Climate report - Iraq

This document summarizes the most important findings presented in Climate reports for five location in the Northern Iraq. The full description with all the details and insights based on the **climate and environmental data** (**1979 - 2019**) can be found in the respective reports for particular locations.

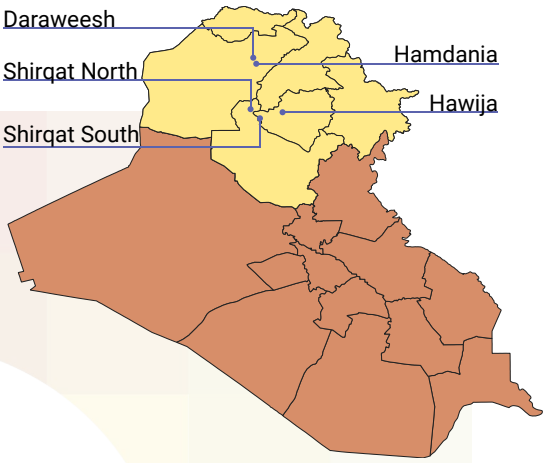
Main findings

- Decline of wheat and barley productivity in all locations; Increase of chickpea productivity
- Below-average precipitation in vegetation seasons from 2010/2011 to 2019/2020
- Increase of minimum temperatures in *cold* months - endangered vernalization of winter crops

Locations characteristics (differences and similarities)

* Main characteristics for three location clusters. More details in other sections or in Climate reports for particular locations

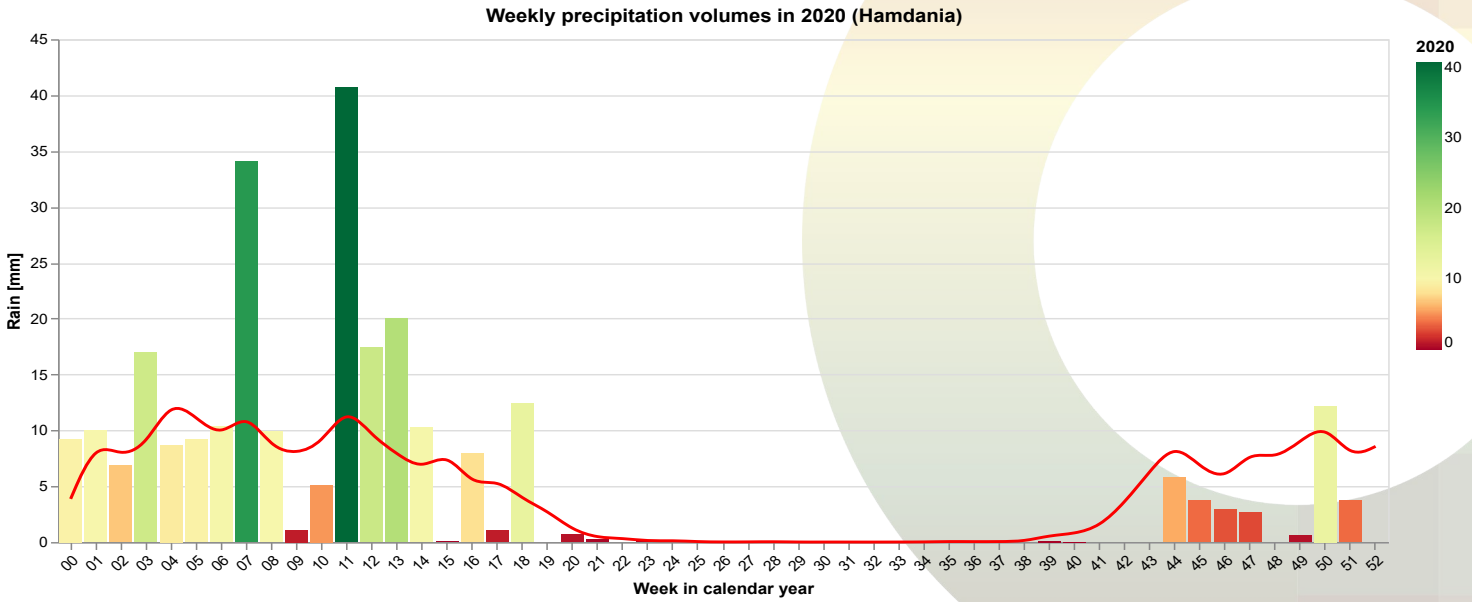
Trends	**Hamdania and Daraweesh**	**Hawija**	**Shirqat South and Shirqat North**
Wheat productivity	👎	👎👎	👎👎👎
Barley productivity	👎	👎👎	👎👎👎
Chickpea productivity	👍👍👍	👍👍	👍
Precipitation	👎👎	👎	👎
Other characteristics			
Precipitation stability	Best in Jan, Feb, March	Best in Jan, Feb, March	Best in Dec, Jan, Feb
Extreme rainfalls	3-4 extreme rainfalls/year	3-4 extreme rainfalls/year	3-4 extreme rainfalls/year
Min. temperature rise	1 °C in "cold" months	1 °C in "cold" months	1 °C in "cold" months



Locations analyzed in the Northern Iraq

Precipitation

- **Extreme rainfalls -** most moisture from **3-4 extreme weekly rainfalls** in 2010-2020 (all locations). These are less effective for crop growth and precipitation totals can be misleading.
- **Worse precipitation conditions in vegetation season -** 6 resp. 7 (based on location) vegetation seasons out of 10 recent years ended up with worse-than-average precipitation.
- **Rainy months stand for reliability -** Dry months (May - October) occasionally provide moisture, however the volumes are insufficient and very erratic. Even advanced approaches (e.g. rain water harvesting) are unreliable.



Visualisation of extreme rainfalls, sample location - Hamdania

Change in Temperature

- **Significant rising of min. Temperatures -** At least 1 °C difference from the start to the end of monitoring.
- This is crucial for "Cold" months (November, December, January, February, March) due vernalization (and also crop yield).

Change in crop yield potentials (the performance of atmosphere)

- **Decline of wheat yields -** Atmospheric conditions have seen a **negative development,** causing a **decline in the maximum obtainable yield**. The Hamdania and Daraweesh are experiencing a slight decline of obtainable production; the Shirqat South, Shirquat North and Hawija are impacted by a moderate decline.
- **Wheat is more productive and stable in Northern locations (table below).**
- **Decline of Barley yields -** Similar development as wheat, however decline is higher.
- **Barley is following a very similar pattern as wheat in terms of productivity and stability, however with generally higher obtainable yields.**
- **Increase of Chickpea yields -** The tested chickpea response on atmosphere performance shows **an increase of maximum obtainable yield**. While the Hawija location is experiencing a moderately positive increase of chickpea yields, other locations are experiencing a slight increase of yield potential.
- **Chickpea is also more productive in Northern locations, however unstable (especially in the southern locations).**

Location	Wheat - mean [kg/ha]	Wheat - Std. dev. [kg/ha]	Barley - mean [kg/ha]	Barley - Std. dev. [kg/ha]	Chickpea - mean [kg/ha]	Chickpea - Std. dev. [kg/ha]
Hamdania	3813.34	441.80	4489.49	753.47	2544.35	869.58
Daraweesh	3851.59	436.69	4520.16	761.57	2583.50	876.03
Hawija	3228.57	980.16	4138.54	1196.63	2070.16	1116.26
Chirqat South	2599.70	1171.97	3737.49	1393.41	1574.98	1103.80
Chirqat North	2616.45	1161.28	3646.75	1376.36	1524.74	1086.23

Mean yields and standard deviation [kg/ha] (1979 - 2019) for potential production (limited by atmosphere and water balance).