Experimental Horticulture of Dent Corn in Northeastern Utah after Year One

Clay Johnson

Abstract

Questions as to the nature, horticulture, economic feasibility, and extent of dependence on dent corn by Formative Period Fremont populations in northeastern Utah have occupied archaeologists for fifty years. First seen as an occasional, late adjunct to Fremont hunting and gathering, corn has recently been suggested to have been a mainstay of subsistence. Corn horticulture developed rather early in the Fremont period. It is not at present understood how or where this maize variety was perfected, how it was so successful in a relatively harsh environment, or the exact conditions under which it was planted and grown. Study of interactive rock art may offer insights into corn horticulture. This presentation is an initial report on an experiment in corn horticulture in northeastern Utah, begun in 1996 using modern Mexican dent varieties, directed toward understanding corn horticulture.

Fremont Corn and Horticulture

Domestication and development of corn (*Zea mays* or *maize*) began by 7000BP (Woodbury and Zubrow 1979:46), and corn was traded or carried northward through Mexico into the future United States of America by 4000BP (Winter 1973:442). Corn appeared in Utah by the beginning of the Christian era (Winter and Hogan 1986:133-7, Madsen 1989:7). Coltrain (1994) estimates, based on a study of stable carbon isotope ratios in bone collagen for the Elsinore burial, that corn may have accounted for up to one-third of the diet at that time. During the five-hundred year period following AD500, corn was apparently a staple of subsistence over much of Utah. After approximately AD1300-1400, corn horticulture (and the Fremont as a horticultural entity) effectively disappears in Utah.

Fremont corn, like much else about the Fremont, is somewhat enigmatic (Burgh and Scoggin 1948, and Winter 1973:439-52). Fremont dent corn (typically) is a fourteen-row red-dent variety characterized as "...a distinctive and productive variety essentially unique to Utah. Presumed to have been particularly hardy..." (although see Jennings 1978:251). Jennings suggests Fremont dent corn mutated or was developed in northern Utah, becoming later and less distinctive as one travels south toward Anasazi areas. Recent Brigham Young University research (Richens 1995, Talbot 1995) at Steinaker dam in northeastern Utah suggests growing (and possibly irrigation of) corn as early as AD300. Stable carbon isotope studies (Coltrain 1995) suggest that corn may have comprised more than 50 percent of the diet at this early date.

Jennings states that effective moisture in Fremont areas today is insufficient for dry land farming of corn (Jennings 1978:13). However, as Madsen (1989:33) points out, many Fremont sites are adjacent to small streams on alluvial flood plains at the mouths of small canyons. Thus, occasional floods, deep soils, and ease of hand watering or simple irrigation could all contribute to the feasibility of farming. Good evidence of irrigation for the Uinta Fremont has not yet appeared (Richens 1995, Talbot 1995). Extensive or sophisticated irrigation systems found for the Anasazi are, so far, sparse or non-existent for northern Fremont sites. In the high, cold desert country of northeastern Utah, precipitation

regime (very little summer rainfall) and poor soils today do not seem compatible with dependable corn horticulture. However, corn has a considerable range of genetic variability and thus the potential to adapt quickly to new conditions.

In selected locations typical of lower elevations along the south flank of the Uinta mountains (Dinosaur National Monument, Dinosaur Quarry, Jensen, Vernal Airport), the growing season is approximately 116-136 days (Ashcroft, Jensen and Brown 1992). However, the season ranges from 60-199 days, and a string of short growing seasons might be as likely a factor as drought in discouraging horticulture. Spring and fall freeze dates are approximately May 20 and September 22, although range for both dates extends nearly a month earlier and later. Annual average precipitation ranges from 8.13 inches in the valleys to 13.55 inches on the benches, with most falling as winter snow. Lowest precipitation is normally in July and August.

Brew (1979:515-6) lists four techniques/physical situations utilized by the Hopi for corn crop production. Of these, irrigation is typically used today by Anglo farmers. The other three types are planting in the flood plains of major streams and watering by stream overflows, planting in sand dune fields forming against escarpments, and planting in alluvial fans at the mouths of arroyos. Additionally, I suggest that moist areas adjacent to occasional small seeps, springs, or streams scattered throughout this area might serve the purpose. Both Nabhan (1987:107-121), for the Sand Papago in the Pinacate, and Cushing (Green 1979:249-281), for the Zuni report fields at considerable distance from habitation and thus from full-time husbandry. Cushing's Zuni fields were as much as forty miles from the village. Kennard (1979:555) reports corn fields twenty or more miles from Hopi villages, although feasible distance might shrink by a factor of four or so when travel is not by horse or motor vehicle. Even a ten-mile radius in the Uintah Basin would include a considerable number of small plots with the conditions discussed above.

It is unknown how, when, and where Fremont dent corn was developed, the extent to which the Uinta Fremont depended on corn, what planting and harvesting dates were used, in what situations/soils Uinta Fremont corn was grown, the extent to which crops were irrigated, weeded, actively protected from plant predators, or otherwise tended, what yields were achieved, and how corn horticulture fit into other Fremont subsistence activities.

Planting dates would be critical in areas with a short growing season. Plant too early, and the seed rots or the tender young shoots freeze. Plant too late and the seeds lack sufficient ground moisture to germinate or the crop is more affected by mid-summer heat and lack of moisture, and consequently may not mature.

Corn in Uinta Fremont Rock Art

My interest in experimental corn horticulture came about through my study of interactive rock art attributed to the Uinta Fremont (Truesdale 1993:71-88). Interactive rock art was designed using shadows on the rock surface on specific days of the year (key days) as templates for the placement, shape and size of rock art elements. Uinta Fremont panels especially are composites, with different elements on the same panel designed on different key days throughout the year. Thus, on days analogous to the day of design, the recurring shadows interact with and emphasize elements designed on that key day. The Fremont attached importance to Summer Crossquarter, a date approximating May 3-7 and August 3-7. Data from Summer Crossquarter interactions in Uinta Fremont rock art showed many interactions stressing variations of the rake element. In particular, an elongated element resembling a lance or coup stick with feathers secured along one side, associated with digging stick-like and mask-like elements, was subject to interactive alignments suggesting the act of planting. Although lances or coup sticks are to my knowledge unknown in the Uinta Fremont artifact assemblage, corn is omnipresent. The lance-like element might be seen as a corn stalk with leaves. The May date seemed feasible (if a bit early) in the Uinta Basin, if not as a specific date to plant corn, then as the date to begin ceremonies or activities connected with planting later in the month. Corn planted during May might mature before Autumnal Equinox, when rock art interactions stress hunting. Could an experiment shed light on the timing and nature of Fremont horticultural practices?

The Experiment

Replicative experiments in archaeology do not reveal exactly how a specific task was accomplished in the past, but they can certainly suggest how a task was not done, suggest ways to test hypotheses, and generate new questions. The experimental horticulture of corn occurred independently to me, Wayne Prokopetz, DINO archaeologist, and Mary Prokopetz, an archaeological consultant. The Prokopetzes were unable to participate in 1996. In cooperation with archaeologists Blaine Phillips of the BLM and Byron Loosle of Ashley National Forest, I began in 1996 experimental planting of selected Mexican dent corn varieties generally similar to Fremont dent corns, preadapted to the extent of available seed varieties for high altitude, short growing season, and arid conditions. Locations were on BLM and Forest Service lands, with a patch in a home garden for a control. Locations were selected to test sprouting, growth, and plant predation problems in the three principal situations: in sand dune situations at the base of massive rocky areas, in alluvial fans watered only by rainfall concentrated by rocky surfaces in small dry canyons, and in moist areas generated by small seeps, springs, or streams. Planting was by digging stick into unprepared ground, deep planting of seed (8-12 cm deep) in clusters, six to eight kernels to a "hill." Surfaces were not otherwise prepared or weeded. Only a small number of "hills" were placed at any one location. Planting occurred at weekly intervals beginning the second week of May and ending the second week in June. Each site was monitored on a weekly basis.

Summary of 1996 Efforts

Variety tested was Maize Rojo from Native Seeds/Search. Summer precipitation was low in 1996, a drought year. At planting sites on BLM land, no rain fell within the three weeks before the first planting, or for more than two weeks after the first planting. In the first two weeks of July, all corn except that planted in the watered garden was lost; final loss due to desiccation. Chronologically, seeds planted May 8-11 sprouted beginning

May 20-27 and continuing through June 8. Eventual germination approached 100 percent for one participant and was very low for other participants/sites. The reason for this disparity is unknown. All plants not suffering from animal predation averaged 8cm (range 4-18cm) high by June 8. By June 21, plants on BLM land were about 13-18cm high where not damaged by animals, while some corn in the garden exceeded 30cm. By July 21, all corn except that in the garden (averaging .9m high) was lost. Corn in the garden acquired tassels beginning as early as July 23, silks in early August, and ears with the silks drying by about September 10. An ear salvaged from a fallen plant on September 12 was approximately 12cm long, a light variegated red color, and had about nine rows of kernels. This ear, boiled with some sweet corn, proved to have a rather bland, not at all sweet, somewhat starchy taste. Plants were still green on September 15, but beginning to dry by Autumnal Equinox on September 22. The remaining five large and well-formed ears could have been successfully harvested and dried on that date. Unfortunately, I elected to leave the ears on the stalks for an additional week, during which a raccoon ate them all and left the cobs on the ground.

Occasional predation from large animals (deer and cows) resulted in loss of entire plants. Predation from small animals and insects resulted in plants being nibbled back, but these plants generally recovered. Lost plants are attributed to desiccation or competition from other plants, occurring by mid-July.

All my plantings used a digging stick made from a juniper limb trimmed by a road crew. The stick was debarked and smoothed on a piece of Frontier sandstone in my yard, taking approximately ten minutes and leaving no mark on the sandstone. This suggests that the grooves at many rock art sites are not made by rubbing wood pieces, unless a lot of people were spending an extensive amount of time rubbing wood. The digging stick proved very effective in damp ground, where the stick could be inserted to a depth of 10-12cm, pried upward to leave a hole along the lower side of the stick, the seeds dropped in, the stick then removed, letting the hole collapse and covering the seeds. The digging stick was worthless in dry ground.

Some Ideas Suggested by the Data

The timing of effective planting, pollinating, and probable harvesting dates for this variety nearly approximating Fremont corn, and the skimpy analysis so far performed on interactive rock art elements that may represent corn, suggest there may well be some time-keyed information on multiple phases of corn horticulture in Uinta Fremont interactive rock art, including possible support for Schaafsma's suggestion that masks relate to crop fertility and rain (Schaafsma 1992). Early May appears to be a feasible, even a necessary planting date if corn is to mature in this area. Corn horticulture seems unlikely (based on this year's results) to have been effective without some kind of fairly constant human presence in the fields. Deep planting of seed did seem to prevent, at least for one participant, the rather common garden problem of birds or squirrels digging up and eating the seed. In future years, the team hopes to investigate effects of full versus partial sun, specific soils, hand watering, weeding, and preventative measures for animal predators.

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