



## **Plot-and-berm agroecosystems in aeolian sand sheets: A case of global/regional cultural connectivity?**

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Overcoming the agricultural liabilities of the properties of loose sand remains a challenge and necessity for increasing global food production. Several historical societies have attempted agriculture in dunefields. They include 19th–20th century A.D. Arab peasant/Bedouin interdune plantations in coastal Israel and Hopi Indian maize and bean farms in shallow vegetated sand sheets in the southwest U.S.A from the 16th century A.D.

“Plot-and-berm” (P&B) agroecosystems consists of sophisticated agricultural utilization of a high-water table within loose, aeolian sand sheets (Taxel et al., in press). P&B agroecosystems situated in agricultural hinterlands are characterized by sunken agricultural plots in between 1–5 m high sand berms. Berms are often coated with anthropogenic refuse/fines to protect them from erosion. The agricultural plots, which lie slightly above the water table, usually enable easy access to the water for crop roots and/or human water extraction. The plot sand soil enrichment is by refuse and organic material. The agroecosystems require significant resources for construction and maintenance, thus making their construction motivations intriguing.

The study reviews the morphometry, function, motivation, development, and possible connectivity of historical and archaeological agroecosystems in the Americas and around the Mediterranean basin. Indian “sunken farm” mahamaes in the coastal sand of Chilca, Peru, date to at least 1000 years and are suggested to have served as supplemental farming. The earliest recognized Mediterranean agroecosystems are Early Islamic (8th–early 12th centuries A.D.) ones along the coastal zone of Israel. This effort may be an original type of mawāt (Arabic: “dead”) land reclamation, an important issue in Islamic economic history. Known from Early Islamic juristic documents, mawāt refers to unowned wastelands. Islamic jurists prescribed rules for mawāt vivification and acquisition, typically cultivated with irrigation systems, such as qanats.

Some of the Mediterranean basin P&B agroecosystems date back to the Middle Ages and include the Saharan Ghout with multi-layered organization of date palms and fruit trees, and herbaceous crops (since the 15th century A.D.) in Algeria (Boualem & Rabah, 2011); masseira, or gamela in the northern coast of Portugal, Navazo in southern Spain (since the 18th century A.D.) (Sánchez & Cuellar, 2016), and pre-modern mawasi in the southeastern Mediterranean coast. Ghout and mawasi agriculture practice, still active today, use mechanized water drilling and modifications of the berms and soil surface level in response to fluctuating water table levels.

The modern agroecosystems may be an inherited or revived manifestation of the possibly original Early Islamic effort in coastal Israel and may render as an example of the human niche construction theory of inceptive change (Kluiving, 2015). Still, it is not yet clear if such biocultural memory was continuously transmitted across the (mainly Islamic) Mediterranean populations from the 12th to the 19th centuries. P&B agroecosystems are also a reminder that marginal environments hold potential for future agricultural exploitation.

### References

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