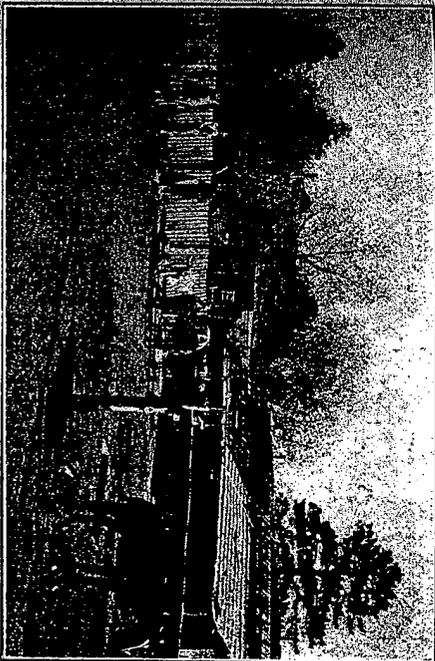


University of Arizona, College of Agriculture

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A pioneer home, Gila County, Arizona

Dry-Farming in Arizona

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Edited and Revised by
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devoted considerable attention to stock raising and have developed an interesting system of range management. In winter they move all their belongings into the mountains and higher valleys. Here they stay until well toward the end of the hot, dry spring and fore-summer. Shortly before the usual summer rains are expected, they return to their homes at the lower elevations and plant their crops of corn and beans, bringing them to maturity by means of occasional irrigations with floodwater. After harvesting their summer crops they return to their homes in the mountains where the range, which has been refreshed by summer rains, furnishes a maximum amount of forage for their livestock. Thus they are able to guard against famine because of their wise range management and by taking immediate advantage of summer precipitation for dry-farming.

The Hopi Tribe: The Hopi Indians (sometimes called Moqui) like the Pimas and Papagoes are peaceful, though anything but cowardly. They are comparatively short in stature, stockily built, and possessed of great physical endurance, excelling in their long distance races. Usually they live in villages; while their fields are often several miles away. These Indians commonly make a run of ten or twelve miles to their fields, do a full day's work, and return home again in the evening without being much fatigued. Authentic reports indicate that occasionally they have run as far as one hundred miles in a day and at times they have been used to help catch wild horses, their efforts on foot being as valuable as those of white men on horseback in tiring wild range stock.

* As far back as their history is known, the Hopis have been agricultural people. They are essentially religious and are divided into a number of clans, the chief ceremonies of each clan being centered about agricultural occupations. The interesting and well-known "Snake Dance," for example, is a ceremony of the Snake Clan, assisted by the Antelope Clan, for the purpose of winning the favor of the rain gods in order that summer rains may be ample to insure them good crops of corn and beans. This ceremony is held about the middle of the summer rainy season. The "Flute Dance" is a ceremony of the Flute Clan for the purpose of winning the favor of the gods controlling the supply of subterranean water which appears on the surface as springs.

† The principal crops of the Hopis are corn and beans; and, like the Pimas and Papagoes, they have contributed several important

varieties for dry-farming, including Hopi Lima, White Hopi, and Bates' beans, and White Hopi and Blue Hopi corn.)

The agricultural implements of dry-farming Indians are few. While a number of them have plows, many have none. Virtually all cultivation is done with hoes, and planting with a long hardwood dibber. Oftentimes the land farmed is covered with a thin veneer of sand which acts as a mulch and renders comparatively little cultivation necessary. At certain times of the year, often regardless of climatic conditions, they make their plantings, usually several inches deeper than varieties developed by white men will emerge from. In planting corn, the dibber is inserted twelve or fifteen inches deep and, as it is pulled out vertically, horizontal pressure is applied leaving a wedge shaped opening into which "a little boy's hand" or about twelve kernels are dropped. The seeds are covered loosely with soil, and the plants emerge with astonishing rapidity. (The Indians have long since learned to properly space their plants, and rarely seed too thickly. Weeds are kept down by hand labor, and the farming is quite intensive.)

When the season is especially dry and summer rains are delayed, seeds are often inserted in balls of moist clay, and the masses thrust into the dry earth. The moisture in these balls of clay is usually sufficient to germinate the seeds and supply the young plants until rain comes. An advantage of two or three weeks' additional growing season is thus secured.

† Fruit growing is not practiced to a great extent among the Indians, though numerous peach orchards exist and oftentimes a fair quality of seedling fruit is produced. The trees grow in clumps and are never pruned or cultivated. The shifting of sand by wind oftentimes covers the tree trunks well up past the first forks of the limbs. Most of the orchards are planted in sandy and silt loams along washes and river bottoms where underground water exists near the surface. There are a few small irrigated orchards of apples, pears, and plums as well as peaches.

While the Piman family has contributed a number of very drought resistant varieties, natural selection must be given the credit. These Indians farm under extreme conditions, and destruction of the unfri through a long period of time has left only drought resistant strains. Since "seed is seed" with Indians, varieties are badly mixed; for instance, in a field of supposedly white corn, white,

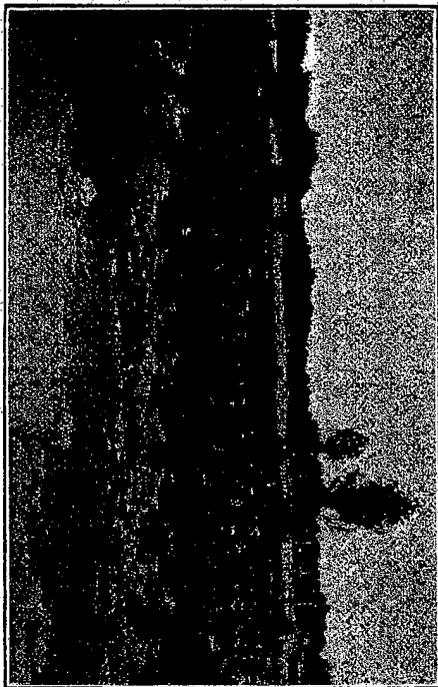


Fig. 12.—Chemehuevi Indian field on land subject to annual inundation by the Colorado River.



Fig. 13.—Yuma Indian field of corn and beans in a Colorado River slough after the annual flood.

dark blue, black, deep red, pink, yellow, and various combinations of the above may be found.

The modified characters of their corn varieties are interesting. Collins* reports that Indian varieties of corn emerged when the seed were planted at a depth of thirty-two centimeters, while the greatest depth through which Boone County White could penetrate was twenty centimeters. He found that the combined length of coleoptyle and mesocotyl of Indian corn was thirty-five and one-half centimeters, while that of Boone County White was but fifteen and four-tenths centimeters.

The thorough acclimatization of Indian varieties is further illustrated by the fact that tepary beans will form seed during the hottest part of the summer in the sub-tropical, irrigated valleys of Southern Arizona, while improved American varieties will fail unless flowering takes place in cooler weather, and oftentimes even their leaves will drop off.

THE YUMAN FAMILY

The Yuman family includes the Maricopa, Mohave, Yuma, and Hualapai tribes. The Chemehuevis, a Shoshonean tribe, from long association with the Yuman family have adopted the agricultural customs of the Yumas. This family has done little to promote dry-farming, but has become expert in farming lands subject to periodic flooding by the Colorado River. As the water recedes crops are planted in the muddy ground, and the conservation and utilization of soil moisture is sufficiently thorough to insure maturity of the crops. Because of the irregular periodicity of the Colorado floods, the Yumas have not been able to insure against famine as completely as the dry-farming Indians of the Piman family.

THE ATHAPASCAN FAMILY

The strongest numerically and of least importance agriculturally is the Athapascan family, including the Navajo and Apache tribes. Their subsistence has come from the chase and raids upon stores of neighboring Indian tribes and white people.

In the early settlement of Arizona by Americans, some errors in management made the Apaches enemies constantly to be feared; and, while the Navajos have ordinarily remained at peace, there

*Journ. Agric. Research, Vol. 1, No. 4, Jan., 1914, p. 993.

in quality to any kidney beans, and is particularly adapted to the climate of many regions in Northern Arizona.*

In 1914, a fungus disease appeared, the greatest damage being done to pink beans.

CORN

Native Indian Varieties: For convenience in comparison, tables recording variety tests of corn are divided into two groups, native Indian, and improved American varieties. The origin of Indian varieties is not known further than that they have been grown for a great many years by various tribes in the State. Some have distinct varietal characteristics, while others should be considered merely as races. In Tables XLVI and XLVII Papago sweet is included among Indian varieties, though it has been bred up and adapted until it may well be considered an improved American variety.

Three varieties of native corn, Yellow Hopi, Pima and Papago sweet, were planted in 1912. The best yield, 1740 pounds of ear corn per acre, was obtained from the plot of Papago sweet. Two plots of Yellow Hopi yielded 1352 and 1600 pounds of ear corn per acre, respectively. See Table XLVI.

Supplementing varieties grown in 1912, Hopi White Flint, Blue Hopi, and White Hopi were added to the test in 1913. The best yield was obtained from Blue Hopi.

In 1914, Mohave, several additional strains of Hopi, and three varieties, Palakai, Koescha Kai and Heroosquapa, obtained from Toriva, were added. The maximum yield of 2200 pounds of ear corn per acre was secured from a plot of Pima.

Fewer varieties were planted in 1915, the best yield being obtained from a plot of White Flint.

In Table XLVII, which summarizes the variety test of native Indian corn, annual yields represent the average of all plots of the specified variety for the given year.

The desirability of certain Indian varieties of corn for dry-farming is clearly evident. A degree of drought resistance has been bred up by natural selection for an unknown period of years,

*For a description of bean varieties see Arizona Agricultural Experiment Station Bulletin No. 68, "Southwestern Beans and Teparies," by George F. Freeman.

EXPERIMENTAL WORK IN DRY-FARMING.

Variety	1912		1913		1914		1915		Average
	Corn	Stover	Corn	Stover	Corn	Stover	Corn	Stover	
Papago Sweet	1740	4860	820	1650	492	4332	84	784	5120
Pima	800	2772	1084	2176	845	3015	996	2596	2640
Blue Hopi	1124	2397	1104	470	1124	784	1256	778	1470
White			2400	392	732	2010	1144	1600	2256
Mixed			208		1040	1520	740	695	1334
Pink					940	2440	352	890	1770
"					360	1200		646	1880
"					800	1400		360	1200
Delicious Hopi					560	920	824	692	1400
Hopi White Flint			3112		1400	1400		1376	1400
Hopi Squaw					1000	1600	784	692	1400
Pinto Hopi					500	2600	7152	560	1600
White Flint					500	2600		560	1600
Palakai					600	1840		600	1840
Koescha Kai					1600	1240		1600	1240
Mohave									

TABLE XLVII. SUMMARY, VARIETY TEST OF NATIVE INDIAN CORN, PRESCOTT DRY-FARM

The best yield was obtained from the Red Hopi variety, which produced 672 pounds of beans and 1911 pounds of straw per acre while the smallest yield was produced by Yellow Hopi beans, which returned 408 pounds of beans and 1296 pounds of straw per acre. Hopi limas grew vigorously throughout the season and set numerous pods, usually containing two, occasionally one or three beans each, and yielded at the rate of 560 pounds of beans and 912 pounds of straw per acre.

The results obtained from July plantings were not so satisfactory, damage by grasshoppers and rabbits materially diminishing yields. The Dwarf Valentine variety, yielding 660 pounds of beans and 528 pounds of straw per acre, gave best results. One plot of White teparies seeded at the rate of eight pounds per acre produced 612 pounds of beans and 576 pounds of straw per acre, and a plot of Trammell yielded 500 pounds of beans.

Six plots of White teparies were planted July 17 and 18 at varying rates, and consequent yields indicate the desirability of thin seeding. The better yield from the plot seeded in thirty-six inch rows at the rate of eight pounds per acre is partly due to more favorable soil and moisture conditions.

Twenty-one varieties of beans were tested in 1915. Most of

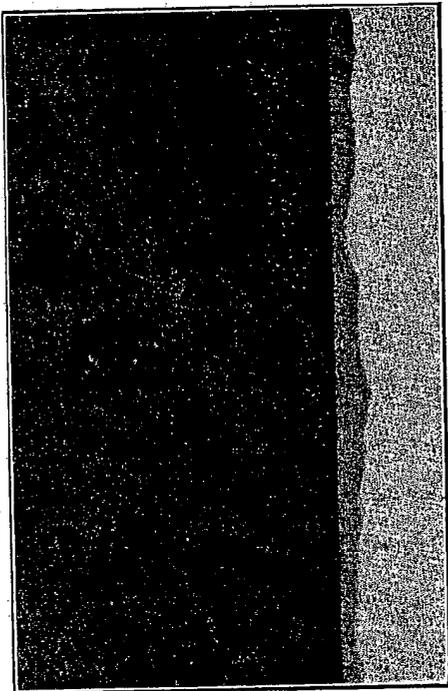


FIG. 38.—Dry-farmed mlo, melons, and beans, near Cochise, Arizona.

planting was delayed until July 17 because of the lateness of the summer rainy season.

To destroy the grasshoppers which infested the field, a poisoned bran mash* was scattered broadcast before the beans came on. The result was quite thorough destruction of the insects, but other grasshoppers came in from the outside and did considerable damage to the crop.

The highest yield in 1915 was obtained from two plots of teparies which produced 720 and 784 pounds of beans per acre respectively. Of the larger varieties Red Hopi again led with a yield of 704 pounds per acre. Casa Grande came next with 528 pounds per acre, and White Hopi and Lady Washington were in third place with a yield of 484 pounds per acre, each. Hopi lima beans did not mature because of the short growing season remaining after summer rains began. The vines grew well and were heavily loaded with green pods when frost came.

TABLE LXX. BEANS; TIME OF PLANTING TEST, SULPHUR SPRING VALLEY DRY-FARM, 1915

Variety	Date planted	Stand %	Date harvested	Yield per acre	
				Beans Pounds	Straw Pounds
Trammell	4-20	50	9-8	85	286
"	5-10	40	9-8	132	308
"	6-15	5	10-10	33	55
"	7-15

1—Destroyed by grasshoppers.

Trammell beans were used in a test to determine the most favorable date of planting. Plots were seeded April 20, May 10, June 5, and July 15. See Table LXX. The planting of May 10 gave the best returns, yielding 132 pounds of beans per acre. The July 15 plot was destroyed by grasshoppers. Data obtained in this test are insufficient to be considered as an absolute indicator of the best time for planting.

To determine the optimum rate of seeding, six plots of Dwarf Valentine and White teparies were planted at rates varying from four to fourteen pounds per acre. See Table LXXI. The teparies

*The poisoned bran mash was made according to the following formula:
 Parts green bran 1 pound
 Water 2 1/2 gallons
 Corn, dry 1 quart
 Lemons 3