Zuni Farming and United States Government Policy: The Politics of Biological and Cultural Diversity in Agriculture

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ABSTRACT Indigenous Zuni farming, including cultural values, ecological and biological diversity, and land distribution and tenure, appears to have been quite productive and sustainable for at least 2000 before United States influence began in the later half of the 18th century. United States Government Indian agriculture policy has been based on assimilation of Indians and taking of their resources, and continues in more subtle ways today. At Zuni this policy has resulted in the degradation and loss of natural resources for farming, reduction in the number of Zuni farmers and their control over farming resources, individualization of rights in farmland, consolidation of farm fields, and declining biological diversity in agriculture. The Zuni Sustainable Agriculture Project with the Zuni Irrigation Association and the Zuni community, are now working to revitalize sustainable Zuni farming, based on traditional values, knowledge, and technology, combined with modern knowledge and technology where appropriate. The United States government can support these efforts through appreciation of the need for Zuni control and the potential value of cultural and biological diversity.

1. Introduction

Zunis have a long and successful history as farmers, going back at least 2000 years before the United States (US) government claimed their territory. Zuni farming appears to have been quite productive and sustainable during this period in part because of its integration with Zuni culture and religion, its support of ecological and biological diversity, and a land tenure system that emphasized community responsibilities. The Spanish invasion of Zuni territory in the 16th century resulted in adoption of new crops and livestock, but also caused a reduction in the Zuni population and a change in settlement pattern. US influence began in the early 19th century, and increased after the beginning of the 20th century. US Indian agriculture policy has emphasized assimilation of Native Americans into the dominant European-American society and by removal of their resources. At Zuni this policy has decreased the biological and cultural diversity of agriculture, and probably its sustainability.

Today, official policy statements by the US Government on relations with Indian nations, including agricultural policy, promote cultural pluralism and sovereignty. However, the major themes of assimilation and the taking of Indian resources persist, so that even when public statements include respect for Native Americans' desire for self-determination, the underlying values can result in more pressure to conform to the standards of the dominant society. This can not only make decisions that go against the dominant society's values more difficult, but result in further loss of farming resources.

The values underlying US Government policy may be alien not only to Indian cultures and Indians' goals for the future, but to the development of sustainable agriculture (NRC, 1992, Pimentel *et al.*, 1992, Strange, 1988). It is important to examine these values if the goal is a policy that truly respects Native Americans' right to develop sustainable agriculture in their own way, an agriculture that not only conserves natural resources, but respects and builds on each group's cultural values.

There are many definitions of sustainable agriculture (see e.g. Allen and Sachs, 1993; NRC, 1989; UNCED, 1993), that include social, environmental, and economic aspects. We define it as farming in ways that provide a good return in farmers' own terms for their work today, while protecting and improving soil, water, crops, and other natural resources for future generations, that is for our grandchildren, their grandchildren, and so on. Sustainable agriculture also means that local people and their communities are in control of agricultural resources and development, that farming is based on their cultural values, and that community members share equitably (i.e., according to each household's need) in the economic, nutritional, and social benefits. In response to increasing interest of the Zuni community in revitalizing its agriculture, the Zuni Sustainable Agriculture Project with the Zuni Irrigation Association is working to revitalize sustainable Zuni farming, based on traditional values, knowledge, and technology, combined with modern knowledge and technology where appropriate.

Our purpose in this article is to increase understanding of the effect of US government policy on Zuni farming, and to encourage discussion about how the US government can assist Native American farm communities in their efforts to develop sustainable agriculture in their own terms.

2. Zuni Farming Before the United States

Long before the beginning of the United States, the Zunis developed a diverse set of farming (as well as gathering and hunting) strategies for supplying themselves through natural resource management of a vast territory with a wide range of soils, temperatures, and rainfall conditions. While the data needed to test the sustainability of Zuni farming before the European invasion do not exist, oral history, archeological evidence, and historical documents suggest that it has supported the local community socially and culturally over the long-term, with only minor degradation of natural resources. The Spanish invasion of Zuni beginning in 1540 had major effects on Zuni population size and settlement pattern, but led to the introduction of many new crops and livestock species that appear to have been largely beneficial.

2.1. Farming and Zuni Culture

Zuni ancestors or *awu:wu:na:awe:kwi:kowa* lived in what is today central and northern Arizona and New Mexico. Corn, beans, and squash were brought by Indian travelers from present day Central America and Mexico beginning about 4000 years ago. By about 2000 years ago farming had become a very important part of making a living for the *awu:wu:na:awe:kwi:kowa*, though gathering and hunting continue to the present. There were pithouses and large storage pits for surplus food at Zuni then, and regional trading patterns were also well established by 1000 years ago (Ferguson and Hart, 1985: 25). The traditional Zuni farming area was much larger than the present-day reservation (Figure 1). The Zuni people who descended from the *awu:wu:na:awe:kwi:kowa* learned to be very successful farmers, being able to grow enough food in most years so that there was a surplus when there was a bad year.

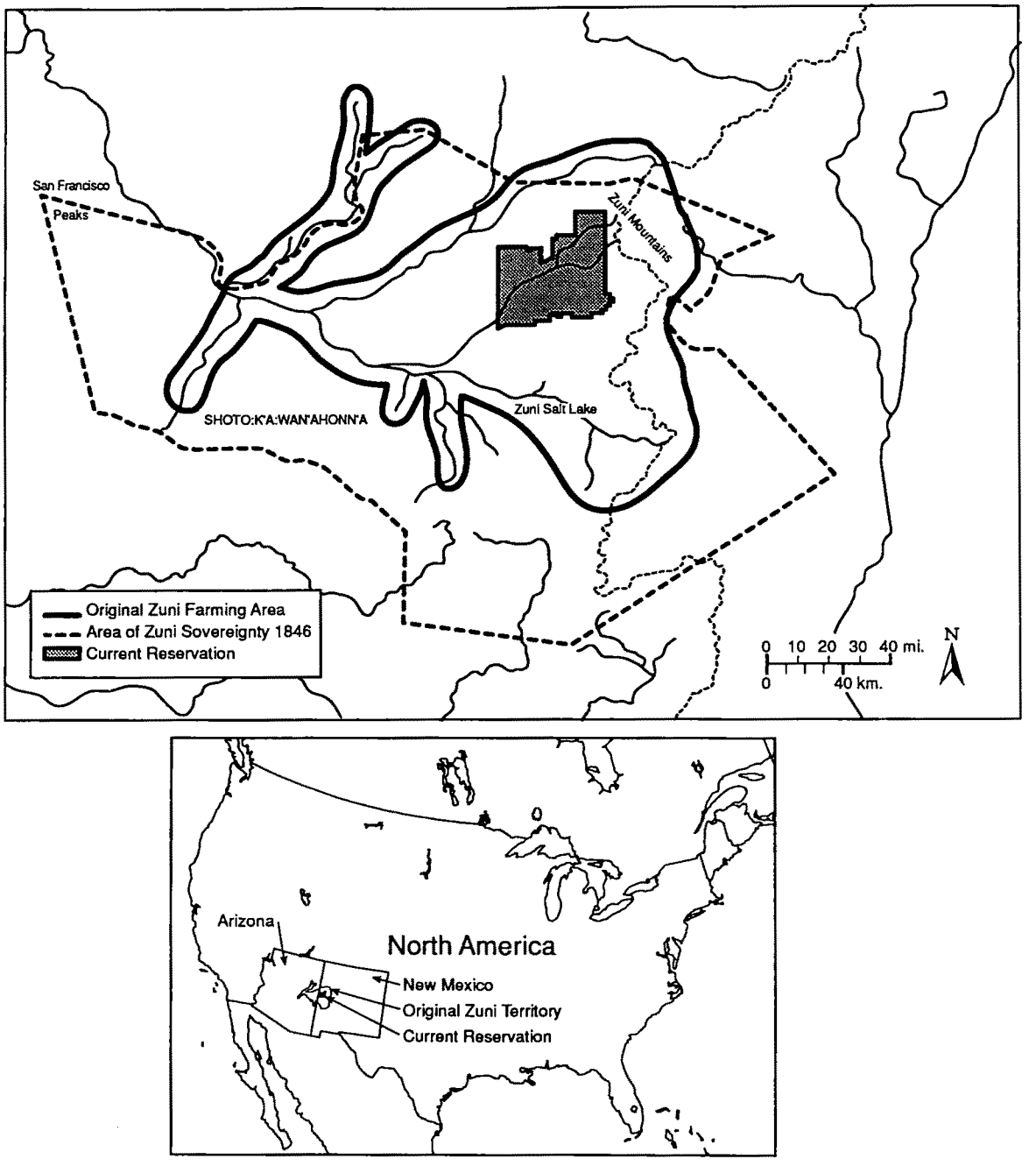
Management and control of Zuni natural resources for agriculture differs according to the nature of each resource and its role in production, as is common in farming communities around the world (Netting, 1993). Resources like farmland are used and controlled by individuals, but with overarching community regulation. Common pool resources such as irrigation water from permanent streams or springs are controlled by community organizations. Worldwide research on management of common pool resources in the last two decades, especially irrigation water, supports the hypothesis that management of these resources by local communities as common property is successful (efficient and equitable) when farmer organizations are in control, and especially in small-scale systems (Berkes *et al.*, 1989; Tang, 1992).

In the 1880s Cushing described the system for regulating the water supply at Nutria:

> So limited is the supply of water during the dry months, that every householder keeps an account-stick hanging somewhere near the sky-hole. Every time he waters a set of his "earth-bins," he has to cut a notch in this account-stick; and as the latter is liable to inspection by the sub-chiefs any morning, he dares not, or rather does not, use more that his proper allowance of the water. (Cushing, 1979: 293)

At about the same time, Stevenson commented that there were seldom disputes over irrigation water,

Figure 1. Original Zuni Farming Area, Area of Zuni Sovereignty in 1946, and the Current Zuni Reservation.



Location of the Zuni Reservation.

and that when they did occur they were settled by the Governor, who was responsible for seeing that water was "fairly distributed" (Stevenson, 1904).

The Zuni tradition and ideal is that land, like most other property, is controlled and inherited by women or the children within the family. The Zuni tradition of individual "ownership" of land has been imbedded within a community prohibition on transferring land to outsiders, and a strong cultural value on distribution of resources within the community to those who need them (see Smith and Roberts, 1954: 78-79).

Zunis claimed and defined fields by marking boundaries with low dirt bunds and the corners with rocks or rock piles (Cushing, 1979: 249) and there was mutual respect for individual fields. Fred Bowannie Jr. says that "what our grandfathers used in past years was natural boundaries. My dad over in the lower village showed me a boundary line that started at 'mouse rock' and went way across to the south side to another mound of rocks. They didn't use tapes or transits. Mostly it was verbal agreement, respect, 'His boundary's right here, I will respect his boundary because I see this rock and that rock over there, I won't go past that'." (Bowannie and Laahty, 1993)

Traditional management of natural resources is based on Zuni religious values of respect for nature. In

spite of hostility toward Zuni religion since the 16th century it continues as an important element of Zuni life today, with Zuni farming in a central role. The agricultural cycle is entwined with the social and religious cycle. A number of outsiders have recognized this fact. For example, in the mid-1880s Cushing described the first planting of maize, which involves ceremonial planting of six different colored seeds (yellow, blue, red, white, speckled, and black) in the six directions of Zuni religious cosmology (north, west, south, east, zenith, and nadir respectively), with a prayer stick in the middle (Cushing, 1920: 176-179; see also Stevenson, 1904: 350). Zunis also place turquoise in the hole with the colored seeds and prayer sticks. After this is done the planter sings a prayer from the Coyote Society for bountiful crops. Today, farming continues in many ways to be a religious activity, but Zunis do not discuss the religious aspect with outsiders.

2.2. Ecological and Biological Diversity in Zuni Agriculture

There is increasing evidence that ecological and biological diversity contribute to long-term stability of crop yields, and therefore are important for sustainable agriculture by reducing risk of crop failure (Cleveland, 1993a; NRC, 1992; Pimentel *et al.*, 1992). In indigenous Zuni farming, biological diversity, especially traditional Zuni crop varieties, and ecological diversity of scarce water and soil resources, were managed for successful farming in a difficult, arid environment.

Zuni receives an average of 10-15 inches of rainfall a year, almost half in the summer rainy season, when temperatures are high, and evapotranspiration rates exceed rainfall by 14 inches during the growing season (Tuan *et al.*, 1973). Production of most crops without supplementing or concentrating natural rainfall is impossible. Rainfall and streamflows vary greatly from year to year, month to month, and from one location to another in Zuni land. The distribution of good soil for growing crops is also quite uneven. Like other Native American farmers in the arid Southwest, Zunis developed techniques of working with the environment to produce abundant yields.

Zuni farming techniques that build on ecological and biological diversity for sustainability can be placed into three categories: location of fields, soil and water management, and selection and maintenance of crop varieties. First, Zuni farmers located fields where nature made conditions optimal for crop production, for example in canyon bottoms, at the mouths of arroyos, and along rivers and streams where there were seasonally moist alluvial soils. They also scattered their fields in different places to spread the risk of a bad harvest (see Figure 1). Some rainfed fields were planted by sheepherders more than 60 miles from the central village (Ferguson and Hart, 1985: 37). In addition to different field types, gardens and orchards (after the introduction of fruit trees) were also cultivated.

There is evidence that smaller sized fields such as those of the Zuni often make more efficient use of resources and have higher yields than larger units, although production is usually more labor intensive (Netting, 1993). In addition, locating fields in different environments reduces the risk of crop failure. Despite a dramatic reduction in agriculture, farmers today have access to land through a complex system of marriage and inheritance from both mother and father that provides access to irrigated and rainfed fields in several different locations at Zuni. They talk about the advantages of this in terms of the yield stability derived from differences in growing season, soils, and pest problems.

The social disruption caused by Spanish military violence and the introduction of infectious diseases from Europe, for which Native Americans had no resistance, were probably an important cause of major changes in the farming system at Zuni. Before the Spanish invasion the Zunis were living in six large villages on or near the Zuni River, but after the Spanish reconquest in 1692 they began living in one settlement, Zuni village (Halona) (Kintigh, 1985). Farming became more focused around this one settlement. However, there was extensive grazing on Zuni lands, as Zunis had adopted the livestock introduced by the Spanish and successfully incorporated them into their production system.

Second, primarily through techniques of rainfed and canal irrigation, Zuni and other farmers of arid southwestern North America, worked with nature to improve soils and water supply. Through different methods of irrigation, i.e. conveying water from outside the field and applying it in the field or garden, they increased the amount of water available for crops (see Stewart, 1940; Stewart and Donnelly, 1943). Rainfed irrigation techniques used by Zunis have included 1) floodwater farming through diversion and channeling of floodwaters during the summer rainy season, especially at arroyo mouths (Bryan, 1929), 2) terrace farming on plots made by the accumulation of soil and water behind small check dams, and 3) rainfall-runoff farming using contour bunds and other means to direct rainwater to fields. The staggered rotation of rainfed fields, in part necessitated by changing stream channels, also conserved soil fertility. Today most rainfed cultivation at Zuni is in rainfall runoff fields.

Zunis made sagebrush windbreaks and left stalks in the field after harvesting not only to protect the soil from erosion, but to capture wind blown silt to improve the soil. When arroyos did begin to develop, farmers controlled them by placing brush in the channels, and later sheep manure. Zuni management skills were recognized by some outsiders. A licensed Indian trader at Zuni with 31 years of experience in erosion control

in the area, criticized the BIA in 1933 for its unsuccessful erosion control measures and recommended that they visit the Zuni corn fields to see "how this work should be done" making small barriers of brush and soil in the traditional Zuni way (Master, 1934).

Zuni farmers also used canals to deliver water from springs and large streams like the Zuni River, although canal irrigation was not as important as rainfed irrigation. Before US government involvement, there were irrigation systems at Pescado, Ojo Caliente, and Nutria that depended to varying degrees on spring flow (Ferguson, 1985; Stevenson, 1904). For example, by at least 1882 Zunis had built a 2.5 mile canal at Nutria fed from a reservoir created by an earthen dam on the Rio Nutria about 0.25 miles below the springs (Figure 2), as shown on General Land Office maps, with 300-500 acres irrigated (Ferguson, 1985; Holmes, n.d.).

Third, Zuni farmers were continually selecting crop varieties for adaptation to the Zuni environment and culture. It is increasingly recognized that folk crop varieties are often preferred over modern varieties by small-scale farmers with limited production resources because of their local adaptations that assure a more reliable yield without expensive inputs such as fertilizers or pesticides (Cleveland, Soleri, and Smith, 1994). Like other indigenous farmers, Pueblo farmers today cite as a major reason for retaining their folk varieties the stability of yield that comes from growing varieties adapted to the local, often stressful, environment (Soleri and Cleveland, 1993).

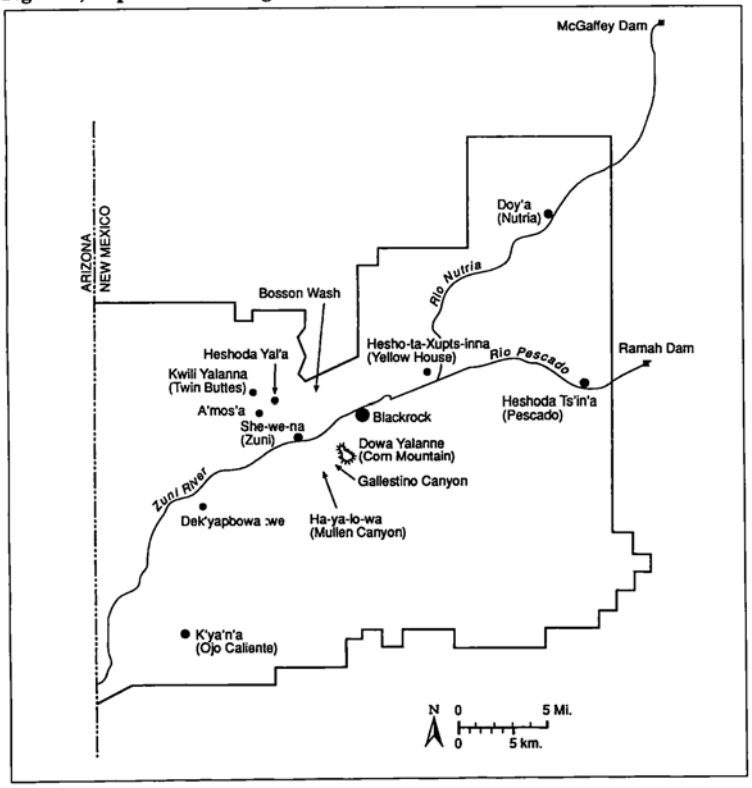
The Zuni people have developed their own varieties of crops originally from present day Mexico and Central America, for example the yellow, blue, red, white, speckled, black, and other colored corn and bean varieties, and varieties of squash (Minnis, 1992). Tribes in southwest North America also domesticated some wild plants, e.g., tepary beans and devils claw, and cultivated a number of wild plants. Planting a number of different crops, and a number of different varieties of some crops, especially corn and beans, and squash, probably also helped to decrease risk. The Spanish introduced many crops (e.g., wheat, peaches, watermelons, cilantro) and livestock (e.g., sheep, burros, horses) (Ferguson, 1985: 30), which were adopted and adapted by Zunis and diversified the farming system. Peaches became a staple of Zuni diet, and extensive peach orchards were located on deeper soils that received runoff from surrounding catchment areas.

Corrected map. Agriculture and Human Values 12(4):83.

Map appeared originally in Cleveland, David A., Fred Bowannie, Jr., Donald Eriacho, Andrew Laahty, and Eric Perramond. 1995. Zuni farming and United States Government policy: The politics of cultural and biological diversity. *Agriculture and Human Values* 12(3):2-18.

Corrigendum (see page 1)

Figure 2, Important Farming Locations and Other Places Mentioned in the Text.



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Corn was the most important crop, and was planted in rainfed fields near the villages in the farming districts and the main village at Zuni. Zuni, Hopi, and Navajo corn was recognized by outsiders 80 years ago to be adapted to the local environment and traditional planting technique. Collins observed two unique morphological features: an elongated mesocotyl, allowing successful emergence from more planting depths of ten inches and more; and a dominant, deep radical, enabling the seedling to make use of moisture far below the soil surface (Collins, 1914a, b). Zuni farmers today cite the adaptedness of their folk varieties to the low rainfall and short growing season of Zuni (Brandt, 1992: 19), and state that Zuni peach trees require less water than commercial varieties (Cleveland *et al.*, 1994).

3. United States Influence on Zuni Farming

US government policy toward Indian agriculture has always been one of taking Indian resources and attempting to assimilate Indian farmers into mainstream conventional agriculture. Since reforms beginning in the 1930s, policies have shown more acknowledgment of Native American cultural diversity and rights to control natural resources. However, US Indian agriculture policy, as part of overall US agricultural policy, continues to be based on the values of Western industrial society, which may be inappropriate for the establishment of sustainable agriculture based on Native American culture and adaptation to diverse, local environments.

The dominant society tends to believe that the only way for agriculture to develop and improve is to imitate industrial agriculture (Todaro, 1994). Another common belief is that technology is more powerful than nature, and that humans should dominate nature for their own ends (Daly and Cobb, 1989). This provides the basis for the assumption that sociocultural and biological diversity is not valuable (Cleveland, 1993a). Social and cultural diversity in farming is not valuable because European-American industrial society and culture is obviously superior to Native American society and culture, and biological diversity is not valuable in farming because technology can control nature to increase yields without the need for biodiversity. Policies of assimilating Native American farmers into conventional society and agriculture, and of the taking of their resources for use by "more productive" and "industrious" Anglo farmers flow logically from these assumptions.

To create an Indian agriculture modeled on US Anglo agriculture, US policy promoted a cash economy, including cash crops, farm machinery and other purchased inputs, and the licensing of traders in Indian territory. Unofficial policy was to separate Indians from their agricultural resources and give those resources to White farmers. Zunis came under US policy in 1848, and it was a major change from Spanish (before 1821) and Mexican policy (1821 to 1848). US government policy has for the most part not recognized the agronomic value of ecological and biological diversity in the Zuni farming system, nor the cultural importance of the unique Zuni values imbedded in Zuni farming. There has been a dramatic reduction of Zuni lands, farm fields, and farmers as a result of the loss and destruction of natural resources, and the assimilation of Zunis into US society.

To the extent that Zuni cultural values and social traditions are adapted to the biologically and ecologically diverse Zuni land, then the maintenance of one is necessary for the maintenance of the other. While such a synergistic relationship between biological and cultural diversity has been suggested frequently in recent years (see, e.g., NRC, 1992), it is difficult to test in specific cases. While we do not have the data to do so for Zuni, the available evidence suggests that such a relationship could exist.

3.1. Loss and Degradation of Natural Resources for Farming

A pillar of US Indian policy since from 1776 until the 1930s has been one of supporting the expansion of dominant White society by taking Indian lands and allocating them to small "reservations" (Hagan, 1988; Horsman, 1988; Kelly, 1988; Prucha, 1988). Even efforts to recognize rights to the land or to limited sovereignty were underlain by the ethnocentric and racist assumption that White society and values were better than Indian ones, and that ultimately Indians would adopt White values and cede most of their lands to the higher uses of White society (e.g., Horsman, 1988: 32). The "civilization policy" developed in 1790s "would make the Indians content with their lot, persuade them that their loss of lands had brought progress, and salve the conscience of the United States" (Horsman, 1988: 34). After the Homestead Act and other federal programs to distribute land, there was little arable land left for White settlers in the West, and by the 1880s, Indian lands were White farmers' "last frontier" (Gibson, 1988: 227). By 1934 Indian land holdings were reduced from over 140 million to less than 50 million acres (BIA, 1972: 9). In addition to outright loss of land, leasing of allotments increased, for example, from 8 to 18 million acres between 1910 and 1918 (Barsh, 1992).

The aboriginal territory of the Zunis included some 15.2 million acres, and Zunis maintained control over this territory under Spanish and Mexican administrations, and even in the early years of US administration when they helped US troops fight the Navajos (Ferguson and Hart, 1985). But between defeat of the Navajos in the late 1860s and 1876, they lost 9 million acres, and by 1935 the official Zuni reservation recognized by the US Government was only 340,000 acres.

In 1882 the railroad was constructed through Zuni territory and opened up a new era of natural resource destruction. Beginning in the 1890s there was clear-cutting of millions of acres of trees in the watersheds upon which Zuni agriculture depended. More than two billion board feet of sawtimber were cut in the Zuni Mountains between 1890 and the early 1900s (Ferguson and Hart, 1985). The railroad also made possible the production and marketing of large numbers of livestock, and after clear-cutting private livestock companies overgrazed the Zuni watershed. As Zuni territory was further and further restricted by Navajos and Apaches, Mormons, Hispanics, and Anglos moving in, as well as by the establishment of other Indian reservations, and US national forests and parks, Zunis had to restrict their own grazing, farming, and other resource use to a smaller and smaller area.

This increased pressure on the land outside of the Zuni reservation most probably led to channel erosion in the mountain valleys above Zuni and in arroyos used for floodwater and terrace farming. Reduction in Zuni grazing areas led to overgrazing and also increased erosion on the remaining Zuni Tribal lands. Deepened arroyo channels made it difficult or impossible to divert water out of them or to dam them effectively, thus reducing farming (see Ferguson, 1989). Many of the erosion-control structures built by the US government since the 1930s have failed, leading to increased erosion. Today soil erosion and arroyo formation have reduced the use of both rainfed and canal irrigated fields.

Starting from some 10-12,000 acres of land in crops in the mid 19th century, by 1912 only 8,000 acres were cultivated, by 1934 only 5,200, by 1968 2,185, and in 1991 about 1,000. It has been estimated that a minimum of 11,000 acres of "prime irrigable lands have been lost to Zuni agriculture" (Ferguson and Hart, 1985: 37; Hart, 1990: 4). Zuni surface water resources were taken by impoundment in the Ramah Reservoir on the Rio Pescado by the Anglo settlement of Ramah in 1936, and by the McGaffey dam on the Rio Nutria. As a result of the reduction in Zuni territory, the destruction of natural resources for farming, and the abandonment of fields, there has very likely been an overall reduction in the ecological diversity of Zuni farming, though the empirical data needed to thoroughly test this idea do not exist. If pressures for consolidation, privatization, and leasing of farmland to outside agribusiness are successful, this will very likely reduce diversity even more.

3.2. Disempowerment

A deep-seated contradiction in US policy at Zuni reflects US Indian policy in general. At the same time the US was pressuring Zunis to become more like Anglo farmers, to learn how to "support themselves," they were not only taking away Zuni resources, but taking away Zuni political power and access to information needed to manage their own natural resources, and denying the validity of Zuni farming knowledge. In spite of three centuries of contact and conflict with the Spanish, the traditional Zuni power structure was maintained (Ferguson, 1985: 36; Perramond, 1994). This was possible because the Spanish developed the secular leadership positions of "governor" and his "tenientes" and recognized holders of these positions as legitimate leaders, and did not attempt to change Zuni land management practices. In contrast to what was probably the situation for the Eastern Pueblos on the Rio Grande, the Spanish emphasis at Zuni was the conversion of souls rather than conversion of agricultural and other natural resources.

Hart has detailed how BIA policy and actions, including deliberately keeping information from the Zunis and forcibly interfering with Zuni religious and secular political institutions, led to political instability throughout much of the 20th century (Hart, 1976; see also Ferguson *et al.*, 1988). This included deliberately deceiving the Tribe regarding its right to file a land claim before the Indian Claims Commission, and preparing a letter for the Governor and Council members to sign that they later testified they did not understand (Lesarlley, 1976), thinking that it had something to do with allotments (Hart, 1976). It seems probable that BIA policy has severely reduced the ability of Zunis to manage their own natural resources, leaving the BIA as *de facto* manager, but without a viable management system (see Ferguson, 1989).

The old policy appears to have prevailed even when new laws passed by Congress had the opposite intent. For example the Self-Determination and Education Assistance Act of 1975 (PL 93-638) created new procedures for tribes to contract and administer BIA programs using their own goals as criteria for contract fulfillment, but subject to BIA-administered contracting procedure and financing (Champagne, 1992: 51,53). Champagne has suggested that the PL 93-638 process was sabotaged by the BIA, especially the Area Offices, by "expanding operations to include provision of technical aid and personnel training to tribal governments . . . in direct contradiction to the congressional intent" (Champagne, 1992: 52-53). At Zuni, recent PL 93-638 contracts to the Tribe for irrigation rehabilitation and dam safety have been arranged so that the BIA is in control, and the Zuni Tribal Council and Zuni community have little or no input.

Underlying the stated goals of assimilation has been the assumption that Zunis are innately inferior, and need to be taught "how to farm," and are not capable of controlling or even meaningfully participating in the planning and implementation of agricultural development. As a consequence, indigenous Zuni farming knowledge has been ignored and devalued.

The Annual Report of the Pueblo Agency for 1885 is typical: "How to plow, to plant, to cultivate, to sow, to harvest, to save, so as to produce the largest results, are lessons which much (*sic*) be taught to these Indians" (Fay, 1981: 125).

Paternalism continues to characterize BIA attitudes towards Zuni farmers, and the BIA and many of its agents criticize farmers for asking questions instead of thankfully accepting whatever the Agency offers (NIU, 1993). BIA personnel have remarked that if Zunis want to get "serious" about farming or ranching they need to hire a "real" manager, meaning a non-Indian. The attitude of US government offices has generally been that Indians don't need to have maps, copies of contracts, project proposals, research reports, or other documents on their own farms or ranches, and have not made it easy for Zunis to obtain them. On the other hand, Zuni farmers have learned that trying to obtain these documents is usually frustrating and unproductive.

A recent example of this frustration is the effort on the part of the Nutria Irrigation Unit to obtain an inspection of the Nutria Upper Diversion Dam so that planning for its rehabilitation of the irrigation unit, including the dam, reservoir, and distribution system, can proceed (Cleveland and Bowannie, 1994). Although the Soil Conservation service has stated that they need a dam inspection before they can help with rehabilitating the irrigation system below the dam, they have no formal guidelines for what an inspection should contain to satisfy their requirements for construction assistance. The BIA Zuni Agency did not provide an inspection as requested, but instead offered the Nutria Irrigation Unit a new plastic pipeline, which was refused by the farmers because no adequate dam inspection had been carried out.

The situation today is that Zuni people have "developed a great distrust for the government because they were not involved in project or program designs or decisions in the past" (Enote *et al.*, 1993: iv). It is not surprising that Zunis generally avoid "public" meetings called to discuss BIA agricultural policy, because their past experience tells them that the US government is not really interested in the ideas of Zuni farmers. It is not surprising either that the BIA cites lack of attendance at these meetings as proof that Zunis don't care about the future of Zuni agriculture.

3.3. Social change

US policy from the beginning has been to assimilate Zunis into mainstream commercial agriculture through encouraging production for the market (e.g., of wheat, alfalfa, and cattle), and increasing dependence on inputs purchased from outside Zuni (e.g,. seeds, machinery, fuel, and irrigation equipment). Zunis welcomed the agricultural markets created by the US, as they had those of the Spanish before, but Zuni trade was squashed by the US when non-Indian farmers became able to fill the market.

After establishing several forts in the Zuni area in the 1850s and 1860s, the US government licensed traders who introduced wagons and steel plows (Hart, 1985). By the 1890s there were quite a few Anglos living in Zuni, including missionaries, teachers, government agents, and traders. The traders and other outsiders shifted Zuni interest toward sheep and cattle after the new railroad opened up markets (Eggan and Pandey, 1979). There was an increase in pasture and in production of forage crops for the horses, and the US government built a mill in 1917 and encouraged Zunis to grow hard wheat for flour.

US policy in the West was to dam rivers and build irrigation systems (Checchio and Colby, 1993), with the assumption that Indian tribes without irrigation weren't really farmers. For example, Indian Agent Romero stated in 1885, that at Zuni and the other Pueblos without canal irrigation "no crops can be raised to any advantage" (Fay, 1981: 125). The construction of relatively large irrigation districts at Zuni beginning in the early part of the century by the US government has permanently changed Zuni farming, and these irrigation districts now dominate current farming area and the interest of Zuni farmers.

In addition to planned change directed by the US government, the decline of farming at Zuni has been in part a result of the overall change in US society in which the importance of farming for households has decreased, while that of wage labor and other economic pursuits has increased. At Zuni the increase in jewelry making, which accounted for "86% of the Zuni Gross National Product Zunis" in 1934 (Holmes and Fowler 1980: 211), appears to be an important cause for the decline in farming. In 1942 the income from jewelry was $562,500, livestock $201,069, and crops $23,046, and it has been suggested that the demands of jewelry business are more compatible with ranching than with farming (Leighton and Adair, 1966: 33; see also Ferguson, 1985: 135). However, some farmers may have initially gotten into jewelry because of a lack of farming opportunities due, for example, to a lack of irrigation water in the Blackrock irrigation district. Ranching was encouraged by the government as being a more appropriate use of Zuni lands than farming, especially rainfed farming.

The Zuni development plan published in 1976, the second development plan published by the Zuni Tribal Government, expresses doubt that Zuni farmers would use improved irrigated land because of "skepticism about acceptance of modern, improved agricultural method and the current reliance on the jewelry industry for income," and therefore proposed a large-scale Tribal farm (Pueblo of Zuni, 1976). Throughout the plan, ranching is emphasized over farming (see section 3.5).

The decline in Zuni farming in recent generations, with a large number of fields not being farmed for many years at a time, has resulted in use rights within the family becoming blurred, so that disputes occur when someone does want to start farming again. Land disputes are a major problem in Zuni farming districts, and are made worse by lack of common recognition of field boundaries. These disputes are one of the main reasons that so much farm land is idle, and most households at Zuni today believe that idle fields should be farmed (Cleveland, 1993b). Many of the land disputes occur within families rather than between them. The most aggressive family member may simply stake a claim by beginning to use the land, and other family members then must bring the case to the Tribal Council for resolution (Bowannie *et al.*, 1994).

Today the cultural, social, and economic involvement of Zunis in the larger US system through education in the public school system, employment, government programs, purchases of foods and consumer goods, television and other media, and travel and military service, as well as skepticism about the future of Zuni farming on the part of Tribal members, continue to threaten Zuni ties to their agricultural tradition.

3.4. Individualization of Rights in Farmland

Early BIA superintendents at Zuni were convinced that breaking up the traditional theocratic government was the only way to free up resources, use the land "properly," and encourage allotment and individual ownership. It was also a way of placing Zuni land in the same category as non-Indian agricultural land, so that it could be freely sold to outsiders, and speed the incorporation of any remaining Zuni farmers into the mainstream economy.

There was also pressure to eliminate traditional Zuni communal land tenure based on inheritance through women as corporate clan members, and replace it with inheritance by men as individuals. As early as 1888 Cushing wrote that a "great many tremendous contests in councils and lawsuits" resulted from the difficulties of adjusting the US and Zuni systems, and made "a terrible lot of work" for the Zunis (Green, 1990: 130). US agents, assigned irrigation plots to individual males, and after the fencing of the reservation in 1934 grazing units were assigned to individuals and fenced, thus eliminating traditional access by all Zunis to resources on tribal lands (Ferguson, 1989). Today the system seems very complex, with all types of inheritance within and between male and female lines, and fields being "sold" (Bowannie *et al.*, 1994).

By the 1950s a review by non-Zunis of Zuni Tribal Council land dispute settlements concluded that "It would seem that the alleged rule of female ownership and devolution is oversimplified and that in practice, while it may form the theoretical norm or ideal, it is subject to many qualifications and is probably in the process of modification in the direction of much greater variance and freedom" (Smith and Roberts, 1954: 81). In the Oak Wash area, for example, there seems to be a change in inheritance in the 20th century away from fathers and husbands giving land to clan nieces and nephews, to fathers giving it to children (Holmes, n.d.). There may have been increasing inequity in distribution of land as traditional Zuni sanctions against concentration of wealth by any individual have weakened (Smith and Roberts, 1954: 78). There is not much historical information on the distribution of farmland within the Zuni community. Cushing described what he saw as unequal land distribution at Nutria, one of the outlying Zuni farming areas (see Figure 1), in the late 19th century. He estimated that 15-20 of the 10x12 foot waffles for growing wheat "make up the patch of a poor man; those of the wealthy who can afford feasts for many laborers being several times larger" (Cushing, 1979: 293).

One outsider observed in the mid-20th century that "a man can control as much land as his resources will permit him to obtain," with the result that "some individuals and families have almost no land and other have enough or more than enough to meet their needs," although this consolidation of holdings may be balanced to some extent by fragmentation through inheritance (St. John, 1952: 10, cited in Smith and Roberts, 1954: 80). In addition the growth of the Zuni population, while the resource base has remained the same or even been reduced, is another likely cause of any inequity. Today at Zuni both grazing units and farm fields are often treated as though they were individually "owned," although all Zuni trust lands are communally owned by the Tribe.

One of the main policy implements for forcing the privatization of farmland was the Dawes Severalty Act of 1887, which called for the allotment of privately owned parcels to individual Tribal members, breaking up the communally owned lands, and opening up much of it to non-Indian settlement. The assumption of the US Government in awarding Tribes large tracts of land or reservations has been that as the Indians became acculturated they would no longer need this land and it would become available to White settlers (Hagan, 1988). Early experience with individual allotments suggested that allottees quickly sold their farms at a fraction of their value. As the Act began to take form, powerful businesses in the West decided to support the plan as a way to expand their agricultural production (Hoxie, 1984). The goal was to make the remaining reservation land available for White settlement (Hagan, 1988). Building on this experience, the Dawes Act called for the elimination of reservations and the allotment of individual plots to Indians.

As early as 1885 Indian Agent Romero was advo-

cating inducing the Zuni and other Pueblo groups to "abandon the central pueblos and live in their cultivated lands in separate houses" (Fay, 1981:123). Soon after the Indian Service established an agency at Zuni in 1902, work began on Black Rock Dam. It has been suggested that while the BIA stated publicly that Black Rock Dam and the Zuni Irrigation Unit were necessary for Tribal self-sufficiency, that the real motive was to gain control of outlying Zuni farmlands by allotting each household a plot in the Zuni Irrigation Unit (Ferguson *et al.*, 1988). The dam had repeated structural failures, the reservoir silted up rapidly, and Zunis strongly opposed allotment. The new ten-acre tracts were ignored, and farmers followed their traditional tenure system (Ferguson, 1985:127-128). Many farmers who moved into the Zuni Irrigation District traded fields in the outlying farm districts to other Zunis, and when the project failed to live up to promises, they could not reclaim their former lands (Ferguson, 1985: 84).

The traditional land tenure system continued to be seen as blocking modernization and the "efficient" use of farm land. In the 1960s BIA Zuni Agency documents refer to "customary use rights" in the irrigation units as "discouraging trading and selling or leasing of lands, and criticize the Zunis for not "living up to the responsibilities of this land ownership." They recommend leasing of land to Indians and non-Indians as a way of promoting consolidation. However, unlike the situation on other reservations no land in any of the Zuni irrigation districts is farmed by non-Indians.

The BIA continues to misunderstand the nature of communal pool resource management in general, and at Zuni in particular. For example, it was recently suggested that the only solution to the problem of trash dumping on rangeland was to have individual grazing permit holders take action against dumpers by finding incriminating evidence in the trash and then forcing the offender to remove it, or dumping it in his/her front yard to discourage future dumping. This suggests an avoidance of BIA trust responsibility for Zuni land on the one hand, and ignorance of the traditional role of the Zuni *community* in resource management, a role that the US government has consistently attempted to invalidate and diminish.

3.5. Consolidation of Farm Fields

Along with increased individual control of farmland, the US Government has consistently pushed for larger farm size through consolidation of small fields. This policy is often couched in terms of "economic efficiency," and is often associated with leasing of land to outsiders or the establishment of large tribal farms managed by outsiders.

In 1946 the United Pueblos Agency stated that because of inheritance the land holdings were "small and scattered," and "some steps must be taken to consolidate these tracts into productive units" (OIA UPA, 1946). The call for consolidation appears in a number of BIA documents in the 1960s. For example, in 1963 the BIA Superintendent at Zuni, R. D. Butts, wrote in a letter to Zuni Governor Fred Bowannie, Sr. that the BIA was "making studies" in the Nutria irrigation unit "that will show how the land might be rearranged in more economic sized units," and an inventory for all the irrigated areas at Zuni in order to make recommendations for "consolidation and possible reassignment of land holdings." In 1973 the Zuni Agency called for the creation of more "economic-size farm units" of 100 acres each, on new land brought under irrigation, to make the necessary consolidation easier, although more small subsistence units were also to be encouraged (BIA OP, 1973: 64). A similar philosophy was stated by the Tribal government in its 1976 development plan where it called for "sufficient consolidated acreage to establish a demonstration farm" using "modern agricultural techniques," with the emphasis on complementing livestock production (Pueblo of Zuni, 1976: 3-A-18). Future expansion of the farm was envisioned "to make it more profitable."

Consolidation and leasing is also promoted by the American Indian Agricultural Resource Management Act of 1993, which reasserts the authority over Indian agricultural land of the Secretary of the Interior under Federal trust responsibility, for example to approve leases of Indian lands in the "best interest of the Indian landowner" (US Congress, 1993: Sec. 105(a)(4)). It waives any "general notice requirement of Federal law" for informing owners before leasing their land, if the tribe defines these lands as "highly fractionated undivided heirship lands," which is justified "to prevent waste, reduce idle land acreage, and ensure income."

Another factor promoting consolidation and leasing is the "practicably irrigable acreage" (PIA) standard used in settling Indian water claims. The PIA standard was established as a result of *Arizona v. California* in 1963, and has resulted in large settlements in the favor of tribes. The PIA is based on tribes' documenting maximum financial benefits of developing new irrigated acreage, which usually results in the design of large-scale, "modern" irrigation systems. Although tribes are not required to implement the large-scale "modern" irrigation projects on which successful settlements are based, there may be pressure to do so using the momentum created by an expensive and detailed plan. Use of the PIA standard "does not encourage tribes to explore water use alternatives that yield higher economic returns, provide better employment opportunities, and are perhaps more compatible with tribal values and protection of the reservation environment" (Checchio and Colby, 1993). The PIA standard is based on the same conventional economic ideology that underlies US Indian policy, and the

development of water in the arid West that has had such negative financial and environmental effects (Checchio and Colby, 1993: 69; Reisner, 1993). There is a danger that it may take attention away from the development of sustainable agriculture alternatives, unless Tribal values and sustainable resource management are included as components in water development planning.

At Zuni, BIA Agency employees equate success of Zuni agriculture with the size of funding received from BIA/Washington, and hold up agribusiness operations managed by non-Indians such as that on the Gila Reservation or the Navajo Indian Irrigation Project (NIIP) as examples of Indian agricultural enterprises that receive multimillion dollar appropriations from the BIA every year. In 1992 the BIA Agency took officers of the newly formed Zuni Irrigation Association on a trip to the Seminole reservation in Florida to show them what "successful" Indian irrigated agriculture looks like. Some of the farmers who went on the trip noted that the large-scale sugar cane and nursery plant operations they saw were managed and worked by non-Seminoles, and that large amounts of chemicals were being used. On the same trip they also visited New Mexico State University and toured large chili farms. Some farmers commented that

> Although the New Mexico State University people told us about the way to do it, they have big farms, big chili fields... Those corn and onion fields are big, we don't have resources like that, especially water. If you actually go out there and see the farmers like us doing it, and actually talk to them and get their input it will be a lot better. (Bowannie and Laahty, 1993.)

3.6. Declining Biological Diversity in Agriculture

Biological diversity has also been diminished by the loss of Zuni folk crop varieties, and a reduction in area planted to remaining Zuni varieties. The possibility that Zuni farmers' folk crop varieties are valuable in the Zuni environment, or that they might even be superior to "modern varieties" in the places where they were selected by Zuni farmers over centuries (Cleveland, Soleri, and Smith, 1994), has not been recognized by the US government in its Zuni agricultural policies and programs. Official US policy has been to provide Indians with "good, pure seed" (USIS, 1910: 4), and the Annual Report of the Pueblo Indian Agency for 1885 stated that "the principal reasons why [Pueblo farmers] do not reap the benefits of their labors are because they have been using the same seeds for centuries" (Fay, 1981: 125).

At Zuni, BIA officials and BIA farmers have been intent on obtaining "pure" seeds for farmers. For example in 1932, after noting that Zunis traditionally save seed from all crops, an official stated mysteriously that "Due to times of stunted crops and bad mixture, caused from voluntary crops, the seed became very inferior." The Agency therefore intended to introduce new varieties and get "the best quality seed" for planting, that is purchased seed that was sold and distributed to Zunis (OIA DEI Zuni, 1932). At least by 1942 the United Pueblos Agency was advocating limited planting of "Indian corn" to an area only adequate to meet family needs, and only on farms where a farm plan was made, and "acreage above that to be planted to Hybrid or yellow dent corn" (OIA UPA, 1946: 5).

Emphasis was put on cash crops, and the annual value of crops sold increased from $1500 in 1914 to $47,994 in 1934, to $68,655 in 1950 (Holmes and Fowler, 1980: 189; OIA, 1914, 1934, cited in Holmes n.d. 25: 25). There was also increasing emphasis on production of feed and pasture for livestock at the expense of traditional food crop production, beginning in the 1930s, and increasing during and after WW II (Leighton and Adair, 1966). This was part of an effort to relieve pressure on Zuni grazing lands, severely reduced by the dramatic loss of Zuni territory.

Alfalfa was brought to the western US in the mid-1800s, and introduced to Zuni as early as 1894 (Hart, 1985: 187). BIA Zuni agency records for 1932 list 1105 acres planted to alfalfa, with a yield of 1 ton per acre, and 500 tons stored and 600 tons sold (OIA DEI Zuni, 1933). Zuni Agency records show a trend between 1942 and 1984 of decreasing wheat, and increasing feed crops (alfalfa, oats, and rye) planted in the irrigation units (Holmes, n.d.: 25-36). Much of the currently farmed land at Zuni is planted to forage crops, especially alfalfa, and many farmers remove corn stalks from the field to feed to animals. While alfalfa can contribute to sustainable agriculture because it fixes nitrogen and improves soil organic matter content and drainage through its deep and vigorous roots, the long-term monoculture of alfalfa that tends to dominate the irrigation districts may lead to increases in insect and disease problems and soil salinization (Cleveland *et al.*, 1993).

As is the case with most indigenous farming groups (Cleveland, Soleri, and Smith, 1994), the quantitative data needed to determine the extent of loss of Zuni crop diversity do not exist. However, a survey of 50 Zuni farm households completed in 1991 has made a beginning (Brandt, 1992). Interviewees named 23 Zuni varieties, but seeds, fruits, or plants were not consistently identified. The most commonly grown Zuni folk varieties were corn (grown by 72% of the households), beans (by 36%), and squash (by 28%). Brandt noted that several of the folk varieties recorded by Bohrer in the 1950s (Bohrer, 1960) were not mentioned by those in the 1991 survey, including several varieties of common bean, tepary bean, several varieties of Zuni pumpkin, and a variety of Zuni popcorn (Brandt, 1992: 11). Only a few people in the 1991 survey were maintaining many of the folk varieties, and this means that even though the particular variety may not be lost from Zuni, its genetic diversity may be significantly re-

duced (Cleveland, Soleri, and Smith, 1994; Soleri and Smith, 1995). The extensive Zuni peach orchards that were once such an important source of food, have all but died out (Cleveland *et al.*, 1994).

In part as a result of the decrease in Zuni folk varieties being grown, and the reduction in production of food crops in general at Zuni, there has been a deterioration in the Zuni diet, associated with an increase in diabetes and other health problems.

4. Community Empowerment to Revitalize Zuni Farming

In recent years more and more Zunis have become interested in reestablishing farming as a central part of Zuni life. This change has been a part of overall renewal of interest in conserving Zuni culture that has included creation of the Zuni Archeology Program in 1975, the Zuni community taking over control of its own school district in 1980, and the recent establishment of a Zuni museum and archives. It has also been spurred by lengthy litigation beginning in the early 1980s in the Zuni land claims and land damages cases that included many hours of testimony by Zuni farmers and outside experts extensively documenting traditional Zuni farming (Hart, 1990). The successful resolution of the land damages case resulted in establishment of the Pueblo of Zuni's Zuni Conservation Project.[2]

The Zuni Sustainable Agriculture Project (ZSAP) and the Zuni Fold Varieties Project (ZFVP, now a part of ZSAP), as part of the Conservation Project, are working to revitalize sustainable Zuni agriculture by empowering the Zuni community to be in control of their own agricultural resources and development (Cleveland, 1993b). This includes not only encouraging farming of increased acreage by a larger number of farmers, but promoting training in new technology, more material on Zuni farming in the Zuni schools, and improved diets. A major focus is the Nutria Pilot Project, in collaboration with the Nutria Irrigation Unit of the Zuni Irrigation Association. The Zuni Irrigation Association was formed by farmers in the spring of 1992 with support of the Zuni BIA Agency, but has since established its independence from the BIA.

This work involves much more than what commonly passes as "participatory development" in development circles, where outsiders decide the basic direction of development, and community members get to choose which version of it they want. This conventional approach involves going to the farmers for problem identification, then to the research scientists to find technical solutions, and then to social scientists and project managers to convince the local people that the solutions are best for them. The community is never in charge, and is never moved in the direction of preparing itself to be in charge.

Outsiders, including missionaries, traders, academic researchers, development experts, and US government agencies, viz. the BIA, but also other agencies such as the Soil Conservation Service, have frequently approached Zuni and other Native American communities with the idea of doing good *for* the Indians. This often denies the existence or value of unique Native American values, and puts Native American communities in the position of recipients of charity, blocking them from achieving power to make their own decisions (see Enote *et al.*, 1993). This has been Zuni farmers' experience with BIA agriculture programs, as discussed above.

The approach of ZSAP and ZFVP is quite different. These projects started with the premise that sustainable agriculture must be based on community empowerment for control of agricultural development. This means working with the community on education, data collection, and analysis, and formulating a plan for revitalizing Zuni farming. While outside technical experts are important, the final decisions must be made by the Zuni people. Because most community members have never worked on project development and implementation in cooperative, equal, or mutually respectful relationships with outsiders, there was much distrust at the beginning of our projects.

The role of project personnel, both outsiders and local people, in this kind of development is very different than the usual role. Rather than bringing in new technology, project personnel are colleagues and consultants to the local community, helping community members to discuss and analyze problems, and to search for and supply new ideas (Haverkort, 1991). One of the difficulties of working in this way is that things go very slowly at the beginning, and deadlines for specific activities are often missed. The temptation for outsiders is to continue to make decisions and be in charge of project activities because they see that as the only way to "get things done." But this means that Zuni people will not get the experience they need to take over decision-making.

Individuals and community-based groups have worked as colleagues and advisors with project staff at all levels including data gathering, problem identifications and solving, and community education. ZSAP and ZFVP have recruited, trained, and put Zuni farmers in charge. These farmers, in consultation with the Zuni community, are making decisions on plans for developing sustainable agriculture. Three Zuni farmers who worked and trained with the project during the first phase, have filled positions as Director and Assistant Director.

Access to ideas and data is an important part of empowerment. This means working with Zuni farmers to collect data on the current state of farming and natural resources for farming, and on people's ideas for improvements, as well as exchanging information

with other communities planning for sustainable agriculture. Farmers working with the projects have carried out several formal surveys in the community, as well as many informal interviews. Education is also a means of encouraging recognition of the knowledge and skills of Zuni farmers, and the projects have published a newsletter (*Zuni Farming*) for the community, have regular community meetings to discuss progress and problems, and work with classes at all levels of their Zuni School District.

The Zuni Folk Varieties Project has documented and publicized Zuni folk crop varieties and Zuni opinions and beliefs about how these varieties should be used, with the goals of increasing the number of Zuni varieties grown at Zuni and the number of farmers growing them, and protecting them for future use by Zunis (Soleri *et al.*, 1994). The remaining Zuni peach orchards have been surveyed, families interviewed about traditional orchard cultivation, and plans made for reestablishing one of the most important orchards near the main village using Zuni peach varieties (Cleveland *et al.*, 1994).

The projects have tried to include everyone, to get their opinions about proposed projects, to see if they have better ideas. When Bowannie and Laahty first started interviewing their fellow Zuni farmers, many of them were suspicious, and they had to reassure them: "We're here to talk to you personally as Nutria farmers. We're not from the BIA." (Bowannie *et al.*, 1993) They tell them that "You'll have a voice in it. Its not up to us, its up to our people . . ." They are starting to understand that even though we are their voice in the irrigation committee, its not up to us to say 'Yes, we will go with this plan.' We have to ask them, have to inform them about what's going to happen."

One of the major activities of the Nutria Pilot Project section of ZSAP has been mapping of farm fields. Bowannie and Laahty have been trained by the Conservation Project's geographic information system (GIS) specialist in using a global positioning system (GPS) to map field boundaries, and this information is loaded into the Conservation Project's GIS data base and can be plotted along with data from other GIS layers, including a soil survey, range units, roads, and streams. The mapping has raised people's awareness of the Project and of the land tenure situation in Nutria, and has already helped to resolve several disputes that had been going on for a long time (Bowannie and Laahty, 1993; Bowannie *et al.*, 1994). It has also helped to put farmers in control of the information on their own farming resources.

Another way in which the projects have increased farmer control is helping farmers to obtain existing documents about their own fields and irrigation projects. We have been able to obtain Soil Conservation Service and BIA Area Office soils mapping data for Zuni, and people from these offices have been very cooperative in working with the projects and the farmers (Prevost *et al.*, 1993). Farmers have discussed their own soils classification with outside soil scientists, attempting to come up with a synthesis to be used in planning (Prevost *et al.*, 1993). The Nutria Irrigation Unit has been searching archives and office files and talking to government employees in a number of federal agencies in an attempt to obtain an adequate inspection of the Nutria Upper Diversion Dam, requested a number of times since at least 1960, and a prerequisite for rehabilitating the irrigation district (Cleveland and Bowannie, 1994).

Empowerment also means creating a policy structure that supports sustainable farming and control by the farmers. Currently tribal agricultural policy is not well defined. How local, state, federal, and international policy affects Zuni farming is not clearly understood, and local policy is not integrated with these other levels. This means that action, or lack of action, by the Zuni government or other agencies can determine the future of farming in ways that have not been discussed or approved by the community. ZSAP and ZFVP have been working with the Tribal Council, the Cultural Resources Advisory Team, the Zuni Irrigation Association, and Zuni Water Rights Committee, as well as other sections of the Zuni Conservation Project, to establish policy options to encourage sustainable agriculture that are responsive to (although they may oppose) policy at local, state, federal, and international levels. Topics under consideration include

- the collection and use of seeds at Zuni by outsiders, the use of seeds already removed from Zuni (in regard to genetic manipulation, patenting, or commercial sales), the use of Zuni folk variety names in marketing of Zuni seeds or food products, and the distribution of seed from the Zuni seedbank (Soleri *et al.*, 1994),
- marketing Zuni produce and food products,
- land-use zoning, including house and road construction on farm land,
- resolution of land tenure disputes,
- the relationship between grazing and farm land, including grazing of cattle in farming districts, and
- water rights adjudication/negotiation and water use in farming.

So far it seems clear that the Zuni farming community wants to increase the number of families actively farming, the area farmed, and crop yields while protecting natural resources. The community is committed to keeping small family farms based on traditional Zuni values, while using modern technologies where appropriate.

5. Conclusion

Despite official policies favoring cultural pluralism, sovereignty, and local control, the assumption that the

only line of development for Indian agriculture is to become more and more like conventional US agriculture is still evident in many ways. Indians are seen as demonstrating "growth and success" when they have large agricultural enterprises bringing in lots of money. Despite public talk about sustainable agriculture, the policies of the Government in general, including those concerned with Indian agriculture, continue to emphasize growth in size along conventional lines, which may not be sustainable.

ZSAP and ZFVP have been supporting the unique cultural values and traditions of Zuni agriculture by empowering farmers to plan their own farming future based on Zuni religion, and on values of communal management of resources and the importance of family farms, gardens, and orchards. Ideas and technologies from conventional US agriculture, such as underground irrigation pipes, tractors, modern crop varieties, and farmers' markets, can support rather than replace Zuni agriculture. ZSAP is working closely with other components of the Conservation Project so that agricultural development plans are linked with work to decrease erosion, and protect rangelands, wetlands, and wildlife. This integration of farming with natural resource conservation is logical for Zuni farmers because they also raise livestock, hunt, fish, and collect pinyon nuts, firewood, and other natural resources, and because many are also religious leaders whose activities are tied to natural ecosystems. Along with more farmers and more fields, orchards, gardens, and fold varieties, this will result in greater biological diversity tied to Zuni's unique culture. To the extent that this diversity contributes to sustainable agriculture, these activities will help to ensure a long future for Zuni farming.

We're not suggesting that large-scale or corporate tribal farms, or a sole emphasis on cash-cropping are the wrong choice for all Indian communities, because Indian communities are very diverse (see Checchio *et al.*, 1993). In fact, Zuni farmers may have more in common with some non-Indian farmers than with some Indian farmers. There is, however, much evidence to support a claim that small-scale, diversified family farming is more socially and environmentally sustainable than large-scale commercial agriculture, not only in the Third World, but in industrial countries like the United States (Strange, 1988; Netting, 1993: 123-145). Even the US government has recognized at times the need to move toward more environmentally and socially sustainable agriculture (NRC, 1989).

It should be possible for the US Government to help in empowering Zuni and other tribes to be in charge of their own agricultural development. There have been encouraging public statements, for example by a member of Congress from New Mexico that the BIA should be either dismantled or overhauled to accommodate the local needs of Indian communities (Richardson, 1993), and by the head of the BIA herself (Deer, 1993). However, if this is to lead to development in Zuni's own terms, it will be necessary to acknowledge the values underlying US Indian agriculture policy at Zuni, and to respect Zuni farming values, knowledge, and technology. This is the only way to avoid business as usual, and empower local communities like Zuni to make their own decisions about their farming future while cooperating with the US government. At the same time, this is likely to result in much more sustainable agriculture.

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Notes

1. Authors after the senior author are listed in alphabetical order. The views expressed in this article are those of the authors and not necessarily those of any the organizations or projects with which they are and have been affiliated.
2. The Zuni Conservation Project, established after the passage of the Zuni Land Conservation Act in October, 1990, provided $25 million for sustainable resource development, including a two-year planning period (October, 1991 - October, 1993) for the development of a Zuni Resource Development Plan (Enote *et al.*, 1993). The Act also established a Zuni Indian Resource Development Trust Fund of $17 million, the principal of which is untouchable, and the proceeds of which supports implementation of the Plan by the Zuni Conservation Project beginning in 1994 and into the indefinite future. Zuni Sustainable Agriculture Project (ZSAP) and the Zuni Folk Varieties Project (ZFVP) were created as part of the Conservation Project. The activities of ZFVP have since been absorbed into ZSAP. During the initial planning phase the Center for People, Food and Environment has managed ZSAP and ZFVP.

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