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LESSONS FROM SOUTHWESTERN INDIAN AGRICULTURE

BY S. P. CLARK



Hopi Indian corn field. Planted in very sandy soil in conical holes 10 or more inches deep and with 15 to 20 kernels in a hill.

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INTRODUCTION

This bulletin was written to make available some of the agricultural practices of the Indians of the Southwest, that have enabled them to live through long periods under extremely adverse conditions.

The first part of the bulletin concerns principally the Hopi Indians, who are located on the Hopi-Navajo Reservation in northeastern Arizona. This reservation is about 100 miles north of Holbrook, and can be reached by stage from Holbrook, Flagstaff, or Winslow.

Because of their isolation these Indians are in many respects among the most primitive in the United States. The agricultural methods by which they have lived are of interest to farmers and others of the Southwest.

The larger number of the Hopi Indians live in four villages, Walpi, Toreva, Oraibi, and Hotevilla, each of which is situated on a high mesa. Until a few years ago Hotevilla was a part of the Oraibi settlement. These mesas, or table-lands are all small in area, nearly flat on top, and composed largely of rocks with occasional patches of sand. The walls of the mesas rise abruptly from the surrounding plain and are in places 200 feet high.

THE COUNTRY AND CLIMATE OF THE HOPI

Centuries ago the Hopis lived and farmed in much more favorable locations along the Little Colorado. This is evidenced by the many ruins found along this stream, and is substantiated by legends of the tribe. Through hundreds of years of warfare with nomadic Navajo and war-like Apache tribes, the Hopis (meaning peaceful) were driven step by step from the more favorable soil and climatic conditions into this extremely arid and semi-arid country. The rainfall averages less than 12 inches per annum. The little snow that falls during the winter is depended upon to start the desert vegetation in the spring. During the latter part of July and through August there are local

thunder showers, but these are seldom extensive enough to cause sufficient water to run in the arroyos (dry washes) to reach the Little Colorado. In this country, as is quite common under semi-arid conditions, the rainstorms are accompanied by heavy winds which often dissipate the clouds before they reach the mesas.

The windstorms of the Hopi country at times are severe. The hardest gales occur in the spring, when the wind-driven sand cuts off the tender growth of vegetation. It also causes a great deal of damage by blowing the sandy soil away from around the roots of orchard trees and growing crops.

The average elevation is about 6,500 feet; the nights are cool, which retards the growth of crops, and there is seldom any dew.

EFFECT OF NEIGHBORING TRIBES ON THE LIFE OF THE HOPI

Previous to the time that the Government began to exercise some control over the Indians, the Hopis could farm only small patches of arable ground on the mesas or close to the foot of the mesas. Even then it was precarious, for frequently a Navajo or Apache foraging party would swoop down on the little farm and help themselves to the crop, robbing the Hopi farmer of the returns of his season's labor. The Hopis are, from the nature of their environment and economic conditions, practically vegetarians. They never possessed herds of cattle, sheep, or goats until quite recently because of the difficulty of protecting them from Navajo raiding parties. Occasionally they caught a rabbit, prairie dog, or squirrel, or obtained a sheep or a goat from a Navajo in exchange for corn or melons.

Corn is the mainstay of the Hopi housewife's menu and she has many methods of preparing it. The Hopis appreciate the value of green food and its substitutes in their diet and gather many native herbs, tie them in bundles to dry, and preserve them for winter use. A partial list of the crops they grow includes corn, watermelons, muskmelons, squashes, onions, beans, chili, sunflowers, wheat, sorghum, tomatoes, cotton, potatoes, grapes, pumpkins, garlic, coxcomb, coriander, false saffron, tobacco, peaches, apricots, and apples.

HOPI AGRICULTURE AND THE SELECTION OF FIELDS

The Hopi Indian exercises good judgment in the selection of his fields for farming. If possible, he chooses low land along a wash that is subject to overflow during the summer rains, or

land that can be flooded by simply building a temporary diversion dam across the wash. Very frequently he builds dams across the washes a month or 6 weeks before there is any likelihood of local rains. These diversionary sources sometimes have their sources as much as 100 miles from the farmer's land, and flood waters may come down very unexpectedly, from rains that fall many miles away. When there is a heavy shower, the Hopi will, in order to make use of all the water possible, go out during the rain and work for hours throwing up dikes and leading the water by little ditches over his field. These fields usually have a stratum of impervious clay 4 or 5 feet below the surface. The Hopi farmer appreciates the fact that the clay holds the moisture where the plants can use it, and retards the downward percolation of water to better advantage, than does a uniformly sandy soil. He also knows that a layer of sand on top of the heavier soil acts as a mulch in retarding the loss of water by evaporation and thus permits the seedlings to come through more readily.

Frequently a farm is located where there is no possibility of making use of runoff water. Under these circumstances the soil has a substratum of heavy clay covered several inches deep with very sandy soil.

In some localities, as on the Hotevilla mesa, the only soil available is composed of practically pure sand with a very small percentage of clay and humus. A high sandhill occupies the central part of this mesa. This hill is barren, except where the Indians have planted peach orchards and crops.

PLANTING METHODS

The planting season follows immediately after the first spring rains, which usually come about the middle of May. The Hopis do very little work, and in the majority of cases none at all, to prepare the land for planting. The dead weeds or brush that may be in the field are cut off after the crop is harvested in the fall and left for the wind to blow away. Also at this time the fields are ditched to collect any moisture that may fall during the winter. There are very few plows or modern farming implements on the Hopi reservation. The principal tools are a large hoe for cultivating and harvesting, and a planting tool, which is a stick about 2 feet long and from 1 to 2 inches thick, flattened at one end for digging. With the latter, the Hopi gouges out a hole 6 to 8 inches deep and 4 to 6 inches wide, and loosens the soil in the bottom. He then puts in 15 to 20 kernels of corn, fills the hole and firms the soil. Where the soil is very sandy and not subject to overflow, conical holes are dug to the underlying strat-

um of clay — no matter if it be 8, 12, or 15 inches — and 15 to 20 kernels are dropped in the moist soil and covered. Each hole is marked by a stone placed at one side. Occasionally, when moisture is not plentiful, the kernels are placed within a mud ball which is dropped in the bottom of the hole and covered with sand. Sometimes a progressive farmer soaks the seed before planting to secure quicker germination. If a sandstorm fills the holes with sand before the plants are above the surface the farmer will uncover them with his hands. There are often several such storms during a spring.

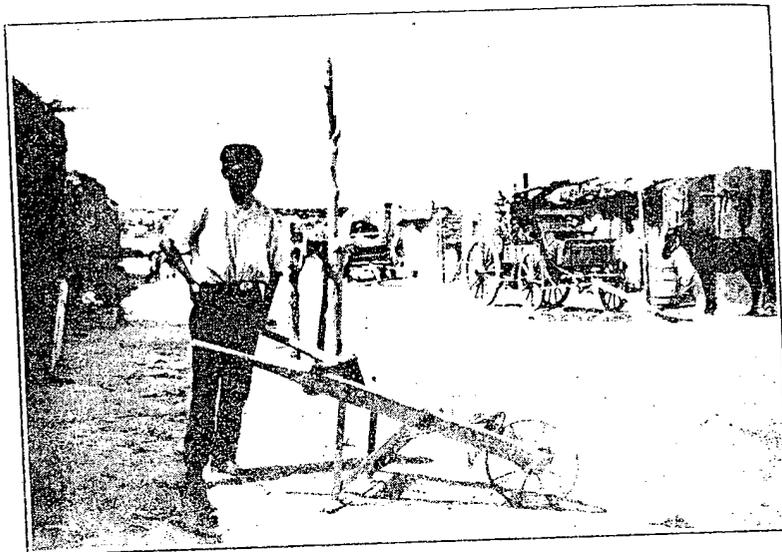


Fig. 1. — Hopi Indian homemade cultivator. This is pulled by one horse and scrapes the weeds from a strip of land about 3 feet wide.

PROTECTING THE CROP

The Hopi has various means of protecting his crops from the action of the wind. One method is to put tin cans from which both ends have been removed over the young plants. After the plants have reached the height of 6 or more inches, the cans are removed, strung on a wire, and hung on the fence to be used the following spring.

Much of the soil is of a very sandy nature, and is, therefore, subject to severe blowing by the winds. During the growing season windbreaks are built across the fields by sticking brush upright in the sand. These windbreaks are located about 30

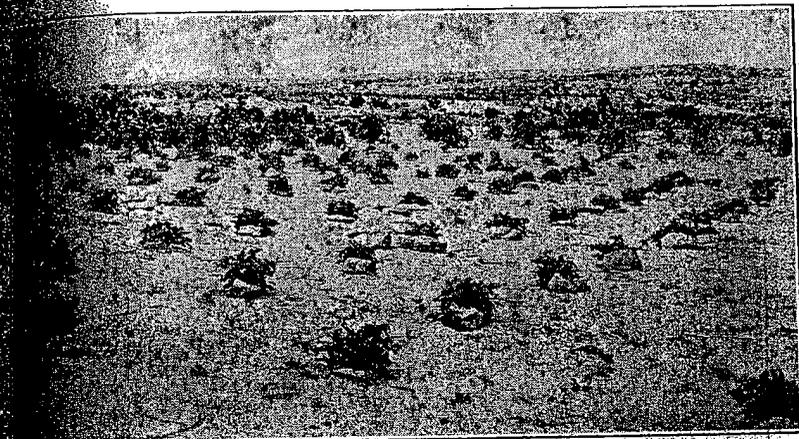


Fig. 2.—A Hopi Indian bean and corn field where each hill is protected with a stone to prevent the plants from being blown out.

are apart in parallel rows and at right angles to the prevailing wind. Even with this protection, the wind sometimes whips around some hills and injures the plants to such an extent that the farmer places a pile of stones, brush, or weeds on the windward side.

After nursing the crop along by first planting the seed deep, and then uncovering the plants when the sandstorms cover them, the Hopi cannot relax his vigilance, for the crop is never safe until harvested. As the corn grows larger, cutworms cause much trouble. Then the patient Hopi carefully digs around each clump of corn, diligently searching for cutworms. This must be done day after day while the cutworm season lasts or he would raise no corn. He must also guard against the crows. The scarecrows he puts up are so ingenious that they are often mistaken for Indians silently watching the fields.

HARVESTING AND STORING THE CORN

When the Hopi corn is mature, the farmer breaks the stalks over close to the ground, then snaps the ears and carries them to the house on his back or on burros. A few of the more progressive farmers have wagons, but these are of comparatively recent date.

When the corn is taken from the field, it becomes the property of the housewife, and it is her duty to husk and store it. After the ears have been removed, the fodder is cut with a large hoe,

tied in bundles, and fed to the stock. The mature corn is stored in the house in neat cord-like piles, the blue, white, and yellow ears being piled separately.

The Hopi Indian has found through long experience that dry years come, and that it is always well to provide for them; so the thrifty housewife stores enough corn to tide the family through at least one crop failure.

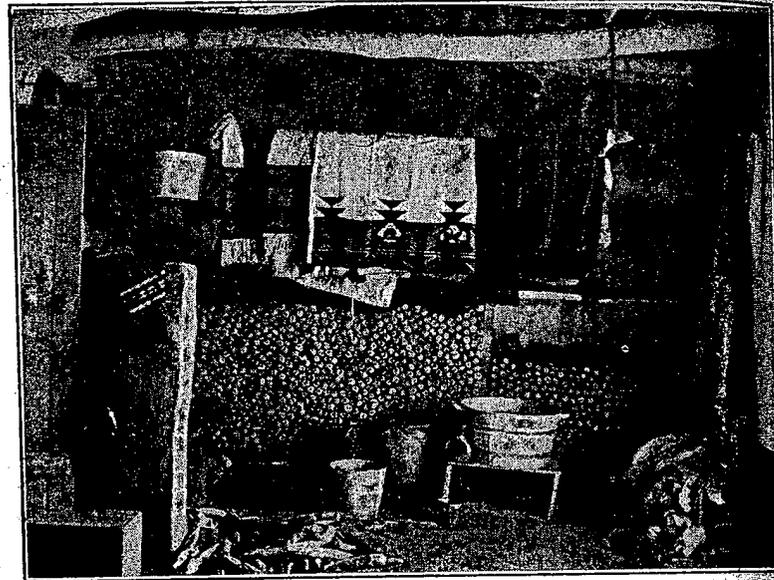


Fig. 3.— Corn piled neatly in a house, the blue and white corn being separate. Note the bundles of dried beans and peppers on the back wall; roasting ears, gourd dipper, and roll of skins on the floor; ceremonial belts and blankets hanging on the rail.

To protect the corn against the inroads of weevils, constant watching is necessary on the part of the housewife. If the weevils are discovered, she calls in her neighbors to assist her, and each ear is carefully inspected for the insects which, when found, are removed by rubbing.

Much green corn is preserved for winter use in the following manner. A shallow pit is dug and thoroughly heated with a fire, after which the embers are removed. The corn, in the roasting-ear stage and with most of the husks left on, is then stacked in, and the opening of the pit is covered completely with leaves and mud, thus making a very creditable fireless cooker. After the corn is cooked it is taken out and all except a few of

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the husks removed; these are braided together with those on other ears, and all are then hung up to dry. The dried product is afterwards stored in neat piles or left hanging from the ceiling until needed.

"As soon as the corn is fit for roasting ears there is much feasting at home and down in the fields. The greatest enjoyment of the year comes when the roasting ears are just right. Then the farmer takes his family and invites his friends and they have a wonderful time camping down in the field and roasting the corn in the fire or in large pits in the ground. In the evening, from the mesa top, one can see these camp fires all over the valley. By every camp fire there is a bunch of happy, corn-feasting Hopis. After a week or two of the field camping, the family and friends return to the mesa, fat and brown, and very well satisfied with their pleasant outing." (E. Bentley, *Tucson Citizen*, March 11, 1923.)

HOPI COTTON GROWING

"The fact that cotton was used and of necessity cultivated by the Indians, is recorded by several early Spanish explorers, as it has been more recently by many ethnologists. In the villages of the cliff dwellers of Mesa Verde National Park numerous fragments of cotton cloth have been unearthed, and in Utah seeds of the plant have been found.

"Today, among the Hopi Indians of Arizona, the cotton plant is highly esteemed, and its fibre enters into many of their ceremonies, as well as into many of their household activities. It is considered essential by them that all strings employed in religious services be of native cotton. The strings of cotton are used to bind together prayer sticks and offerings of all kinds and are placed in the trails entering the pueblos where the ceremonial services are in progress. The badges of the chiefs are all wrapped with native homespun cotton strings and cotton is also used to weave ceremonial kilts and wedding blankets.

"Unfortunately the native Hopi, once deft in the art of weaving blankets, mantles, rugs and other articles from cotton, now finds it far easier to purchase either the yarn already spun, the cloth already woven, or the complete garment, and thus the art is gradually being lost. Cotton is still cultivated by them, however to a small extent in a village in the western Navajo Reservation and in another of the Moqui (Hopi).

"The Department of Agriculture has conducted an experiment with Hopi cotton for the past seven years. This particular species of cotton is remarkable for the rapidity with which it

grows, and the early date at which it blooms, it being the earliest to blossom of several hundred varieties tested. Plants of this species have borne ripened bolls in 84 days from the sowing of the seed." (*Literary Digest* 45, 1009, Nov. 30, 1912.)

Moenkopi is the only place on the reservation where the Indians have grown cotton for any length of time.

BEANS AN IMPORTANT HOPI CROP

Beans are a staple article of food of the Hopis, and practically every field has a portion set aside for their production. There are more than twenty varieties, varying greatly in color, but all of native origin. They have a special variety of small brown beans, from which the green pods are gathered, dried in the house, and used as a vegetable in the winter diet. The farmer is careful to plant, harvest, and store the different varieties separately, but, of course, there is more or less mixing, and when a surplus is to be marketed, the varieties are separated by hand. The threshing is usually done by trampling or flailing. The Indian women will spend many days blowing out the chaff with their breath, often becoming faint from exhaustion.

MELONS AND SQUASHES

Melons and squashes find great favor in the Hopi family. When the first frost comes in the fall, all melons are harvested and stored in the house. These are eaten through the winter as they ripen. They have a native white-fleshed melon which retains its good flavor until January or February. The squashes are cut in rings, hung in the sun, and dried for winter use.

HOPI IRRIGATION

Wherever there is a spring, all possible use is made of the water, and special crops, such as onions and peppers, are planted close together and irrigated by means of small ditches. About half-way down the cliffs of the mesa at Hotevilla, there is a large spring, near which the Hopis have hollowed out a small open reservoir. This reservoir is used to store water for domestic purposes, and the overflow is used on a number of terraced gardens. These terraces are about 4 feet wide and 20 feet long, and so arranged that the waste water from one terrace is utilized in the next one below.

HOPI FARMING AT MOENKOPI

The Hopis at Moenkopi (65 miles north of Flagstaff) and at other places where the Government has developed water for irri-

gation, have adopted more modern methods of farming, due to closer contact with white men and more or less government supervision. They have horse-drawn implements, such as the plow, cultivator, mowing machine, rake, and, occasionally, a hay-baler.

Under these projects considerable alfalfa is grown, and crops of wheat, corn, barley, and oats are produced in small amounts. The corn is planted in hills spaced about 4 feet apart, and in every fourth furrow, 16 to 20 kernels are dropped into each hill. The farmer, explaining the reason for putting so many kernels in a hill, says that the cutworms, rabbits, prairie dogs, and gophers always destroy a considerable number of the plants, and this large number of kernels is necessary to insure a full stand. If too many plants remain, he thins the hills to six or eight stalks after the plants have become well established.

FRUITS IN THE HOPI COUNTRY

There are a few apricots and apple trees and a great many peach orchards in the Hopi country. The peach was introduced by the Spaniards several hundred years ago and is still propagated from seeds. As a consequence, some of the fruit is very poor, although some is of excellent quality. The Hopi is careful to keep his orchard free of weeds. He believes that when the fruit is bitter and poor in quality, it is because the field was not cultivated and the weeds removed during the fruiting period. A few of the trees are more than 50 years old and still bearing. Each orchard is owned by a single family who cares for it and harvests the fruit. The orchards are always located where the sand is deep, and this is usually at the foot of the precipitous walls of the mesa. These sand-drifts dotted with fruit trees at the foot of the cliffs are a picturesque sight.

The fruit that is not eaten in the fresh state is preserved for future use. In very recent years, the field matrons of the Government have taught the Indians modern methods of canning, but the method of preservation generally used is to cut the fruit in halves and dry it in the sun. Then it must be stored and protected from weevils. Here the Hopi has his own peculiar but effective method. An adobe wall is built 12 to 15 inches from the inside wall of the room and high enough to make a bench or shelf. The dried fruit is placed in the space between the two walls, covered with slabs or rocks or adobe brick and carefully sealed over with mud plaster, thus making an air-tight chamber. Fruit stored in this way is sometimes kept for several seasons in first-class condition.