



## Flood-Water Farming

Kirk Bryan

*Geographical Review*, Vol. 19, No. 3 (Jul., 1929), 444-456.

Stable URL:

<http://links.jstor.org/sici?sici=0016-7428%28192907%2919%3A3%3C444%3AFF%3E2.0.CO%3B2-K>

*Geographical Review* is currently published by American Geographical Society.

---

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/ags.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

---

For more information on JSTOR contact [jstor-info@umich.edu](mailto:jstor-info@umich.edu).

©2003 JSTOR

<http://www.jstor.org/>  
Tue Nov 25 18:46:16 2003

## FLOOD-WATER FARMING

Kirk Bryan

*Harvard University*

THE usually clear distinction between irrigated and unirrigated farm land breaks down in the consideration of marginal lands irrigated by flood water. In some instances there is a complete transition, and fairly well designed irrigation systems are maintained to utilize water during the time of heavy run-off in the spring, although enough water may be available for only one irrigation. There are also areas of meadowland that were originally more or less flooded and are now maintained as "wild hay" land by simple diversions and by drainage. But in the western United States there are also many areas, usually of small acreage, where the growth of a crop is dependent on sporadic and muddy floods. No regular system of diversion or of conveyance of water is maintained; but areas selected as likely to be flooded are planted, and those portions of the field not too badly washed by water or covered by silt make the crop. This is flood-water farming, a precarious type of agriculture, long practiced in our Southwest in both ancient and modern times. It should be distinguished from dry farming, in which after each rain the soil moisture is conserved by producing a dust mulch that prevents evaporation.

The two types are alike in that the fields are generally isolated and frequently abandoned. Both types are dependent on the uncertainties of the weather, and hence such fields are called by Spanish-speaking people, *temporales*. The irrigated field is a *labor* or *labor regado*. *Sembrado*, "a planting," is also used as a substitute for *temporal*, as all such fields are more often planted than harvested. As maize, or Indian corn, is the principal crop, the Nahuatl word *milpa* is also used, although more strictly it means a cornfield whether irrigated or not.

Flood-water farming is practiced in the more remote areas of the Southwest and was more prevalent in the early days of settlement than at present. Some recent studies by Quesenberry<sup>1</sup> indicate that it may still play a part in the modern development of the region.

The purpose of this paper<sup>2</sup> is to consider the geographical relation-

<sup>1</sup> F. R. Quesenberry, in an unpublished bulletin of the New Mexico Agricultural College.

<sup>2</sup> Collection of data on flood-water farming has continued over a number of years and was much facilitated during the past season by a grant from the Shaler Memorial Fund of Harvard University. Thanks are also due to J. L. Burkholder, chief engineer of the Middle Rio Grande Conservancy District, Albuquerque, N. Mex., for permission to use material gathered for the district and to Gen. H. F. Robinson, supervising engineer of the U. S. Irrigation Service, Albuquerque, for the use of maps prepared under his direction for other purposes.

ships of the practice of flood-water farming and to consider the decline in acreage in relation to recent changes in stream channels. This complex relationship has also an anthropological importance since flood-water farming was one of the important sources of livelihood of the prehistoric sedentary Indians of the Southwest.

#### MODERN FLOOD-WATER FARMING

Save in exceptional places and at altitudes above 6500 to 7000 feet the rainfall of New Mexico and Arizona is ordinarily too scanty to mature crops. At higher altitudes the growing season is short, and in many open valleys among the mountains corn cannot always be matured. Here also the fields are small and the area limited. In the vast, open alluvial basins and on the extensive plateaus of the region large areas of good soil are available. Here, where living waters suitable for systematic irrigation do not exist, flood-water farming has its place.

The areas utilized are variable in size and location, but each is chosen so that the local rainfall may be reinforced by the overflow of water derived from higher ground. The selection of a field involves an intimate knowledge of local conditions. The field must be flooded, but the sheet of water must not attain such velocity as to wash out the crop nor carry such a load of detritus as to bury the growing plants. Such conditions require a nice balance of forces that occur only under special conditions. Shrewd observation and good judgment are necessary in the selection of fields.

The sites chosen fall obviously into two main types: gentle slopes below rock or shale escarpments, valley floors inundated by sheet floods. At sites of the first type the watershed is limited in area and consequently in run-off, but the run-off is large in proportion to the rain. Thus even "little" rains produce a good run-off. The locations of the second type fall into two classes: those where the water of a stream channel spreads out over an alluvial fan at the so-called "arroyo mouth" and those adjacent to large streams which overflow their flood plains. It is obvious, however, that these types more or less grade into each other, and their separation is largely for convenience in description.

#### FIELDS BELOW ESCARPMENTS

The Spanish-speaking inhabitants of little valleys in the Sandia Mountains, New Mexico, cultivate cornfields at or near their scattered ranches. Settlements were made at these localities about 1815 and reached a more or less stabilized condition in 1850 or shortly after the American conquest. Farming is not the sole resource of these people

## FIELDS AT THE "ARROYO MOUTH"

In the Papago country of southern Arizona the flood run-off of the mountain areas is gathered in streams with well defined channels which on reaching the great undissected alluvial basins spread out into sheets. The place where this spreading occurs is called by the Papago Indians *Ak-Chin*, "arroyo mouth." These are favorite

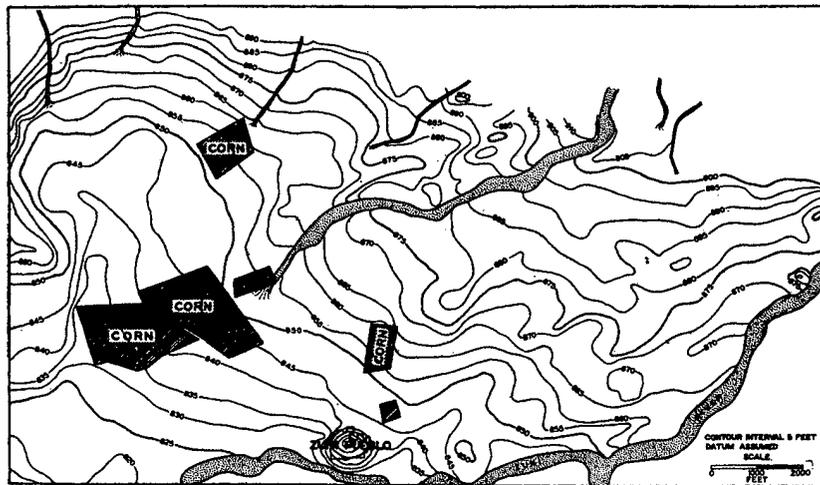


FIG. 7.—Map of part of Zuñi Valley, McKinley County, N. Mex., showing areas fenced for cultivation of corn in 1908 before irrigation of the valley by water stored in Zuñi Reservoir. (Redrawn from map by U. S. Indian Irrigation Service).

situations for flood-water fields, and more than six villages or localities once inhabited in Arizona and Sonora are called *Ak-Chin* or a corrupted form of the same name.

Localities where flood waters derived from a channel or arroyo spread out in a sheet are fairly common, but they have been much reduced in number by the recent trenching of the channels of streams. In Zuñi Valley, McKinley County, New Mexico, such localities have always been used for fields by the Zuñi Indians. In 1906 the U. S. Indian Irrigation Service began the construction of an irrigation system for these Indians, and a topographic map of the land to be irrigated was made in 1908 (scale 1 inch to 500 feet; two-foot contour interval). Part of this map, with a much reduced scale and a five-foot contour interval, is reproduced in Figure 7. The Zuñi River runs in a well defined arroyo which at that time had banks 15 to 20 feet high. Since the completion in 1908 of the Zuñi Dam, nine miles east of Zuñi Pueblo, only small quantities of water have been carried by the river. The sand contributed by two large arroyos that enter the river below the dam has filled the channel at least four feet at Zuñi Pueblo. The deep channel of Zuñi River is relatively recent and, as

to Gregory, 20,000 acres were farmed with flood water in the period from 1909 to 1915.<sup>4</sup>

#### CONTRAST BETWEEN INDIAN AND SPANISH FARMING

The kinds of places suitable for farming under the system have been outlined. These sites have existed from the time of prehistoric settlement; but cultivation, by its disturbance of the surface, leads to washing and channeling, which temporarily or permanently ruin a field. Thus at the same site the best places to plant are limited in area and changeable in position. The Indians of the present day, like their prehistoric ancestors, hardly disturb the ground, as they do not plow but merely insert the seed in a hole made with a planting stick. They select each spot that is to be seeded and by deep planting assure a strong root system capable of resistance to drought and to some surface washing by flood water. Even with the use of their methods fields must be periodically abandoned for later reoccupation. One of the principal causes of such shifts in location lies in the habits of ephemeral streams in the stage of alluviation. Such a stream has a discontinuous channel. For several hundred yards or for a mile or more it runs in flood as a thin sheet. As there is no low water or permanent flow, there will be left, on the recession of the flood, a smooth valley floor with almost no trace of a channel. Downstream from such a flat a channel begins suddenly and may be from 2 to 20 feet deep, according to the size of the ordinary flood that is to be carried. This channel may continue for yards or miles and then rather suddenly fade out in another channel-less flat. The flats are the best sites for cultivation, and the characteristics of such areas are well shown in Figure 9. These phenomena are obviously due to adjustments between load and discharge of the stream for the maintenance of as smooth a grade as possible. Obviously also, with variable discharges of water and silt by tributary streams, the proportionate load of the main stream varies, and the location of the discontinuous channels and broad flats varies in position through the years. The best situations for fields also vary with these changes.

To the Indian such shifts were usually of little importance as he farmed only for subsistence and was accustomed to walk long distances from his village to his fields. The Papagos<sup>5</sup> and Hopis even today cultivate such fields 20 to 30 miles from their winter residences. These long distances are frequently traveled afoot, and before the Spanish conquest the crop was carried home on the backs of men and women.

<sup>4</sup>H. E. Gregory: *The Navajo Country, U. S. Geol. Survey Water-Supply Paper 380*, Washington, 1916, pp. 103-105.

<sup>5</sup>J. W. Hoover: *The Indian Country of Southern Arizona, Geogr. Rev.*, Vol. 19, 1929, pp. 38-60; reference on pp. 49-55.