FOOT-PLOW AGRICULTURE IN PERU.

By O. F. Cook.

[With four plates.]

Three principal types or systems are to be recognized in the study of the highly specialized agriculture of the ancient Peruvians. In the lower valleys, at altitudes less than 5,000 feet, farming probably was limited to the more primitive milpa system, the same that is still followed generally in tropical America in regions of low elevation. Under the milpa system a new "farm" is made each year by cutting and burning the trees or bushes, which clears the land for planting and renders cultivation unnecessary. In some countries it is customary to raise a second crop, which may receive a little weeding or hoeing, but the land is not kept in cultivation continuously. There must be a new growth of trees or bushes before the same place can be cleared again by burning.

Above the milpa belt, in the intermediate or temperate valleys of the eastern Andes, at altitudes between 5,000 and 11,000 feet, agriculture was of the terrace system, which the ancient Peruvians carried to a higher development than any other people. The megalithic retaining walls, built of huge rocks, unsquared, but fitted together with precision, testify to a high degree of industry, organization, and skill, and must be reckoned among the chief wonders of the ancient world. Hundreds of square miles of land were reclaimed by straightening rivers, walling, filling, leveling, and covering with a deep layer of fine soil. All of these artificial lands had also to be irrigated, often by carrying the water channels for many miles through craggy mountains or along precipitous slopes. After being cropped with maize continuously for centuries the terrace farms are still fertile, and have enabled millions of people to live in a region that in its natural condition could have been of no use for agriculture purposes.[1]

In still higher valleys, at altitudes of from 11,000 to 14,000 feet, the climate is colder, moisture is more abundant, and the slopes are more gentle. There is less need of terracing or of irrigation, but the alpine grasses and other small plants form a dense, fibrous turf, a condition like that of northern countries where the plow is the basic

[1] See Staircase Farms of the Ancients, National Geographic Magazine for May, 1916.

implement of agriculture. Though the early accounts show that llamas were employed extensively as beasts of burden the ancient Peruvians appear to have devised no means of using these animals for draft purposes or to assist in the cultivation of the soil. The farming of the mountain grasslands was done by human labor, facilitated by a peculiar implement for breaking the sod.

The Peruvian foot plow, in the Quichua language called *taclla* or *chaquitaclla*, consists of a rather stout wooden handle, between 5 and 6 feet long, shod in modern times with an iron point about 3 inches wide and two or three times as long. On the left side just above the iron point, is a foot rest, bound to the handle by leathern thongs. A few inches farther up is another rest attached in the same way, projecting forward. The second rest is for the left hand, which thus assists the foot in applying the weight of the body to the pushing of the implement into the soil. Middendorff's idea of the *taclla* being worked with both feet may have been suggested by the presence of the two projecting pieces, but one foot would be needed on the ground.

Other names for native Peruvian plows are *arma* and *yapuna*, recorded by Holguin and Middendorff, respectively. The verb to plow is *yapuy* or *yapuni*, and *yapuk* is a plowman. In the Aymara language, spoken in the high tablelands around Lake Titicaca, *yapa* is a field or farm, corresponding to *chacra* in Quichua. Among the Quichua words that may be related to *taclla* are *tacllamaqui*, the palm of the hand, and *tacllani*, meaning to slap or to knead, which might refer to plowing. Another verb, *takyani*, meaning to fix or make firm, might allude to the lashing on of the rests for the foot and the hand. Holguin gives *suruna* as the name of the foot rest of the *taclla*. The word *chaquilpa* is defined as a part of a *chaquitaclla*, and *huisu* as a stick that is lashed to a plow.

The plowmen do not work alone, but two together, so that their *tacllas* enter the soil only a few inches apart, under the same piece of sod, which is then pried up. A boy or woman kneels in front of each team of plowmen to turn the sods as fast as they are loosened. There is also a special word, *racra*, defined by Holguin as the boy who turns the sod in plowing. Effort is required in driving the *taclla* into the ground, as well as in prying up the sod. In the rarified atmosphere of the high altitudes plowing with the *taclla* is very strenuous exercise. The men are soon out of breath, and the work has to be done in short "heats." While the operation might be compared to spading, there are three notable differences—the way of handling the tool, the tearing of the sod, instead of cutting it, and the turning of the sod by hand instead of lifting and reversing it with the spade. The *taclla* is like a narrow spade, or spud, but

this tool has a sharp cutting edge, and is used to extirpate thistles or other deep-rooted weeds, not for breaking the sod.

The work that was being done on the slopes along the pass of La Raya in the middle of April, 1915, corresponds to fall plowing in northern latitudes. Only narrow strips of sod were being turned at this time, marking the rows where the potatoes were to be planted, but all of the ground is broken later and the tough sod disintegrates during the long growing season into a loose black soil. The cultivation of potatoes is carried to an altitude of more than 14,000 feet on the southern slopes of the valley in the district between Santa Rosa and Araranca.

Agriculture in the high altitudes becomes strictly subordinate to pastoral activities, the feeding of flocks of llamas, alpacas, and sheep on the grassy lands above the range of cultivation. The hardiest varieties of potatoes are too bitter to be eaten in the fresh state, but are dried as a reserve stock of food, after freezing, thawing, and treading out the juice. The natives are familiar with the names, habits, and distinctive qualities of many varieties of potatoes, including several types that are very different from any known in the United States. The flavors, colors, and textures of the different kinds of potatoes are as keenly appreciated among the high-altitude people as the varieties of apples or peaches are with us. In the pass of Panticalla a hospitable Indian farmer favored us with boiled potatoes to eat out of hand, and insisted that we put the remainder of our "treat" in our pockets. The firm textures and distinct flavors of the Peruvian varieties may be due in part to their being less affected by cooking, since water boils at lower temperatures in the high altitudes. Potatoes are not baked or roasted, fuel being too scarce.

At the upper limit of agriculture in the pass of La Raya the only crop associated with the potato is a small species of chenopodium, called *cañihua* (canyéwa). In the year after potatoes a crop of *cañihua* is grown on the same land, with no additional preparation. The *cañihua* is not the same as the better known *quinoa*, which is grown at somewhat lower elevations, but is a smaller plant with smaller seeds, not bitter like most varieties of *quinoa*. The *cañihua* is sown broadcast, requires no cultivation, and is gathered by pulling up the plants and piling them on blankets, where the seeds are rubbed out by hand as soon as the plants are gathered. And after being dried and winnowed the seeds are parched and ground into a meal that is similar to the *gofio* of the Canary Islanders, and is used for food, in the same way, by shepherds in the mountains or travelers on the road.

Weeds and grasses resume possession of the soil while the *cañihua* is growing, and the land is left as pasture for several years before

another "plowing" is attempted. The periods of cultivation are too short to break down the fibrous roots of grasses and other plants in the soil, so that very little erosion can take place. In favorable locations the system is permanent, and there is nothing to show how long it has been in operation or how many times the sod has been turned. Uncounted generations have lived in the highlands, and as much labor may have been applied to plowing with the *taclla* as in building the walls, terraces, artificial lands, and aqueducts for the more striking system of agriculture that was developed in the intermediate valleys.

FIG. 1.—The *caschrom* or foot-plow of the Hebrides, from Mitchell's "The Past in the Present," page 113.

That northern Europe may have passed through a stage corresponding to the foot-plow agriculture of Peru is suggested by the survival of a similar implement in the Hebrides and along the west coast of the Scotch Highlands. The Gaelic name, *caschrom*, is explained as a compound of *cas*, foot, and *chrom*, crooked, and is defined in the Standard Dictionary as "a highland pick or bog-hoe for stony ground. Called also foot-plow and crook-spade." As described and figured by Mitchell[1] the *caschrom* is essentially similar to the *taclla*, in spite of several differences in detail, such as a longer point, a more distinct curve near the base of the handle, and the lack of a separate hand rest, in addition to the foot rest. The mechanical principle is the same, the use of the weight of the body in breaking the soil. It might be said of the *taclla*, as of the primitive European implement, "the work which the *caschrom* does is neither contemptible in quantity nor quality, and there has gone brain to its contrivance."

The Peruvian foot-plow agriculture may be said to have had a very important relation to the present agriculture of northern Europe,

[1] The Past in the Present, p. 113.

seeing that the northern nations have become so largely dependent upon a Peruvian plant (the potato), the same crop that was the chief basis of foot-plow agriculture in Peru. That the laborious native system of plowing the potato lands has survived the Spanish conquest is easy to understand, since the Spanish colonists had nothing better to take its place. Spanish methods of plowing with oxen are now in general use in the dry intermediate valleys of Peru, where maize and wheat are the principal crops; but these methods are poorly adapted to the sod-lands of the potato belt in the higher altitudes. The primitive plows of dry Mediterranean countries serve merely for breaking and stirring the surface soil, not for cutting and turning a tough sod. Even a name for sod seems to be lacking in Spanish. The Quichua word is *champa*, but in Quichua-Spanish dictionaries *champa* has to be explained as "turf of earth with roots" (*cesped de tierra con raices*), or "clod of turf" (*terron de cesped*).

Although the potatoes and the other Andine crops are not confined to the soils that have to be broken by the foot plow, this implement may well symbolize the agriculture of the highlands. A special problem was presented by the mountain grasslands, and was solved by means of the *taclla*. The native hoe, or *lampa*, sufficed for the agriculture of the intermediate belt, and the axe or the cutlass for the milpa system of the more tropical valleys where new clearings are cut and burned each year. The foot-plow system is like milpa agriculture in that the land is planted only at intervals, but in other aspects—climate, soils, crops, implements, and methods of farming—it is widely different.

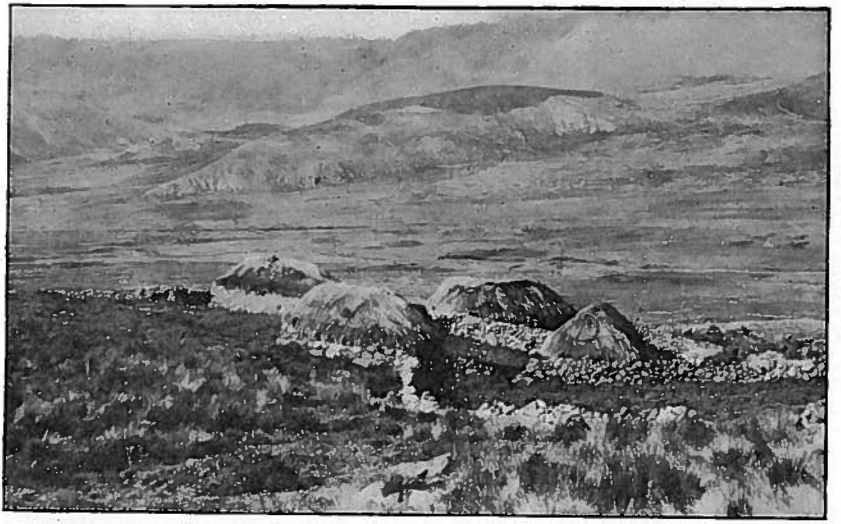
seeing that the northern nations have become so largely dependent upon a Peruvian plant (the potato), the same crop that was the chief basis of foot-plow agriculture in Peru. That the laborious native system of plowing the potato lands has survived the Spanish conquest is easy to understand, since the Spanish colonists had nothing better to take its place. Spanish methods of plowing with oxen are now in general use in the dry intermediate valleys of Peru, where maize and wheat are the principal crops; but these methods are poorly adapted to the sod-lands of the potato belt in the higher altitudes. The primitive plows of dry Mediterranean countries serve merely for breaking and stirring the surface soil, not for cutting and turning a tough sod. Even a name for sod seems to be lacking in Spanish. The Quichua word is *champi*, but in Quichua-Spanish dictionaries *champi* has to be explained as "turf of earth with roots" (*cespedi de tierra con raices*), or "sod of turf" (*terron de cespedi*).

Although the potatoes and the other Andine crops are not confined to the soils that have to be broken by the foot plow, this implement may well symbolize the agriculture of the highlands. A special problem was presented by the mountain grasslands, and was solved by means of the *wallka*. The native hoe, or *taklla*, sufficed for the agriculture of the intermediate belt, and the axe or the cutlass for the *montaña* system of the more tropical valleys where new clearings are cut and burned each year. The foot-plow system is like *montaña* agriculture in that the land is planted only at intervals—but in other respects—climate, soils, crops, implements, and methods of farming—it is widely different.

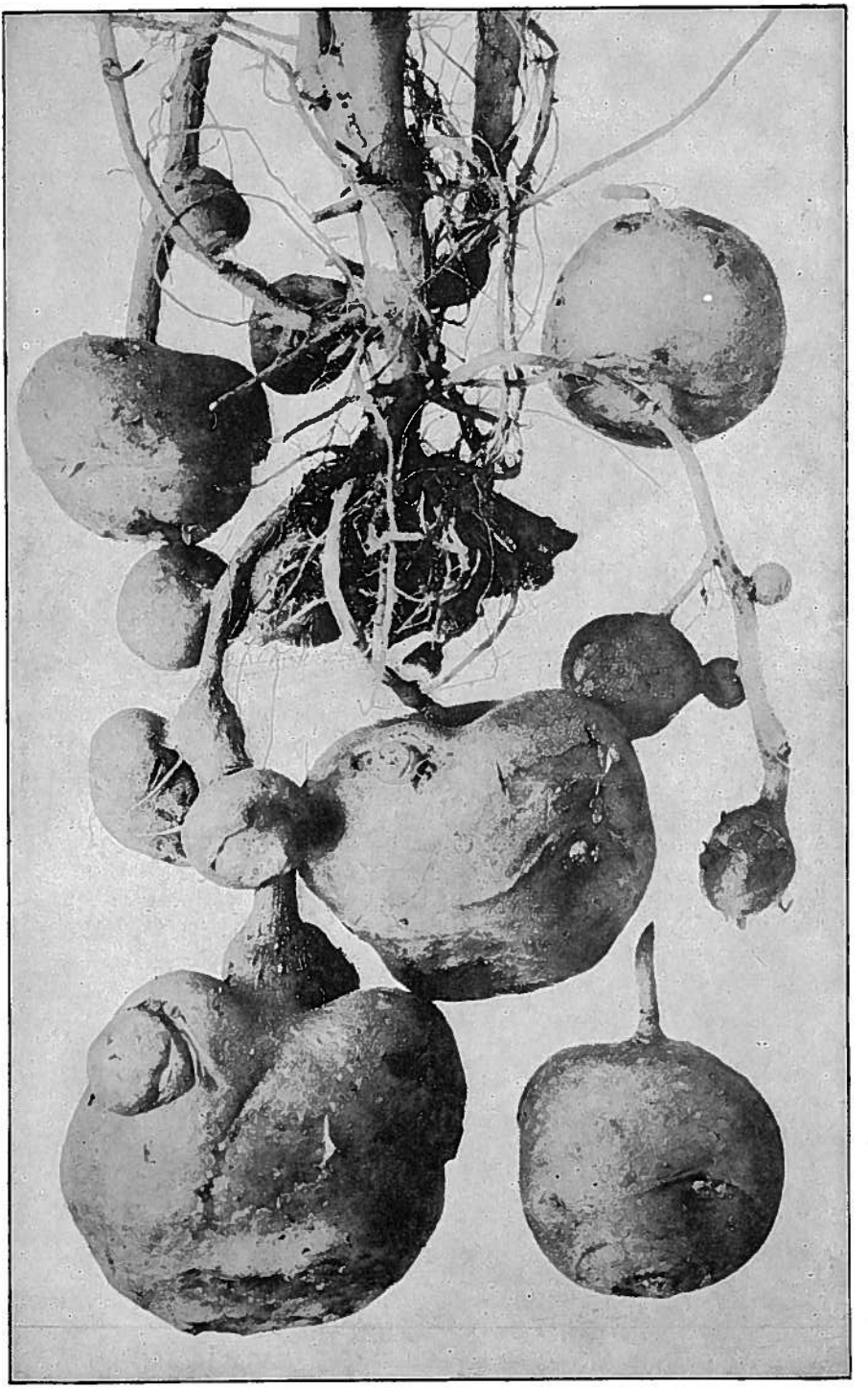
FIG. 1.—THE TACLLA OR PERUVIAN FOOT PLOW AND THE METHOD OF HOLDING AND USING IT.

From the National Geographic Magazine.

FIG. 2.—FALL-PLOWED FIELD AT THE UPPER LIMIT OF CULTIVATION, ABOUT 14,000 FEET. PASS OF LA RAYA, SOUTHERN PERU.

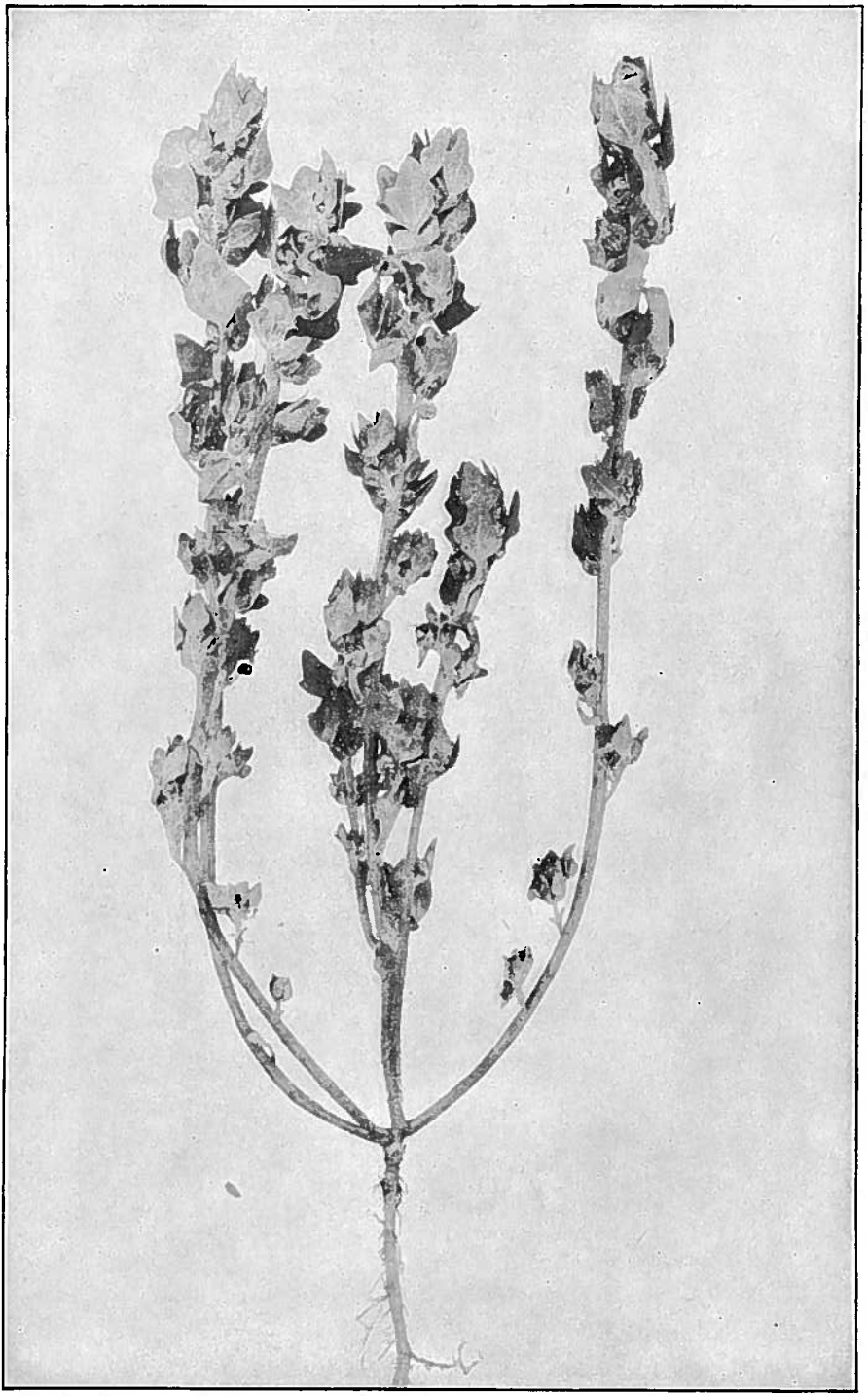


A GROUP OF NATIVE HOUSES AT THE UPPER LIMIT OF CULTIVATION, PASS OF LA RAYA, SOUTHERN PERU.



A BITTER VARIETY OF POTATOES CALLED TUTU, GROWN AT THE HIGHEST ALTITUDE, NOT EATEN IN THE NATURAL STATE, BUT DRIED INTO CHUÑOS. NATURAL SIZE.

From the National Geographic Magazine



A RATHER LARGE PLANT OF CAÑIHUA, A SPECIES OF CHENOPODIUM, PLANTED AFTER POTATOES, AT THE UPPER LIMIT OF AGRICULTURE. NATURAL SIZE.