

Comparing Papago and Hohokam Irrigation

(from *Rivers of Empire*)

Donald Worster

Papago

The most extraordinary achievement in surviving the arid Southwest belongs to the Papago, the Bean People. They have dwelt for millennia in the Sonoran desert, a land that gets an average rainfall of less than ten inches, where saguaro, paloverde, and the Gila monster are among the flourishing forms of life. It was an unlikely place to take up farming, but they made a stunning success there until the white man's technology entered and destroyed their way of life⁽¹⁾. Papago agriculture, supplemented by hunting and gathering, was a mobile affair, touching the desert lightly. From April to September they collected cholla buds, wild greens, acorns, and fruit from the saguaro and prickly pear. For their protein they killed bighorn sheep, mule deer, peccary, and rabbits. But it was particularly in farming that they showed the most remarkable ingenuity. Whenever and wherever the rain fell, they rushed to get a bean crop raised. The bean on which they thrived was the tepary, a fast germinator. It had to be fast given the short growing season in the desert, where erratic rainfall may cause rivers suddenly to rise only to be followed in a couple of months by soil that is bone-dry again.

The Papago and other Sonoran groups perfected a technique called "floodplain irrigation," which was confined to a few river edges and arroyo mouths. Here is how it worked: A flash flood comes roaring down the sandy riverbed on a July day. It surges into a temporary catchment basin, where it immediately soaks into the soil or forms a pond for later diversion. Cottonwoods, willows, and burrobushes, some of them artificially planted by the Indians in fencerows along the watercourse, slow the current, spreading the water over a broad, flat surface and trapping the suspended silt for fertilizer. Then, in the mud left by the flood, the Papago plant their seeds, expecting to harvest them before the earth turns bricklike again. The fields irrigated in this way are small, irregular patches—two acres here, three or four there. This technique, at which they were so skilled, was also called arroyo-mouth, or *ak-chin*, farming⁽²⁾. The traditional Papago had little margin for error or complacency, yet they can be described as a people of abundance, at least in the sense that everyone among them had enough to eat and enough leisure to spend, when work was done, on stories, games, and tranquility.

Guiding floodwater as the Papago did required a communal effort, for no solitary individual could handle the flood torrents. In 1895 an admiring white observer, W. J. McGee, called the system "economy of solidarity," adding that no creature, human or otherwise, could get along in the desert without it⁽³⁾. Besides cooperation, Papago agriculture demonstrated an intimate knowledge of the desert ecosystem, stream hydraulics, and agronomy. But theirs was not a science devoted to the technical conquest of nature; rather, it aimed more modestly at achieving a secure coexistence and a thrifty subsistence.

Hohokam

Before the Papago and the related Pima Indians appeared in the desert, their Hohokam ancestors (the "finished" or "gone" people) built far more ambitiously, and they suffered for it. Between A.D. 300 and 900, the Hohokam constructed the first large-scale irrigation works in what is now the United States. Excavations carried out from the 1930s on have gradually laid bare an advanced canal network along the Gila River near Chandler, Arizona, as well as on the site of Tempe and Phoenix, threading out from the Salt River⁽⁴⁾. The Hohokam dug those canals over a period of centuries, until at last they had created a spiderlike web that could tap the entire spring runoff, drawing it off upstream and taking it to their fields high above the riverbeds. The largest of their canals was 30 feet across, 7 feet deep, and 8 miles long; it was capable of bringing enough water to irrigate 8,000 acres. Rawhides and baskets hoisted on Indian shoulders were the engines that carried away the dirt dug from that and other trenches. But at last the Hohokam overreached themselves. Intensive irrigation has everywhere led to increasing concentrations of salts in the topsoil, poisoning the farmer's fields. That nemesis came to the Hohokam too, and they were forced one day to abandon their agriculture completely, leaving behind them whited fields and dust-drifted canals⁽⁵⁾. It was their children's children who then had to learn how to get along in the desert with a lighter touch.

Enter again the Wittfogel theory of irrigation society. The social organization required of the Hohokam was substantially different from that needed for *ak-chin* farming. The latter was a self-contained village or family operation, where individuals of more or less equal standing came together to do a common job. But with the

Hohokam, as among the Rio Grande pueblos, local self-management very soon did not suffice; downstream villages had to establish control over those living upstream if they were to get any water at all. The outcome was a more efficient utilization of rivers- if efficiency means complete, total use-and a more elaborate legal frame work to resolve conflicting interests. Pushed far enough along, the big-scale irrigation system, according to Wittfogel's theory, must replace local community control with a supravillage regime.

The Hohokam did not in fact have the full infrastructural base, nor perhaps did they have the intention, to go that far toward the consolidation of power. We have no firm evidence that they ever set up an elaborate bureaucracy to manage their Salt River waterworks. But were they on their way to concentrated rule when fate cut them down? Lacking supporting written evidence on precisely how the system was governed, reading only from the works themselves, archaeologists have reasoned their way to contradictory conclusions. Emil Haury and Richard Woodbury, two of the leading authorities on the Hohokam, maintain that the system could have been constructed and preserved by spontaneous, informal cooperation sustained over several hundred years. Village elders up and down the river could have worked out their peoples' differences in times of emergency without yielding local sovereignty to a central command⁽⁶⁾. This reasoning, however, is unconvincing, based as it is on the dubious assumption that the Hohokam were able to work with a single-mindedness and long-term harmony that other societies have not shown. A second and more credible argument comes from Bruce Masse, who has recently looked again at those Hohokam traces and concluded, "Some form of coordination or control was necessary not only within single irrigation systems but among all the systems in the Salt River Valley," especially for dealing with periods of savage, unpredictable floods or droughts. Another scholar, D. E. Doyel, has gone further to insist that one village must have come to wield economic and social power over all the others⁽⁷⁾. We will never know much about the actual distribution of power in Hohokam times, and what we know will always be uncertain, but that last conclusion has common sense on its side. The Hohokam, then, are an example of what can happen when a people outgrow the local mode: of the political and environmental consequences of bigness.

Source: Worster, Donald, 1985. *Rivers of Empire: Water, and Aridity and the Growth of the American West*, Pantheon Books, New York, pp. 33-35.

Footnotes

⁽¹⁾ The destruction of Papago agricultural ecology is the theme of Charles Bowden's excellent book, *Killing the Hidden Waters* (Austin, 1977), pt. 1. I am also indebted to Gary Nabhan of the Office of Arid Lands Studies, U. of Arizona, for providing a draft of his unpublished paper "Papago Indian Desert Agriculture and Water Control, 1697-1934." The same author's book *The Desert Smells Like Rain* (Berkeley, 1982), is an eloquent account of Papago ways. See also Alice Joseph, Rosamond Spicer, and Jane Chesky, *The Desert People* (Chicago, 1949), 28-39; and Amadeo Rea, *Once a River* (Tucson, 1983), chap. 1.

⁽²⁾ This account is based on Gary Nabhan, "Living with a River," *J. of Arizona History*, 19(1978): 1-16; and Nabhan, "The Ecology of Floodwater Farming in Arid Southwestern North America," *Agro-Ecosystems*, 5(1979): 245-55.

⁽³⁾ McGee, "The Beginning of Agriculture," *American Anthropologist*, 8(1895): 366.

⁽⁴⁾ Emil W. Haury, *The Hohokam* (Tucson, 1976), 120-51.

⁽⁵⁾ James Ayres, "Use and Abuse of Southwestern Rivers--The Desert Farmer," *Hydrology and Water Resources in Arizona and the Southwest*, vol. 1, Proc. of Arizona Academy of Science (Tempe, 1971), 378.

⁽⁶⁾ Haury, 149; Woodbury, "A Reappraisal of Hohokam Irrigation," *American Anthropologist*, 63 (1961): 557.

⁽⁷⁾ Masse, "Prehistoric Irrigation Systems in the Salt River Valley, Arizona," *Science*, 214 (1981): 414-15; Doyel, *American Scientist*, 67 (1979):544.