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STUDY ON MEETING THE WATER REQUIREMENTS OF MAIZE (*ZEAMAYS L.*) IN SOCOL, CARAŞ-SEVERIN COUNTY

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Abstract: This study analyzes the climatic factors influencing maize (*Zea mays L.*) water requirements in Socol, Caraș-Severin County, during 2022–2024. Using data from the Moldova Veche Meteorological Station, thermal and rainfall regimes, as well as hydroclimatic balances, were assessed. Maize evapotranspiration and water use were estimated through the Thornthwaite and Lawry–Johnson methods. Results show that 2024 was the hottest and driest year, 2023 the warmest and wettest, and 2022 warm but drier than the multiannual average. Rainfall covered 68%, 100%, and 52% of maize water needs, respectively. The findings highlight the strong dependence of maize water balance on climate variability and emphasize the need for supplemental irrigation in dry years, preferably using sprinkler or drip systems for efficiency.

Introduction

Maize (*Zea mays L.*) is one of the world's most important cereal crops, ranking third after wheat and rice. It originated in the Americas and later spread to Europe after the 15th century. Today, the United States and China are the leading global producers, followed in Europe by countries such as Ukraine and EU member states.

Although maize is relatively tolerant to water stress, it has high water requirements. The maximum water demand occurs from mid-June to mid-August, accounting for about 68–74% of the total seasonal need. Maintaining soil moisture at 60–80% of field capacity during this critical period is essential, as prolonged drought and heat can significantly reduce yield and cause incomplete ear formation.



Material and method

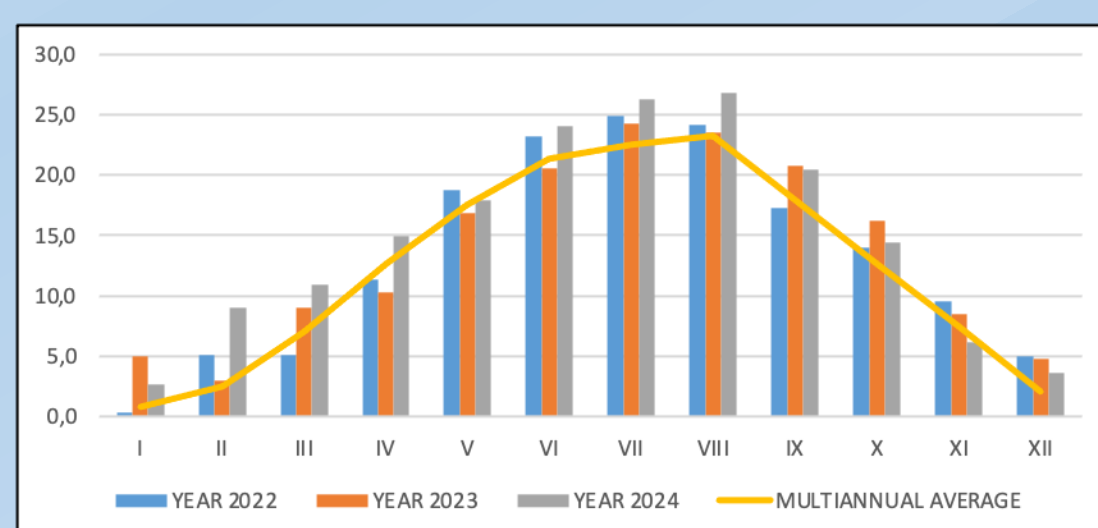
The study analyzed the **climatic elements** of the years **2022, 2023, and 2024**, focusing on:

- Monthly and annual **temperature regime** and its deviations from multiannual averages;
- **Precipitation regime** and distribution throughout the maize growing season;
- Data recorded at the **Moldova Veche Meteorological Station**, Caraș-Severin County.

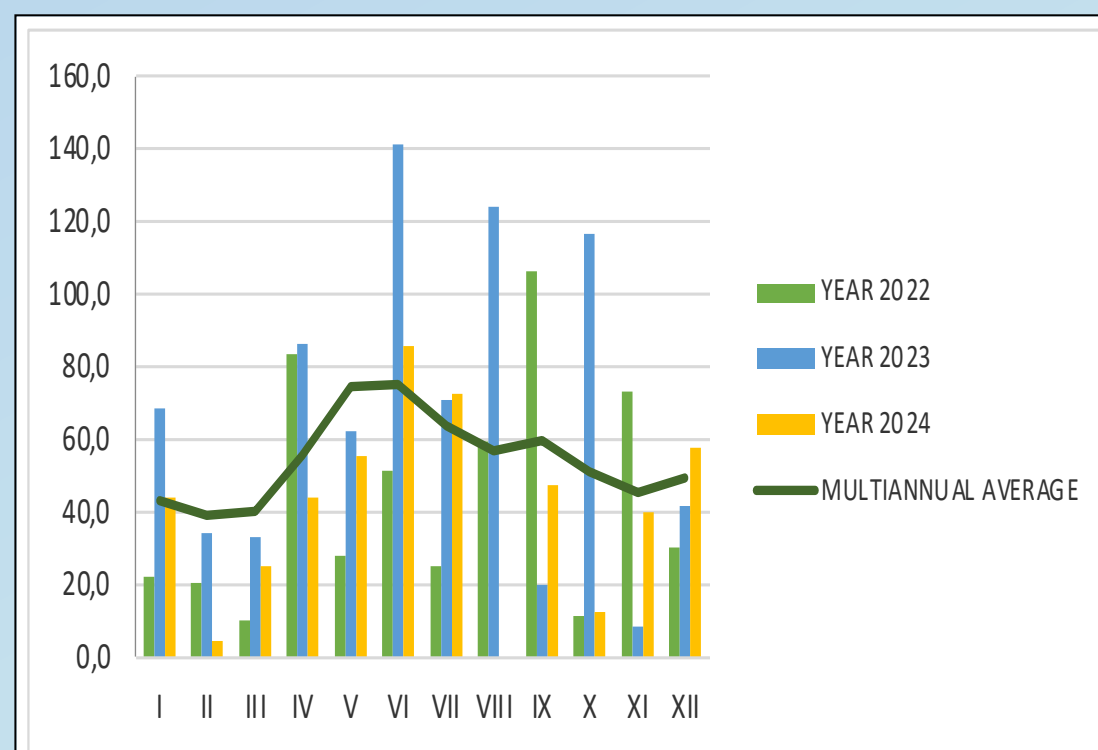
To estimate maize **water consumption**, two **indirect calculation methods** were applied: the **Thornthwaite** and **Lawry–Johnson** methods. In addition, **hydroclimatic balances** were established for each of the three years. Both **monthly** and **total water consumption** were calculated for maize grown in **Socol, Caraș-Severin County**, during 2022–2024.

Thermal and Precipitation Regimes

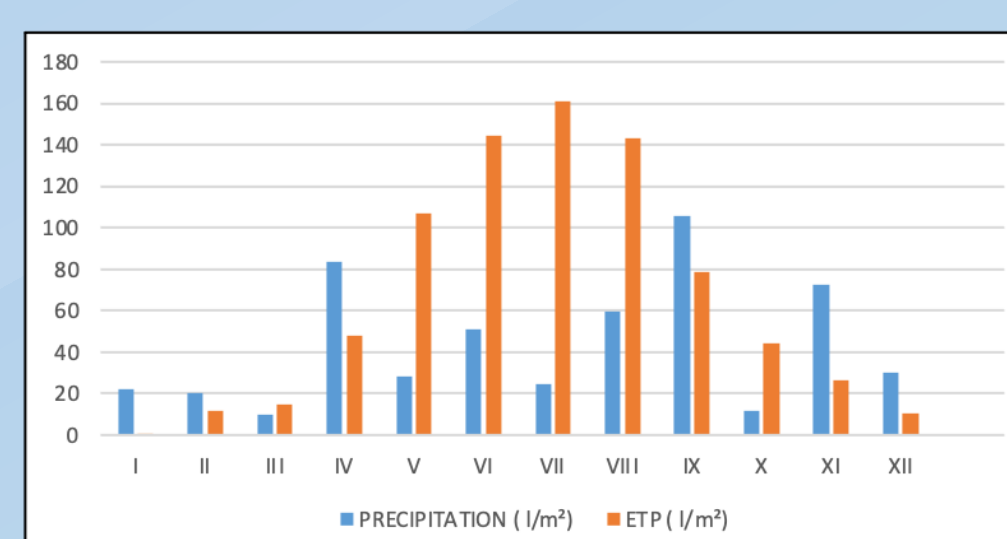
- 2024 was the warmest year;
- 2023 slightly cooler;
- 2022 had lower temperatures in early spring and autumn.



- ♦ 2023 – most humid year;
- ♦ 2024 – driest (487.9 mm vs. multiannual 652.8 mm).

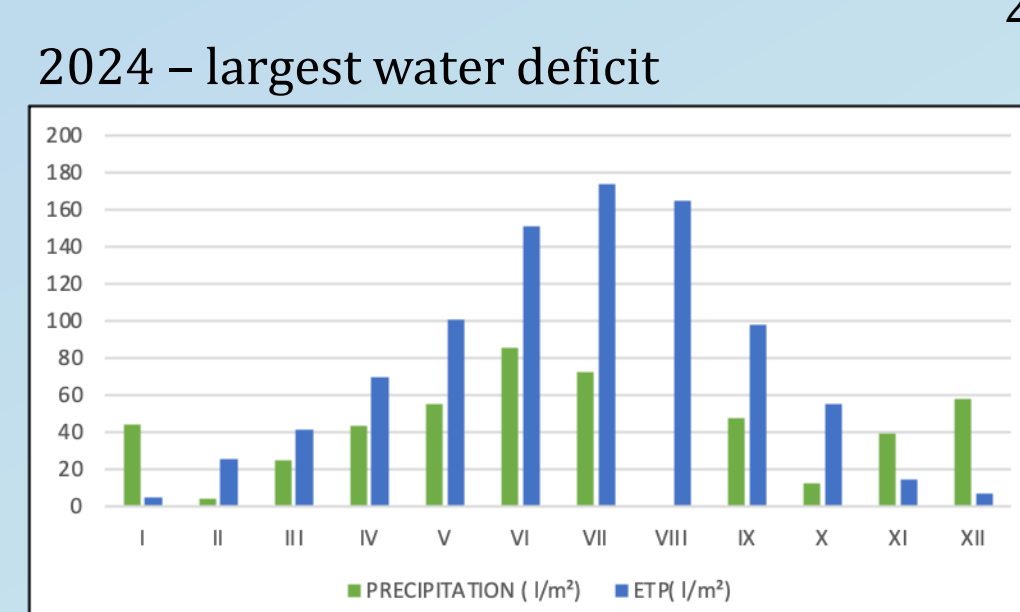


Results and discussions

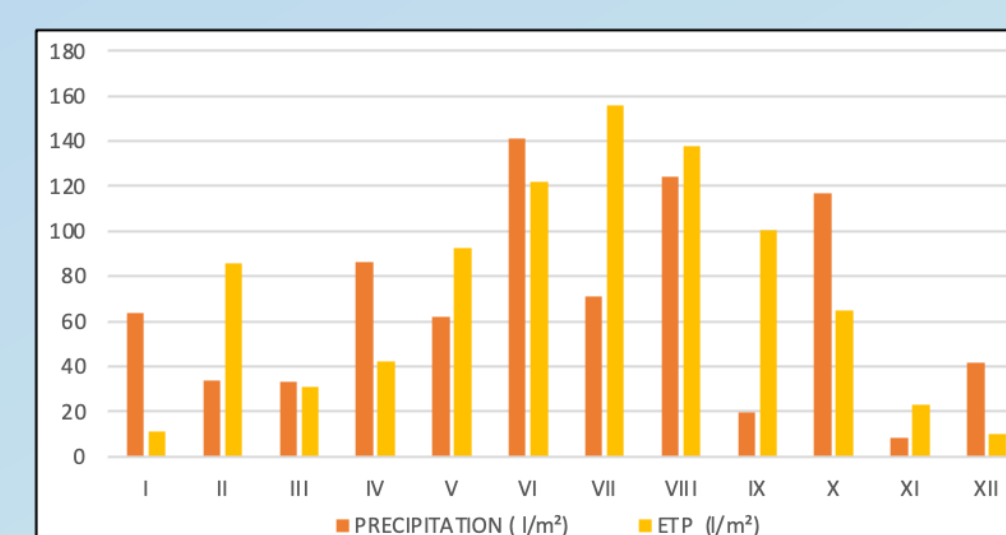


2022 - moderate deficit, with shorter dry periods

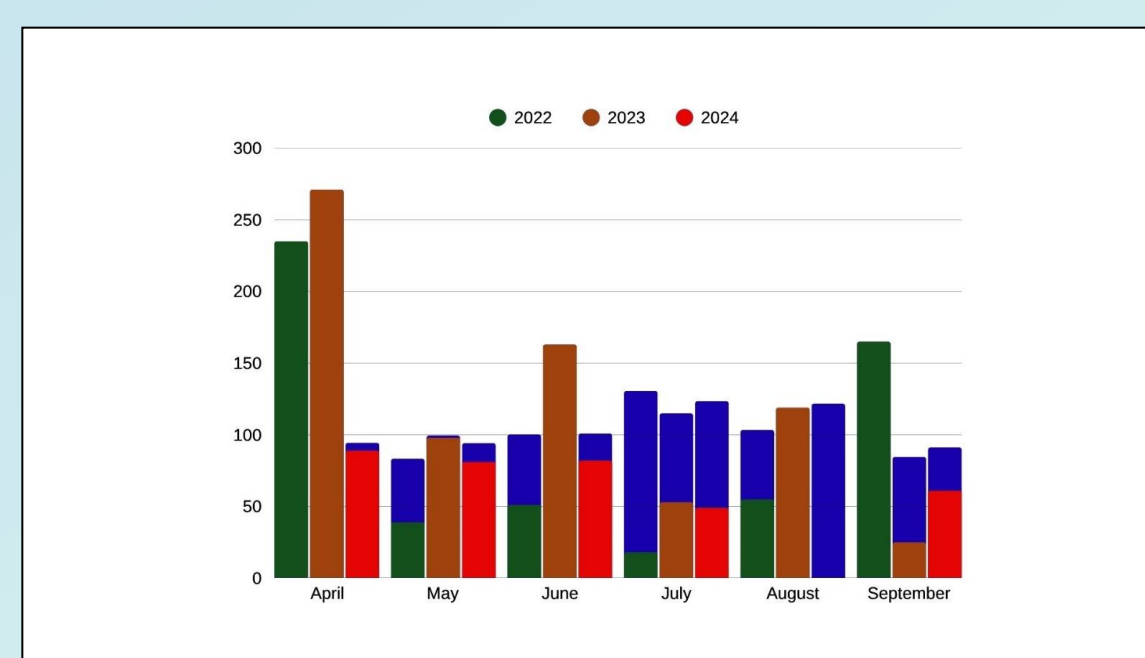
Hydroclimatic balance



2024 – largest water deficit

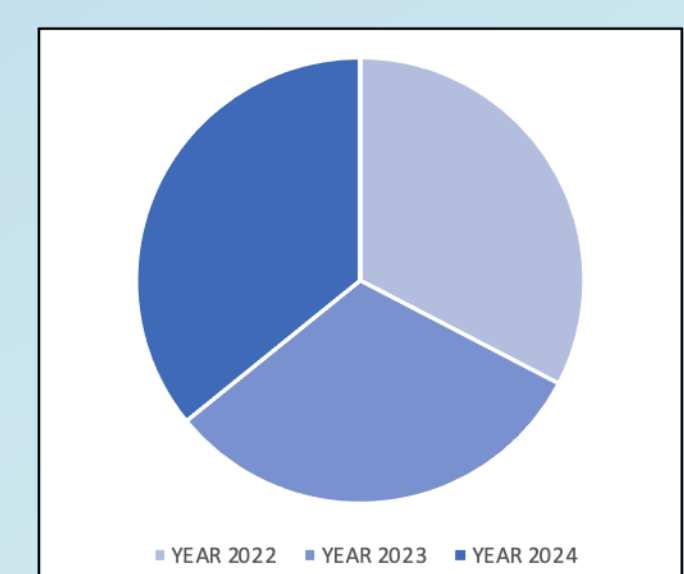


2023 – smallest moisture deficit



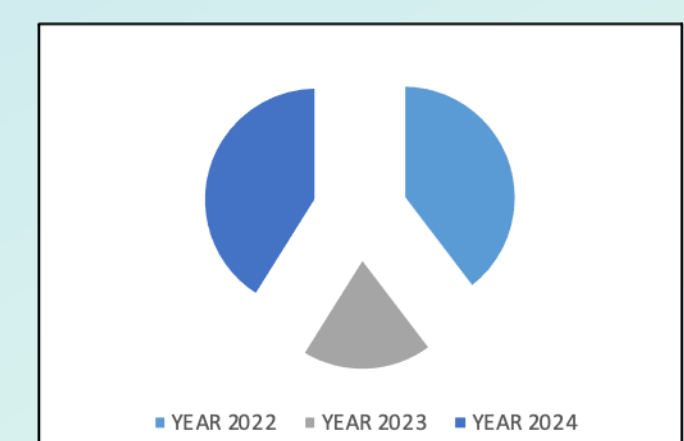
Total maize water consumption:

2022 → 5177 m³/ha
2023 → 4991 m³/ha
2024 → 5685 m³/ha



Rainfall coverage:

2022 → 68%
2023 → 100%
2024 → 52%



Highest monthly consumptions:
June–August → 866–1469 m³/ha

Monthly rainfall coverage of maize water consumption

Conclusions: The three years (2022–2024) showed distinct climatic characteristics. Year 2022 was warm and dry, 2023 was warm and wet, while 2024 was the hottest and driest. The highest water consumption was recorded in 2024, followed by 2022, and the lowest in 2023. Rainfall fully covered maize water needs only in 2023, with significant deficits of 32% in 2022 and 48% in 2024.

- To compensate for these deficits, irrigation covering 25–30% of the total water requirement is recommended.
- Considering local soil and climate conditions, sprinkler or drip irrigation systems are the most efficient. Continuous climatic monitoring and adaptive management are essential to maintain sustainable maize yields under variable climate conditions.