

BUFFALO BIRD WOMAN AND HIDATSA AGRICULTURAL TECHNIQUES

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ABSTRACT

The archaeological cultures in the Northern Plains region of North America have long been characterized as primarily nomadic bison hunting populations. However, semi-sedentary villages that focused on maize based agriculture existed in the Dakotas during the historic period and over a much wider range prior to European contact. The agricultural potential of these societies and the impact they had on neighbouring bison focused groups has been recognized only recently in the archaeological literature. The primary historic groups in this study are the Hidatsa, Mandan and Arikara, and the details of their agricultural technique stem from Buffalo Bird Woman account as recorded by Gilbert Wilson. This ethnographic data is combined with experimental and historical production data to illustrate implications for Precontact societies and relationships between different indigenous groups on the Northern Plains.

INTRODUCTION

The Aboriginal groups on the northern plains region of North America have been a topic of interest for many people around the world. European explorers and traders were captivated by their

first encounters with these groups, and this fascination propagated the image of Plains Aboriginal people around the world, creating biased perceptions of what these aboriginal cultures looked like. Plains Aboriginal people tend to be depicted with long flowing eagle feather headdresses, buckskin leggings and moccasins, bow and arrows, tomahawks, riding among bison on wild mustangs and shooting arrows from point blank range. While these stereotypical perceptions of Plains society are rooted in some truth, they overlook a level of cultural diversity that is not recognized in the region.

Among these stereotypes are popular ideas concerning the manner in which Plains Aboriginal people obtained their food. There is a prevalent view that the region was inhabited by nomadic bison hunters who rode down their prey on horseback. While it is true that bison was an important aspect of their diet and cultural activities, agriculture played an equally important role. The ethnographic and historical records demonstrate the importance of agriculture to the diet of many Plains Aboriginal groups, however this aspect of their society is often forgotten.

The archaeological record emphasises the utilization of bison in the diet of many precontact plains groups, due to taphonomic and preservation biases. Since evidence for crop production does not preserve as well as bone and stone, it is important to seek other avenues to study food production in the archaeological record. By observing the ethnographic and historical evidence of aboriginal food production on the northern plains, we can better understand the scale of food production by precontact agricultural societies. In addition, by studying post-contact agricultural groups on the northern plains it will be possible to identify unique archaeological characteristics of the agricultural societies. This will allow for precontact agricultural societies to be identified in the archaeological

record. In recent decades, there has been a growing recognition of the importance of agriculture to northern plains groups (Flynn and Syms 1996; Lints 2012; Smith 2006), yet its cultural importance is not yet completely understood. By studying the practices of historic agricultural First Nations groups on the northern plains, in particular the Hidatsa agricultural system, we can better understand the scale of food production within their societies, which in turn would provide the foundation for economic interpretations of the archaeological and historical record. The account of Buffalo Bird Woman as recorded by Gilbert Wilson (1987) provides a framework for understanding the impacts of agriculture in the archaeological record.

CULTURAL OVERVIEW: NORTHERN PLAINS HISTORY AND THE HIDATSA

The northern plains of North America are a vast region, consisting of the southern portions of the provinces of Manitoba, Saskatchewan, and Alberta, as well as Montana, North Dakota, and South Dakota. The landscape is dominated by a prairie ecosystem, including both short and tall grass prairie. However the northern edges of the region are best described as a parkland environment, where prairie and aspen forest intertwine (Campbell and Campbell 1994). Southern Manitoba is dominated by this ecosystem, as well as Saskatchewan and Alberta. The parkland environment is a transition from the prairie into the boreal forest ecosystem which dominates most of Canada.

In terms of subsistence, there are two major divisions in this region. In the west, subsistence strategies focus on the utilization of bison and wild plant gathering. These groups were largely nomadic, following a seasonal route and living in highly mobile tipis. This

lifestyle has been emphasised and idealized in popular culture, in particular the bison hunting. Plains hunters are often depicted as riding wild mustangs bareback across the open prairie, shooting bison from point-blank range with arrows and lances. While the use of horses for hunting bison did occur on the northern plains, it was only after the introduction of horses by Europeans in the 1780's (Brink 2008). Prior to European contact, aboriginal hunters used bison jumps and pounds to trap and kill hundreds of bison at a time. The archaeological record is rich with massive bison kill sites across the northern plains, stemming largely from these practices (Brink 2008).

The principle modern groups in this study are the Hidatsa, Mandan, and Arikara. These closely related and allied indigenous groups were the main cultural groups in the eastern half of the northern plains who demonstrated a subsistence strategy that relied upon the abundant bison herds in the area, as well as a heavy reliance upon the agricultural produce from their plots (Brink 2004; Wilson 1987). Unlike the nomadic aboriginal groups in the west, the Hidatsa, Mandan and Arikara lived in permanent villages, consisting of large sod covered structures known as earthlodges, and would typically move back and forth between their summer and winter villages (Stewart 2001). The maize, beans, squash, and sunflowers produced from their plots would sustain these groups through the long winter months (Wilson 1987).

These modern groups are linked with numerous archaeological sites in the region with evidence of agriculture. Agriculture first appeared in the late precontact period and was introduced to the northern plains region in South Dakota. The earliest definitive evidence of agriculture in the region dates to about AD 1200, and is demonstrated by macrobotanic remains of maize and

tools associated with agriculture (Schneider 2002). Recent research challenges this literature dogma regarding the appearance of agriculture, with extensive maize use demonstrated across southern Manitoba and Saskatchewan earlier than previously thought (Lints 2012). Despite issues surrounding the initial appearance of maize in the region, it is generally accepted that from South Dakota the use of agriculture spread northwards along the Missouri River valley into North Dakota, and the southern edges of Manitoba (Nicholson et al. 2002). However, the general global cooling trend of the “Little Ice Age” in the 1600s caused difficulties with maize based agriculture, which led to a general abandonment of agriculture in southern Manitoba (Playford 2010). When Europeans arrived in the region in the late 1700s, agriculture was restricted to the Upper Missouri River Valley of North and South Dakota (Flynn and Syms 1996).

Contact with Europeans exposed aboriginal groups to new diseases and the confined living conditions of the earthlodges village ensured smallpox spread rapidly. A smallpox epidemic between 1780 and 1781 caused massive depopulation in the region; some groups lost up to 50 percent of their population, while the Hidatsa lost around 10 percent (Ahler et al. 1991:57). This demographic shift weakened the previously stronger agriculturalist groups, and would lead to an increase in raiding from nomadic aboriginal groups in the coming decades.

The independence of the Hidatsa, Mandan, and Arikara ended in the 1830s, when another smallpox epidemic swept over the northern plains region. The already weakened groups were almost eradicated, including 50 percent of the remaining Hidatsa population (Ahler et al. 1991:59). Their nomadic neighbours, such as the Lakota and the Dakota, escaping the majority of the epidemic and equipped with horses and firearms, harassed the weakened agriculturalist

groups (Smith 1972). The combination of these forces caused the remaining Hidatsa, Mandan, and Arikara people to amalgamate in 1845 at the Like-a-Fishhook Village, next to Fort Berthold, North Dakota (Smith 1972). They would remain here to farm and hunt in a traditional manner, until the near extinction of the bison in the 1870s.

BUFFALO BIRD WOMAN

It is in this later period that the principle informant on agricultural methods was born. Buffalo Bird Woman, a member of the Hidatsa, was born in 1839, just prior to the amalgamation at Like-A-Fishhook Village (Wilson 1987). Gilbert Wilson, an early ethnographer, interviewed Buffalo Bird Woman in 1912, seeking to record what he described as traditional gardening techniques for the region. He asked her about the traditional ways in which she prepared her plot, the crops and tools she used, and how they harvested and stored their produce. Buffalo Bird Woman was extremely dedicated to faithfully recording all of her experiences, so much so that she would often lie on the floor while Wilson transcribed; too exhausted to sit, but refusing to stop (Brink 2004).

Buffalo Bird Woman lived during a time of intense social and cultural upheaval. Her people were ravaged by disease (Ahler et al. 1991) and were forced to join with other cultures in order to survive. Buffalo Bird Woman was six years old when the Hidatsa arrived at Like-A-Fishhook Village in 1845 and she was exposed to the traditions and cultures of the various groups living at the village as well as European influences from the nearby American fort. Nevertheless, Buffalo Bird Woman's description of agricultural techniques appears to be a continuation of a time honoured tradition. She states that she learned how to grow crops from her Grandmother Turtle, who was one of the last people in the village to own a bison

scapula hoe (Wilson 1987:12). Buffalo Bird Woman followed the teachings of her grandmother and tended her plot in a manner which would have existed prior to European contact. However, Buffalo Bird Woman also states that there were other families in the Like-A-Fishhook village who were not as productive as her family, and that she could not speak for how they grew their crops (Wilson 1987:16). It appears that the techniques described by Buffalo Bird Woman are from an older tradition in the region, but it cannot be applied universally to everyone. There would have been minor variation between cultures and even within populations.

HIDATSA AGRICULTURAL TECHNIQUES

Buffalo Bird Woman described a step-by-step process by which an individual could create a Hidatsa plot. The first aspect involved picking the location for the field, since the Hidatsa are practicing shifting cultivation, they would be making new fields roughly every fourteen years (Wilson 1987). When selecting an area of land for cultivation, Buffalo Bird Woman said: "In old times we Hidatsas never made our gardens on the untimbered, prairie land, because the soil there is too hard and dry. In the bottom lands by the Missouri, the soil is soft and easy to work" (Wilson 1987:9). The softness of the soil and the ease of work is an aspect of Hidatsa agriculture that Buffalo Bird Woman often reinforces due to the use of bone hoes and wooden digging sticks. Since these tools were not durable, the Hidatsa would seek out soils that were easier to cultivate. The chernozemic soils of the prairies are rich in nutrients, but usually heavy and hard to break up. Sand and silt rich soils could be found closer to a river flood plain, and would be far easier to cultivate by hand than a clay rich soil. This restriction can inform archaeological research. The presence of bison scapulae modified to

be used as a hoe can suggest the presence of agriculture during an occupation. Archaeological sites located near timbered river valleys with sandy soil would be prime candidates to search for evidence of agriculture.

Buffalo Bird Woman further stated that the Hidatsa would select wooded areas next to a river to plant their crops. This is supported by other historical sources describing other aboriginal groups living further south on the Missouri and Mississippi river (Matthews 1971). These areas were heavily wooded and were cleared prior to planting. Buffalo Bird Woman and her family used iron axes to cut down large trees, but she indicated that prior to the introduction of metal tools, the Hidatsa would have planted their crops around the trees (Wilson 1987:13). Once the field was cleared of brush and trees, the Hidatsa women would cultivate the soil using wooden digging sticks and bison scapula hoes. They would also gather and burn the remaining tree and shrub roots, believing this process would make the soil softer (Wilson 1987:15). Buffalo Bird Woman would spread and burn the debris evenly over the entire field (Wilson 1987: 15), but her Grandmother Turtle would burn the debris away from the field (Wilson 1987:11).

The second step of Hidatsa agriculture involved building mounds for planting. The women would heap soil into large mounds four inches high, and place them three feet apart (Wilson 1987). They created long rows of mounds in their fields, in which they planted maize, beans, and squash. The crops were planted in a pattern, commonly referred to as the "Three Sisters." This involved the maize and beans being planted in alternating rows with the squash surrounding them and sunflowers planted around the edges of the fields (Wilson 1987, Figure 1).

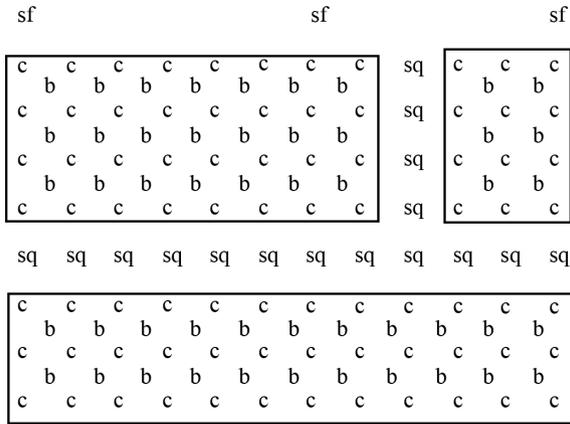


Figure 1: Schematic diagram of planting rows adapted from Wilson 1987

The combination of maize, beans and squash places importance on intercropping and the symbiotic relationship between the three plant species. Maize provides structural support for the bean vines to grow on; root nodules on the bean roots fixate nitrogen into the soil, which is a major limiting nutrient for most soils; and the squash leaves spread over the bare ground and protect the surface from evaporation (Munson-Scullin and Scullin 2005).

The Hidatsa women would spend the summer weeding and hoeing their plots, and in the early fall the crops would be harvested and a large portion was dried for winter storage in large bell shaped storage pits (Wilson 1987). They were lined with willow and grass to keep moisture out, covered with a wooden lid and layers of earth and grass. This design kept the contents dry and free of rot, as well as helps to hide the food from raiders. These bell shaped storage pits can be found in the archaeological record in the Upper Missouri River Valley and north into Manitoba (Flynn and Syms 1996).

SUBSISTENCE CLASSIFICATION SYSTEMS

Diet is one of the most important aspects of human existence. What humans eat and how they obtain it shapes all aspects of culture and this aspect was often noted and generalized in early anthropological research. Using these generalizations, anthropologists have identified four main subsistence strategy categories: foraging, pastoralism, horticulture, and agriculture. This framework was used for decades to classify different cultural groups, neatly separating populations according to subsistence strategies. However there are many flaws within this system, which have led to incorrect assumptions concerning the relevance and importance of activities among different cultures. Many Native American groups have been classified as horticulturalists rather than agriculturalists, which causes a biased perception of their society to arise. Hunting and foraging is emphasized rather than the production of domesticated plants, which does not correlate with the historical, ethnographic, and archaeological record.

Horticulture focuses on the production of domesticated plants. These groups typically vary from semi-nomadic to semi-sedentary, and the subsistence is divided largely along lines of gender; the men hunt for wild game and the women create gardens for vegetable produce. Horticulturalists utilize shifting cultivation, also known as slash and burn (Ferraro 2006), and typically use simpler hand tools made from stone and bone (Miller and Wood 2006). Another common feature of horticulture is polycropping, where farmers will plant more than one species together during the growing season (Ferraro 2006). The production yield in a horticulturalist society is often limited, leaving enough for the immediate family of the horticulturalists and none for trade. This

label has been applied to the Hidatsa, Mandan, and Arikara, along with many other North American aboriginal groups.

Agriculture is the subsistence strategy that is most familiar to the western world. It is similar to horticulture, with the focus on the production of domesticated plants, but it is often associated with large-scale societies and state-oriented civilizations (Miller and Wood 2006). Agricultural societies differ from horticultural societies due to the larger scale of crop production, as well as the use of irrigation to boost productivity, and the implementation of draft animals for labour (Ferraro 2006). In addition, agricultural societies usually practice monocropping, which entails the planting of only one crop species in a field during a growing season.

The separation of horticulture from agriculture is problematic for three reasons, the first of which is that the underlying principle for both strategies is the same, namely the manipulation and production of domesticated plants for food. Secondly, the criteria used to separate horticulture and agriculture often overlaps. For example, shifting cultivation is a major defining characteristic of horticulture, but many agricultural societies will leave fields in fallow to recover nutrients. Shifting cultivation is simply a technique used when needed, and not indicative of a particular lifestyle or culture. Similarly, irrigation is supposed to be a unique agricultural trait, but irrigation is only used when the climatic and environmental condition require it. If annual rainfall is sufficient to allow for optimum plant growth, there is no need to irrigate. Thus there are societies that are classified as agricultural that do not irrigate. Finally, the terms horticulture and agriculture are used inconsistently across the literature. This is evident when studying groups in Central and South America. Societies such as the Inca are generally accepted as agricultural societies, due largely to the scale of their agricultural

activities (Earls 1998). The stone terraces that cover the Andes Mountains demonstrate their dedication to this subsistence strategy. Their system, however, would also fall under horticulture specifications, as they used simple tools such as hoes and digging sticks. In addition, the Inca did not use draft animals for labour, as they did all of the planting and harvesting by hand. So what appears to be a horticultural group is popularly considered an agricultural society.

In respect to the northern plains, the Mandan and the Hidatsa are traditionally classified as horticulturalists. While certain generalizations of the horticulture category are true, such as the semi-sedentary lifestyle and the use of domesticated crops, other generalizations are false. Specifically, the separation of horticulture from agriculture decreases the importance of food production in these societies, suggesting that crop production contributed little to their diet. Ethnographic and historical evidence has demonstrated that these groups were capable of producing vast quantities of agricultural produce for their families and communities, and that their diet was less reliant upon hunting and foraging.

EVALUATION OF THE BUFFALO BIRD WOMAN AGRICULTURAL SYSTEM

In order to determine the efficacy of the techniques used by the Hidatsa, the benefits of Buffalo Bird Woman's system must be studied. One such study was done by Munson-Scullin and Scullin (2005), where they applied the methods that Buffalo Bird Woman described. A defining characteristic of the Hidatsa's agricultural technique is the employment of the Three Sisters, a method of polycropping. The symbiotic relationship of the three plant species

has been demonstrated to be extremely efficient in other regions of the continent (Kuepper and Dodson 2001). However, experiments have indicated that this combination is only effective in drier regions where there is less arable land and a need for conservation of space and water (Munson-Scullin and Scullin 2005). The maize and beans grow together, using each other to further their development in a smaller area, and the squash vines and leaves shade the soil from evaporation. These benefits are important in arid regions. In regions like the American Southwest where the Zuni farmed, this is an extremely efficient system for their climate (Kuepper and Dodson 2001). In contrast, the upper Missouri River Valley is a region with more space and plentiful amounts of rain. The Three Sisters system was designed for drier environments, so its benefits may not be as apparent in this region.

Experiments with Hidatsa agricultural techniques, namely those conducted by Munson-Scullin and Scullin (2005), have demonstrated that the three main benefits of the Three Sisters combination are not always apparent. From 2001 to 2003, researchers grew several monocrop maize plots, and polycrop beans and maize plots, following the instructions given by Buffalo Bird Woman (Munson-Scullin and Scullin 2005). Ideally the maize stalks would act as supports of the bean vines so that the beans get more sun exposure, however during the Hidatsa experiments the beans vines did not reach to maize stalks. The researchers found that the vines were often killed by rainfall splashing soil onto the plant and transmitting disease and fungi (Munson-Scullin and Scullin 2005:17). Another facet of the Three Sisters relationship is the nitrogen fixation of the bean plants. Measurements of the soil's nitrogen content were taken throughout the course of the experiment and indicated no noticeable difference in the amount of nitrogen

between the plots with intercropped beans and corn, as opposed to plots with only corn (Munson-Scullin and Scullin 2005:17). This contrary result is the result of the initial high nitrogen content of the soil, ensuring that the benefit of nitrogen fixing plants was not realized for the duration of the experiment. The benefit of nitrogen fixing plants could be realized in a longer trial, but the shorter experiments produced no added benefit. The final portion of the triad is the soil shading benefit of squash. Munson-Scullin and Scullin's (2005:17) results indicated that the squash leaves kept the soil cooler than exposed areas, but the squash vines would also tangle and knock down other plants.

In the case of the Hidatsa and their agricultural neighbours, the Three Sisters symbiotic relationship does not give any of the added benefits that were assumed to exist. This is not to say that the experimental plots were unsuccessful at growing produce. In fact despite the issues surrounding the implementation of the Three Sister benefits in the experiments, Munson-Scullin and Scullin's (2005) plots still produced on average 38 bushels of corn per acre. This level of food production would be satisfactory for modern farming. Moreover, the results of the experiment demonstrate that the Three Sister system was designed for specific conditions and does not always translate into other regions.

Another characteristic of the Hidatsa agricultural system includes planting crop seeds into mounds and maintaining them throughout the years. Buffalo Bird Woman gave no explanation for the use of mounds in her field, but this is also a common feature across North America (Kuepper and Dodson 2001). One theory proposed that the mounds act to stabilize the corn stalks in strong winds (Munson-Scullin and Scullin 2005). The Hidatsa use a species of corn known as Northern Flint, which is leafy and top-heavy,

making it prone to being knocked over in the strong prairie winds. However, when the corn is planted in clusters, the roots intertwine and it stabilizes the base of the plant. Buffalo Bird Woman stated that the Hidatsa would continue heaping soil over the maize roots during the summer, which is thought to prevent the stalk from blowing over (Wilson 1987).

Another possible function of the mounds is drainage. The Hidatsa grew their crops close to bodies of water where the water table is closer to the surface. This can be problematic since maize requires well-drained soil to grow, and is hampered when the water table is too close to the surface. The roots of the plant cannot penetrate deeply into the soil, which stunts the growth of the plant. Modern solutions use drainage ditches and pipes to lower the water table and allow for deep root penetration of the soil and a higher yield. The Hidatsa instead used the mounds to elevate the maize farther from the ground surface. The mounds need to be at least 6 to 8 inches high to allow maize stalks to resist the effect of wind damage (Munson-Scullin and Scullin 2005). By constructing a mound and raising the seed, it gives more space for root penetration of the soil before encountering the water table.

CONCLUSION: HIDATSA AGRICULTURAL YIELDS – HISTORICAL AND EXPERIMENTAL

The question of production potential is an important one to consider for the northern plains, as it has implications for food surplus and economic power. Body (1998) considered the sociocultural implications of agriculture and food surplus in the context of the northern plains, citing an oscillating pattern of conflict between bison focused groups and maize based agricultural groups.

Agricultural products were greatly desired in this region, often traded over long distances (Lints 2012). Developing a successful agriculture system would increase the status and wealth of groups able to capitalize on the surplus (Boyd 1998). In terms of producing surplus, Buffalo Bird Woman stated there would be enough food from one harvest to feed her family without ration until the next harvest, but she does not give a specific quantity to the productivity of her field (Wilson 1987:58). However, when historical documents detailing the yields of aboriginal fields across the plains (Wedel and Frison 2001) are paired with the ethnography of Buffalo Bird Woman, a clearer hypothesis begins to take shape.

Historical documents from the late 1700s to the early 1900s indicated that on average, midwestern semi-sedentary agricultural groups could produce 20 bushels per acre of maize (Wedel and Frison 2001). Using Buffalo Bird Woman's garden as a proxy, her three-acre field would have yielded approximately 60 bushels or 3,360 pounds of dry weight maize. For her family of nine, each person would receive 373 pounds of maize for the entire year or approximately one pound of corn a day, indicating that, on average, the Hidatsa would be able to produce considerable excess. Experiments with Hidatsa agricultural techniques demonstrated a greater production than recorded in historic documents. The first year of a freshly broken plot yielded an average 38 bushels per acre of dry weight maize (Munson-Scullin and Scullin 2005:12). The subsequent years of production saw decreased production from the plots, which is common for shifting cultivation techniques; the results were, however, all higher than the average historical yields. Using Buffalo Bird Woman as a proxy, her three acre field would yield 6,384 pounds of corn in one year. Her family of nine would be able to consume two pounds of corn a day for the entire year,

without ration. These calculations are illustrative, as consuming two pounds of corn in a day would not be an ideal diet. In addition to the agricultural produce, the diet would be supplemented with wild plants, bison, and other game animals (Johnston 1970) Buffalo Bird Woman stated that her field could produce enough food to feed her family without ration for an entire year, and the historical and experimental documents support this statement.

These results demonstrate that there was likely considerable food excess for the semi-sedentary agricultural groups in the archaeological record on the northern plains. The traditional agricultural techniques in the region were efficient at supplying the population with a stable source of food, as well as surplus for trade. This trade would alter power structures and relationships between groups, affecting the movement patterns of groups living in the area (Boyd 1998). Evidence of agriculture at archaeological sites can be demonstrated by the presence of similar tool sets and techniques for food production as described by Buffalo Bird Woman. By tracking the distribution of agriculture production on the northern plains, we can inform our interpretations of culture change in the region.

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