Reassessing Agricultural Potential in Chaco Canyon: Exploring the Link Between Soil Salinity and Maize Agriculture

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Introduction

The potential agricultural productivity of Chaco Canyon has been a topic of archaeological debate for several decades. Some researchers argue that due to the area’s arid climate, the soil quality in the region would not support agriculture. Others propose that the area’s water management systems were sufficient to support the sizable population observed in the region. New research in soil salinity has the potential to provide a clearer picture of the agricultural potential of the region.

What is Salinity?

Salinity is the amount of salt dissolved in a solution, and is a key factor in determining soil quality. If too much salt is dissolved into a solution (saturaion), dissolution will cease and subsequent precipitation of salt or salinisation may begin. This process can occur naturally—rock weathering, tidal exchange, evaporative processes—or anthropogenically with irrigation practices. High salinity can restrict plant growth by inhibiting water flow into the root system, which causes the plant to wilt, regardless of water availability. Salt tolerance among plants varies depending on heartiness, growth cycle, and root systems. Maize, the primary Southwest crop, has a relatively low salt tolerance.

Measuring Salinity

The salinity level of the soil influences agricultural potential by affecting crop productivity. Maize is particularly sensitive to salinity, with a threshold for 100% yield decrease set at 1.7 dS/m. This threshold can vary depending on factors such as irrigation water quality, soil texture, and crop variety. Salinity is measured in units of electrical conductivity (EC), which is expressed in milliSiemens per meter (mS/m) or deciSiemens per meter (dS/m).

Middle Gila River

The Middle Gila River Valley is an important agricultural area for understanding the environmental context of the Chaco region. The Hohokam civilization built a sophisticated network of irrigation canals to support agriculture in this area. The Hohokam's agricultural productivity is evident in the presence of extensive canal systems and substantial evidence for settlement in the region.

Maize Productivity

Maize productivity varies greatly amongst plants. Maize can vary from the lowest tolerances of the staple crops in the Southwest at 1.7 dS/m. However, salinity can affect the yield, not causing a 100% decline until soil EC reaches 10 dS/m.

Discussion

As shown by the electrical conductivity graphs, the Hohokam people in the Middle Gila River Valley used a variety of water management systems to support agricultural production, including adobe houses, long irrigation canals, and extensive canal systems. The presence of extensive canal systems and substantial evidence for settlement in the Middle Gila River Valley suggest a successful agricultural practice in this region.

Conclusion

Ultimately, the soil salinity from Chaco Canyon and the Middle Gila River Valley do not exhibit significant differences from one another. Spatial variability, both horizontally and vertically, is to be expected and has been observed in modern productive corn fields (McCool et al. 2018). Additionally, the presence of outliers in yield may affect the reported salinity thresholds, making it difficult to associate modern readings with past soil conditions. As a whole, this study suggests salinity should be treated with caution when applied to archaeological contexts.