	تضخم كلف وأسعار المدخلات الزراعية	
	انخفاض فرص الحصول على أعلاف الماشية بأسعار معقولة وخدمات التطعيم	
	انخفاض فرص الحصول على التمويل (القروض، الائتمانات، التمويل الصغير، الإعانات)	
	أخرى، حدد	
	١	
	٢	
	٣	

٣	مجموعة: المزارع التجارية متوسطة الحجم	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	انخفاض إنتاجية المحاصيل على العموم	
	تضخم كلفة وأسعار المدخلات والأجهزة الزراعية	
	انخفاض فرص الحصول على التمويل (القروض، الائتمانات، التمويل البالغ الصغر، التأمين، المعونة، الإعانات)	
	أخرى، حدد	
	١	
	٢	
	٣	

٤	مجموعة: الأسر والأطفال الذين تقودها النساء	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	انخفاض استخدام المياه في المنازل	
	نضوب الآبار وتملحها	
	انخفاض الاستهلاك المحلي	
	تضخم أسعار الأغذية والأدوية ومنتجات النظافة الصحية	
	انخفاض إنتاجية المحاصيل والماشية	
	انخفاض الدخل من العمل (أيام وأجور)	
	تضخم أسعار وكلف المدخلات والأجهزة الزراعية	
	أضرار التي لحقت بالممتلكات والآلات	
	انخفاض فرص الحصول على التمويل (القروض، الائتمانات، التمويل الصغير، المعونة، الإعانات)	
	زيادة سوء التغذية وفقر الدم والأمراض	
	زيادة وفيات الأطفال وخاصة الرضع	
	محدودية فرص الحصول على المساعدات الاجتماعية والخدمات الصحية	
	محدودية الوصول إلى التمويل الصغير وتكامل سلسلة القيمة	
	أخرى، حدد	
	١	
	٢	
	٣	

٥	مجموعة: الشباب	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	المزيد من المهام لدعم اقتصاد الأسرة	
	تغيب المدارس	
	انخفاض فرص العمل	
	تخفيض ميزانية الترفيه للأنشطة الثقافية والرياضية	
	انخفاض فرص الحصول على خدمات النظافة والرعاية الصحية	
	انخفاض فرص الحصول على التمويل لإنشاء الأعمال	
	التعرض لحركة المرور والجنوح	
	أخرى، حدد	
	١	
	٢	
	٣	

٦	مجموعة: اللاجئين والعمال والعمالة الوافدة	
استخدم هذا العمود لترتيب التأثيرات	**الآثار ذات الأولوية**	**الأسباب ا الرئيسية ضع إشارة (✓) حيث تنطبق الحالة**
	انخفاض استخدام المياه في المنازل	
	انخفاض الاستهلاك المحلي من الاغذية	
	تضخم أسعار وكلف الأغذية والأدوية ومنتجات النظافة الصحية	
	انخفاض الدخل من العمل (أيام وأجور)	
	انخفاض فرص الحصول على التمويل (القروض، الائتمانات، التمويل الصغير، المعونة، الإعانات)	
	انخفاض فرص الحصول على الخدمات الاجتماعية وخدمات الرعاية الصحية	
	التعرض لحركة المرور والجنوح	
	أخرى، حدد	
	١	
	٢	
	٣	

س١١: من تلقى مساعدات /دعم (أسئلة لكل المجوعات)

	ضع إشارة (✓)	رتبة	الإجراءات المتخذة في ٢٠٢٠-٢٠٢١		الإجراءات المتخذة في ٢٠٠٠-٢٠١٩	
			الحكومة	المنظمات غير الحكومية	الحكومة	المنظمات غير الحكومية
الأسر الزراعية الفقيرة (المزارعون الصغار ومربي الماشية في الأراضي المروية)			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣
الأسر الزراعية الفقيرة (صغار الملاك' المحاصيل والماشية في البادية			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣
المزارع التجارية متوسطة الحجم			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣
الأسر والأطفال الذين تقودهم النساء			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣
شباب			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣
اللاجئين والعمال والعمالة الوافدة			١	١	١	١
			٢	٢	٢	٢
			٣	٣	٣	٣

س ١٠: ما مدى استجابة المحافظة على الخصوص للجفاف في الماضي

تأثير الأولوية على:	الاستجابة في الماضي	كيف تقترح الاستجابه في المستقبل
الأسر الزراعية الفقيرة (المزارعون الصغار ومربي الماشية في الأراضي المروية)	١	١
	٢	٢
	٣	٣
الأسر الزراعية الفقيرة (صغار الملاك' المحاصيل والماشية في البادية	١	١
	٢	٢
	٣	٣
المزارع التجارية متوسطة الحجم	١	١
	٢	٢
	٣	٣
الأسر والأطفال الذين تقودهم النساء	١	١
	٢	٢
	٣	٣
شباب	١	١
	٢	٢
	٣	٣
اللاجئين والعمال والعمالة الوافدة	١	١
	٢	٢
	٣	٣

Annex B. Administrative Arrangements

To initiate the assessment formally, the Director of the Drought Management and Governance unit at the MWI, Eng. Ali Ghanim, wrote an official correspondence on behalf of MWI Secretary General Dr. Jehad Al-Mahamid to His Excellency the Minister of Agriculture (Eng. Khalid Al-Hanifat[13]) and His Excellency the Governor of Tafilah, Dr. Mohammad Abu Jamous. The Governor of Tafilah assigned the Deputy Governor, His Excellency Raed Shibli, to oversee the work. He, on January 15, 2022, assigned Mr Izzeldin Al-Haggage, Liaison Officer, as the project's point of contact at the Governor's Office. All logistics were finalized by mid-February, after the last snows, and the survey team was trained on administering the questionnaire.

The first group meeting (described in Section 3.2) was an official meeting to introduce the USAID point of contact, the Tafilah survey team and IWMI consultants to Jordanian government officials (Figure B1).

The lead of the Tafilah survey team briefed the officials on the progress of the study, and His Excellency the Deputy Governor committed to continue supporting it.

Figure B1. Meeting at the office of the Governorate of Tafilah hosted by HE the Deputy Governor (March 2022).

[13] Note that the Minister of Agriculture from March 2021, Eng. Khalid Al- Hanifat, previously held numerous governmental positions in Tafilah. See more at: https://moa.gov.jo/AR/ListDetails/%d8%a7%d9%84%d9%88%d8%b2%d8%b1%d8%a7%d8%a1/23/1003

Annex C. Simplified Drought Impact Reporting Form

Based on the quality of data collected, and efficiency of data collection, using the form shown in Annex A, we suggest the following three-page Drought Impact Reporting form to be used in the future by field teams comprising regional agriculture and water officers.

Interviewer name:		Phone:
		Email:
Interviewee name:		Profession:
Age:	Experiences (yrs.):	
	Phone:	Email:

1. Name of the district:

2. How dry was the season?

Definition of drought: In a given location, when the water demand for human activities and environmental sustainability is in balance with normal water availability, we consider that to be a 'normal' condition. However, in a situation of deficiency of precipitation compared to this 'normal', we consider it a condition of insufficient water to meet the demand. Such a situation corresponds to a 'drought' for that location.

Select the drought severity of the season from the following options:

	Moderate drought (Alert level): A significant precipitation deficit leads initially to soil water deficit. Crop and pasture growth has temporarily slowed during a month. Such a drought tends to have reversible effects when it occurs for a period of less than two months and once wet conditions and soil water balance return to normal levels. Such drought conditions occur at intervals of 10 years.
	Severe drought (Emergency level): If the soil water deficit is prolonged for more than two months, it will result in a decline in residual soil moisture, causing crop/vegetation stress that can lead to irreversible impacts on agricultural production including livestock mortality and degradation of rangelands and threaten human health. Crop and pasture color is affected; water levels in streams, reservoirs and wells fall low. Water shortages occur and restrictions may be put in place. Such drought conditions occur at intervals of 20 years.
	Exceptional drought (Crisis level): Crop/vegetation stress is prolonged for more than three months and water resources deplete significantly, leading to a reduction in food and water availability (for all economic sectors) and forest fires. Soils become dry, ponds and reservoirs nearly empty, streams dry up, wells need maintenance, and mandatory water restrictions are put in place. Even if wet conditions return, shortages of food and water continue with significant effects on livelihoods and health in fragile communities. Such drought conditions occur at intervals of 50 years.

3. What percentage of the district area experienced severe and exceptional drought conditions? Indicate localities under catastrophic conditions and poverty pockets.

	District	% of area impacted	Localities under catastrophic conditions
1	**Al-Hasa**		
2	**Busera**		
3	**Qasabah**		

4. What drought type occurred? Choose from options below:

	Creeping drought (CD): A continuous drought from autumn through spring (Sep-May) with severe to exceptional drought classes occurring over +50% of districts in the governorate.	
	Late-onset drought (LOD): Starts in late winter or early spring (Feb-March) after a wet or normal autumn and winter (Sep-Jan). It is characterized by severe to exceptional drought during the Feb-May period in over +50% of the governorate's districts.	
	Flash drought (FD): Occurring for one month only during the period Dec-May, with severe to exceptional drought classes occurring over +50% of the governorate districts.	
	Interspersed drought (ID): Characterized by an alternation of dry and wet months through the season.	

5. Rank the priority of the following drought impacts:

Use this column to rank impacts	Priority impacts	Key root causes (provide maximum 3)
1	**Smallholder farming families (crop-livestock integrated smallholders in oases/irrigated lands)**	
	Reduced indoor water use	
	Well water depletion and salinization	
	Reduced domestic consumption	
	Inflation of food, medicine and hygiene product prices	
	Reduced crop and livestock productivity	
	Reduced income from labor (days and wages)	
	Inflation of agricultural input and hardware	
	Property and machinery damage	
	Reduced access to finance (loans, credits, microfinance, aid, subsidies)	
	Others 1. 2. 3.	

2	**Smallholder farming families (crop-livestock integrated smallholders in Badia): transhumant/ nomads**	
	Reduced access to water in traditional sources	
	Reduced domestic consumption	
	Inflation of food, medicine and hygiene product prices	
	Reduced crop and livestock productivity	
	Inflation of agricultural input prices	
	Reduced access to affordable livestock feed and vaccination services	
	Reduced access to finance (loans, credits, microfinance, subsidies)	
	Others 1. 2. 3.	
3	**Medium-sized commercial farms**	
	Reduced crop productivity	
	Inflation of agricultural inputs and hardware prices	
	Reduced access to finance (loans, credits, microfinance, insurance, aid, subsidies)	
	Others 1. 2. 3.	
4	**Women-led families and children**	
	Reduced indoor water use	
	Well water depletion and salinization	
	Reduced domestic consumption	
	Inflation of food, medicine and hygiene product prices	
	Reduced crop and livestock productivity	
	Reduced income from labor (days and wages)	
	Inflation of agricultural input and hardware prices	
	Property and machinery damage	
	Reduced access to finance (loans, credits, microfinance, aid, subsidies)	
	Increase in malnutrition, anemia and diseases	
	Child mortality	
	Limited access to social aid and health services	
	Limited access to microfinance and value chain integration	
	Others 1. 2. 3.	

5	**Youth**	
	More tasks to support family economy	
	School absenteeism	
	Reduced job opportunities	
	Reduced budget for cultural and sporting activities	
	Reduced access to hygiene and healthcare services	
	Reduced access to finance for business creation	
	Exposure to crime and delinquency	
	Others 1. 2. 3.	
6	**Refugees and foreign laborers**	
	Reduced indoor water use	
	Reduced domestic consumption	
	Inflation of food, medicine and hygiene product prices	
	Reduced income from labor (days and wages)	
	Reduced access to finance (loans, credits, microfinance, aid, subsidies)	
	Reduced access to social and healthcare services	
	Exposure to crime and delinquency	
	Others 1. 2. 3.	

International Water Management Institute

Partners

Primary partners: International Water Management Institute (IWMI); National Drought Mitigation Center, University of Nebraska-Lincoln; Daugherty Water for Food Global Institute, University of Nebraska; Goddard Space Flight Center, National Aeronautics and Space Administration (NASA); and Johns Hopkins University.

National leader: Ministry of Water and Irrigation

National partners: Ministry of Agriculture; Ministry of Environment; Jordan Meteorological Department; Ministry of Health; Department of Statistics; National Agricultural Research Center; National Center for Security and Crisis Management; and the University of Jordan

Contact details

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