

Indian Agriculture, United States Agriculture, and Sustainable Agriculture: Science and Advocacy

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INTRODUCTION

“Sustainability” is the inescapable focus of almost any discussion of agriculture today, and Indian agriculture is no exception. An important focus in such discussions is the relative sustainability of conventional industrial agriculture, often promoted in Indian country by agencies of the U.S. government, compared with that of indigenous or traditional agriculture based on Native American agriculture before the European invasion.

Environmentally, economically, and socially sustainable agriculture can be broadly defined as agriculture that provides adequate food and income equitably for present generations while conserving natural resources for future generations.¹ However, there are many possible ways to interpret such a broad definition in specific situations, based on different assumptions which are often unexamined, and proponents of sustainability often emphasize either the environmental, economic, or social aspect.² Defining sustainable agriculture is the

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same as defining the goal of an agricultural system, and therefore any definition is based on values and thus arbitrary. However, once a definition is agreed on, empirical data can be used to test the sustainability of a given agricultural system or system component.

As a non-Indian agricultural anthropologist who has worked with Hopi and Zuni farmers, as well as with indigenous farmers in other parts of the world, I am particularly interested in how outsiders might be able to contribute to the development of sustainable Indian agriculture. This paper is based primarily on examples from my experience working with the Hopi and Zuni, as well as my experience working with other farmers and agricultural scientists, and on my understanding of the literature in this area. I make the following conclusions, which are presented to stimulate discussion and to suggest ideas or hypotheses for testing in other contexts:

(1) Current U.S. Indian agriculture policy continues the tradition of promoting replacement of indigenous Indian agriculture by modern Western agriculture. It increasingly couches its discussion in terms of sustainability, emphasizing economic, and secondarily environmental, aspects. It frequently assumes, along with conventional agriculture, that economic and environmental goals can be unambiguously defined by applying objective science, and thus confuses science and advocacy.

(2) Advocates of indigenous Indian agriculture often emphasize social sustainability and assume that it is inherently environmentally sustainable, and this also confuses science and advocacy. They tend to define social sustainability in terms of the rights of Indian people and tribes to practice traditionally based agriculture.

(3) Achieving sustainable Indian agriculture may, therefore, depend on combining advocacy based on values to define sustainable agriculture, and science using empirical data to test sustainability based on these definitions. This may provide a useful but difficult role for outsiders in helping to bring Indian farmers together with the Bureau of Indian Affairs, the United States Department of Agriculture, and other federal agencies to discuss the value-based goals of agriculture, and how best to measure them empirically. This could both assist Indian farmers to achieve their own goals, while informing policy making at the federal level that includes Indians as decision makers.

U.S. AGRICULTURE AND INDIAN AGRICULTURE

The Indian policy of the U.S. government since its creation in 1776 until the 1930s, while not entirely consistent, has been one of supporting the expansion of dominant white society by taking Indian lands, water, and other natural resources; allocating Indians to small "reservations"; and forcing them to assimilate into mainstream economic and farming life.³

For example, since the late nineteenth century, U.S. government policy at Zuni has supported the elimination of traditionally based Zuni farming through: (1) appropriating Zuni resources and their over-exploitation by non-Zunis for short-term gain; (2) disempowering farmers through lack of understanding and respect for their traditionally based farming; (3) replacing traditionally based Zuni agriculture by canal irrigation, ranching, and agribusiness enterprises; (4) substituting individual rights to land for community rights; (5) promoting consolidation of small, family-operated garden and farm plots into larger more "efficient" plots; and (6) replacing the crop genetic diversity present in the many numbers of Zuni maize, bean, squash, and other crop varieties by a smaller number of introduced crops and crop varieties such as alfalfa and hybrid maize.⁴

By the 1960s the blatantly racist foundation for these policies had been modified, and President Nixon's historic 1970 message to Congress stated, "From the time of their first contact with European settlers, the American Indians have been oppressed and brutalized, deprived of their ancestral lands and denied the opportunity to control their own destiny... The time has come to break decisively with the past and to create the conditions for a new era in which the Indian future is determined by Indian acts and Indian decisions."⁵ Cultural diversity and tribal sovereignty now dominate official policy statements by the United States government on relations with Indian nations. For example, in the Senate confirmation hearing for her appointment as assistant secretary for Indian Affairs (the head of the BIA) Ada Deer stated, "I want to help the BIA be a full partner in the effort to fulfill the Indian agenda developed in Indian country."⁶

Yet the reality is that the more direct, colonialist approach to controlling Indian agricultural and other resources may have simply been replaced by what Russel Barsh has called the "servo-economy," in which outright confiscation is replaced by

"routine economic supervision ... that favors certain patterns of resource exploitation."⁷ For example, during the Reagan administration agricultural resources, along with other natural resources, were "pushed towards the marketplace," with the result that between 1983 and 1985 the amount of the total Indian trust farmland used by Indians dropped from 38 percent to 35 percent, and grazing land from 95 percent to 85 percent.⁸

Advocates for Indian agricultural development along the lines of conventional industrial agriculture often make the unjustified assumption that agriculture is an entirely objective science and that therefore culturally diverse ways of farming are not relevant. Thus, while it may be increasingly accepted that Indians can have their own "cultural" diversity, this is often relegated to ceremonies and celebrations, language, and other "nonscientific" areas. The common conception that Native Americans are people who existed back in time but who have now vanished provides a rationale for objectivizing Native Americans, their sacred and secular goods and their beliefs.⁹ Freezing indigenous peoples in a past that never existed can be a justification for dispensing with their values and traditions in the present. Native American farmers may have difficulty in maintaining and asserting their cultural distinctiveness and the relevance of indigenous knowledge and practice for sustainable agriculture because the realm of allowable diversity has been defined for them by the conventional model of agriculture used by the dominant culture and government. This model emphasizes the economic aspect of agriculture, relegates the environmental to secondary status, and all but ignores the social.

Conventional agriculture is frequently based on the following assumptions of conventional economics:¹⁰ (1) continually increasing production and yields are essential for agricultural development; (2) there are no natural limits to this growth that cannot be overcome by human inventiveness and technology; (3) markets and private property are the best means to distribute resources for optimizing social benefits by providing a mechanism for the interaction of individuals' self interest; and (4) there are no alternatives to this model (i.e., it is a unilineal evolutionary model of the type that was almost completely eliminated from natural and social sciences some time ago). Indigenous agriculture is seen as "inefficient and low-productivity ... agriculture in developing countries," and contrasted

with the "highly efficient agriculture of the developed countries" where the "specialized farm represents the final and most advanced stage of individual holding in a mixed market economy."¹¹

Several brief examples will illustrate the application of these assumptions by the U.S. government and society in general. The first example is the rise of conventional irrigated agriculture, which has come to dominate the western United States and has had a strong effect on the development of Indian agriculture, including the large-scale use of Indian water by non-Indian farmers with little benefit to Indians, as well as pressure on remaining Indian farmers to copy their Anglo neighbors. Proponents have argued for large-scale irrigation as "the epitome of scientific agriculture" and as contributing to a "more rational society."¹² It has greatly increased production through greater control of water resources and centralization of management, but also has high costs in terms of environmental degradation and social inequity.¹³

Historically, non-Indians in the West diverted surface flows, primarily for mining purposes and later for irrigation, under the prior appropriation doctrine, and by 1900 most western states relied on this doctrine to grant water rights to those who first appropriated surface waters and applied them to some "beneficial use."¹⁴ This doctrine promoted westward expansion by providing secure access to water and led to the over-appropriation of surface water supplies in much of the arid West. It was embodied in the 1902 Reclamation Reform Act that initiated nearly nine decades of dam building for agriculture and other uses. Shortly after Congress passed the Reclamation Reform Act, the U.S. Supreme Court recognized Indian reserved water rights in its historic *Winters* decision of 1908, which held that when reservations were established, Indian tribes and the United States implicitly reserved, along with the land, sufficient water to fulfill the purposes of the reservations.¹⁵ However, those Indians who farmed their irrigated allotments found themselves obligated to repay the government for reimbursable debts after 1921, and most Indian allottees refused to farm their irrigated allotments, which opened up more Indian land to non-Indian farming. The first act permitting leasing of Indian lands was passed in 1891,¹⁶ and much of the farming that did occur on Indian lands was done by non-Indians who leased water and land for nominal fees for periods of time sufficient to develop the land for agriculture.

Only recently has substantive federal assistance been available to tribes to assert and develop their reserved water rights guaranteed under the *Winters* doctrine, and a number of cases have been decided in favor of Indian tribes' claims to water.¹⁷ These decisions have helped to increase Indian farming, although the historical pressure for Indian tribes to turn over farming enterprises to outside contractors or managers remains. At Zuni, for example, U.S. government officials have commonly stated or implied that "real agriculture" means large-scale irrigation and ranching with "real" (i.e., non-Indian) managers (code word for Anglos), while at the same time information on Zuni irrigation systems needed by Zuni farmers in their efforts to develop Zuni farming in their own way is made extremely difficult to obtain from the government.¹⁸

Application of the *Winters* doctrine has often been based again on the assumptions of industrial agriculture, including the dominant "practicably irrigable acreage" (PIA) standard established as a result of *Arizona v. California* in 1963, which led to the design of large-scale, "modern" irrigation projects. The PIA standard has resulted in large settlements in favor of the tribes, and is under attack by the states, but as an embodiment of the *Winters* doctrine, it has been upheld by the courts and the U.S. Congress.¹⁹ However, because the PIA is based on documentation of the financial benefits of developing new irrigated acreage, "it 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."²⁰ Although tribes are not required to implement the projects on which successful settlements using PIA are based, there may be pressure to do so, in part because of the momentum created by an expensive and detailed plan. Supporters of the PIA approach at Zuni, including lawyers assisting the tribe, seemed to assume that the only definition of successful negotiation of rights was one measured by the size of the financial settlement. Such development may take attention away from alternatives emphasizing socially and environmentally sustainable agriculture based on Zuni values. For example, many Zunis state that they value agriculture, including their traditional crop varieties, because it is an important part of their culture and religion and because it offers the opportunity for family members to work together.²¹

A second example is the American Indian Agricultural Resource Management Act of 1993, which shows little recognition of indigenous Native American farming knowledge and practice as a basis for future agricultural development. While it manages to include the three aspects of sustainable agriculture by talking about "integrated resource management," for the development of Indian agricultural lands, it only defines this as "holistic" management that includes "quality of life" and "production goals."²² On the other hand, it reiterates the authority of the secretary of the Interior over Indian agricultural land under federal trust responsibility, for example, to approve leases of Indian lands in the "best interest of the Indian landowner."²³ 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." While this act was supported by the Intertribal Agricultural Council and a number of tribes, it seems to be based on the assumption that modern scientific agriculture that maximizes profits is always in the best interests of Indian farmers. Thus, despite the obligatory mention of environmental and social aspects of sustainable agriculture, the act appears to be overwhelmingly biased in favor of economic aspects.

The third example concerns Native Americans' intellectual property rights in their traditional or folk crop varieties. While the value of indigenous crop genetic resources for modern agriculture is increasingly recognized, their value for the development of sustainable indigenous agriculture is just beginning to be recognized,²⁴ and Native Americans and other indigenous peoples are generally considered to have no intellectual property rights in their indigenous crop varieties, which are considered part of the public domain.²⁵ Desirable traits for commercial plant breeding and conventional agriculture continue to be borrowed from Native American folk varieties under the assumption that these are the shared resources of all peoples, without any apparent permission or compensation to Native Americans.²⁶

In addition, the dismissal of indigenous Native American agriculture and crop varieties as antiquated is coupled with increased marketing of Native American food products by non-Native Americans. A number of companies sell food products based on association with Native American corn and bean

folk varieties, using copyrighted packaging emphasizing elements of Native American symbols and myths. One manufacturer of blue corn chips in the United States claims on the package that the company is "dedicated to the Pueblo Indian tribes of the South West who *believed* this blue corn to be a sacred gift from the Kachinas, their gods" (emphasis added). This use of the past tense, common in this type of advertising, demonstrates ignorance of the contemporary existence of these indigenous peoples and their religious values and their continuing use and conservation of blue corn folk varieties. It may thus serve as a rationalization for lack of consideration of any intellectual property rights of indigenous peoples in their symbols or folk varieties.²⁷

Another company has trademarked the name "Hopi Blue" and uses it to market a blue popcorn purported to have been created by crossing "authentic" blue corn with white popcorn, stating that colored corn "was" grown by Hopis. There is no indication of compensation to the Hopi Native Americans who implicitly contributed the "authentic" blue parent in the cross, and who continue to produce their own blue corn folk varieties in large amounts.²⁸ Blue corn meal is also sold as an ingredient in "Native American" religious paraphernalia by new-age mail order companies. Blue corn grown by the Santa Ana Pueblo in New Mexico has been used as an ingredient in soaps and cosmetics described as "enriched with the natural goodness of blue corn" (although no evidence is offered of any cosmetic efficacy) and marketed internationally by the Body Shop.

INDIGENOUS INDIAN AGRICULTURE

In opposition to the imposition of values by the dominant culture, Native Americans have increasingly begun to assert the validity of their own values and knowledge regarding natural resource management and agriculture, through such groups as the International Indian Treaty Council, often in concert with indigenous peoples around the world.²⁹ However, like advocates of industrial agriculture for Indian country, advocates of agriculture based on indigenous Native American knowledge and practice may also confuse advocacy and science.

Diversity is assumed by many advocates of traditionally based Indian agriculture to be always positive, and cultural and biological diversity are often assumed to be inseparable

and synergistic and inherently sustainable.³⁰ Like indigenous agriculture in general, Indian agriculture may be essentialized and romanticized, for example, as a “freely chosen (or accepted) way of life that allows self-realization, conserves resources, and provides subsistence.”³¹ This becomes an ideology of indigenous sustainability, and supporters are willing to support scientific documentation of the indigenous system that supports their conclusions, but not to formulate and test hypotheses about its sustainability under a given definition. Indigenous rights and environmental conservation advocates may try to portray indigenous peoples in terms of Western environmentalist stereotypes.³²

Thus, objective reality and science are confused with values and advocacy, for human rights, for instance. This lack of understanding of the dynamic nature of indigenous (and all) cultures does not provide a sound basis for advocacy, as when supporters of Amazon rainforest peoples who “naively imagined” them as “primitive ecologists” saw them as villains after revelations that some were helping in the logging of their own forests and the pollution of their own rivers by gold mining.³³

To avoid such pitfalls I suggest that important qualities that may be characteristic of indigenous, including Native American, farmers and farming should be kept in mind when discussing the sustainability of indigenous Indian agriculture. First, indigenous farming is temporally and ecologically dynamic. Farmers’ environments and their relationship to it and to each other are constantly changing, and thus any assessment of sustainability must also change. Diversity in the form of distinct, locally adapted cultural groups does not necessarily result in natural resource management and agriculture that is inherently environmentally sustainable. Evidence that indigenous groups have survived over the millennia while our industrial society threatens the whole planet after just a few centuries, does not prove the functional adaptability or sustainability of indigenous systems. When local carrying capacity (social or ecological) is exceeded, one of the major strategies of human groups throughout our history has been migration—but this and many other traditional strategies are no longer viable, for the world has changed irrevocably from the one in which indigenous groups evolved.

While traditional Native American agriculture may often serve as a foundation for developing sustainable agriculture for the future, it cannot be *assumed* to have been sustainable in

the past, and in most cases is probably not optimally adapted to present or future conditions because social, biological, and physical environments have been greatly changed by colonialism, international markets, population growth, environmental degradation, migration to new areas, and international conflict.

Studies of long-term changes in agricultural soils cultivated between 3,000 and 3,500 years ago in the Mimbres area of New Mexico south of Zuni suggest that increased erosion began during cultivation.³⁴ Ancient farmers practicing rainfall runoff farming chose sites with appropriate soils, farming terraces built up behind small rock dams on gentle slopes, but these soils "remain partly degraded (accelerated erosion, compaction, decreased organic matter, and nutrient levels) more than eight centuries after agriculture ended, perhaps due to sensitivity of this area to disturbance."³⁵

Second, indigenous farmers are culturally dynamic. They are not isolated from industrial agriculture and modern society and may define "indigenous agriculture" in ways that include industrial agriculture technologies such as fertilizers or tractors, in part because it serves their larger goal of maintaining their physical and cultural identity.³⁶ Most indigenous farmers appear to be more than willing to experiment with modern crop varieties and will adopt them when they fulfill a set of complex criteria that include not only local adaptation and cultural value, but increased yield as well.³⁷ Zuni farmers have learned how to use global positioning system (GPS) technology to map their family farm fields, and this has become a powerful force in resolving land disputes that have impeded the revitalization of indigenous agriculture.³⁸

Third, indigenous farming groups are not homogeneous; there is much variation both within and between groups. Progress in Indian agricultural development based on indigenous values and knowledge requires critical awareness of the history of stereotyping and unconscious essentializing of non-Western and indigenous cultures by Western industrial society, often as "savages," either noble or inferior,³⁹ and of indigenous cultures by indigenous peoples themselves.⁴⁰ Empirical data suggest that knowledge about indigenous farming varies a great deal, for example, among Hopi farmers about their crop varieties.⁴¹

Fourth, indigenous farmers' knowledge of the world is the result of complex interaction between relativist (cultural values-based) and objectivist (scientific) epistemologies including

negotiation over control of "truth," and human behavior is the result of a further complex interaction between this knowledge, cultural norms of behavior, and input from the environment.⁴² Indigenous farmers' knowledge may sometimes be more ad hoc improvisation than the organized body of indigenous scientific theory and data that outsiders often conceive of it as being.⁴³ In addition, like all farmers, what they can observe and understand is limited by their technology and experience.⁴⁴ Yet evidence exists that farmers experiment carefully to discover the nature of objective reality and conceive of independent causal variables.⁴⁵

Many Indian peoples have shown more understanding of the complex nature of indigenous Native American farming in the late twentieth century than many non-indigenous experts. For example, Zuni religious leaders (the Cultural Resources Advisory Team) considering options for safeguarding their traditional crop varieties see the necessity for developing hybrid, syncretic forms of rights in these varieties based on the primacy of traditional Zuni values, while acknowledging the reality that Zuni culture is included within a dominant and alien society, as well as the existence of many different ideas and values among Zuni people themselves regarding agriculture.⁴⁶ They often expressed an ideal position that Zuni folk varieties are only for Zuni people and should not be given, sold to, or used by outsiders, for example, that seeds of older Zuni folk varieties, including corn, beans, squash, melons, gourds, chilies, and peaches "should not be sold or given to outsiders for profit, resale, breeding, or trademarking because of their significance to the Zuni people." However, many people, including those who hold this position, believe that it is either too late or unrealistic to enforce this ideal, and that therefore Zuni folk varieties could be given to, sold to, or used by outsiders, within limits.

SCIENCE, ADVOCACY, AND SUSTAINABLE INDIAN AGRICULTURE

The role of outsiders in supporting Indian communities in developing sustainable agriculture can be one of colleague and consultant, helping community members to discuss and analyze problems and search for new ideas from the outside.⁴⁷ Social science can help us tell the difference between statements that are based on values and which cannot be tested as

hypotheses about the objective world, and those that can be rendered as operational hypotheses which can be so tested. As Daly and Mills pointed out in their essay contrasting legal views of Native American concepts of land use and land tenure,⁴⁸ non-social scientists are often perplexed by claims that it is possible to be scientist and advocate at the same time.

However, because of the dual nature of human understanding (subjective and objective), we are all advocates when we are being objective, and all advocacy must be based on an evaluation of the objective world. Problems arise when we do not keep fact and opinion, objective and subjective, as distinct as we should. While it is impossible to separate them completely and unambiguously, it is important to keep up a constant dialogue between these two aspects of understanding the world. For example, if empirical data call for rejection of the assertions about resource conservation or equity in a given case of indigenously based Indian farming, then those who don't share the values underlying the definition of sustainable agriculture to which they are linked may deem this sufficient justification for not recognizing the right of Indian peoples to develop their own alternatives to conventional agriculture.⁴⁹

Room must also be made for advocacy in defining sustainable Indian agriculture, recognizing that no "facts" are neutral and that knowledge is a key weapon in the power struggle for natural resources and cultural space. In addition to discussion and consensus on values that support sustainable development as defined by each Native American community, we need more scientific research outlining the components of traditional resource management, agriculture, and social organization that will support a sustainable future under any given definition and how they can work together with "modern" approaches.

What implications does all of this have for policy? It suggests that sustainable Indian agriculture for the future must include the most current information and techniques from Western scientific understanding of agriculture, without wholesale adoption of the profit-maximizing values and overall organization of industrial agriculture. It needs to give social as well as environmental sustainability an equal or perhaps greater role in defining the direction of agricultural development than economic sustainability. It means that outsiders can be advocates for the control by Native American farmers of their own agricultural development, while at the same time helping to test hypotheses with empirical data on the rates of

soil erosion, crop yield under different management strategies, and other factors.

It can be difficult for outsiders to gain the confidence of tribal officials, especially of farmers. The 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."⁵⁰ It is not surprising that Zunis generally avoid public meetings called to discuss BIA agricultural policy, or that the BIA cites lack of attendance at these meetings as proof that Zunis don't care about the future of Zuni agriculture. Even tribal technicians, scientists, and administrators may be wary of including farmers with no experience in project design and implementation, but as at Zuni, the results of including them can be very positive.⁵¹

Native American agriculture has certainly been colonized by the ideology of conventional industrial agriculture, but there is also danger of colonization by the ideology of indigenism agriculture. For those outsiders who wish to help our Native American colleagues in the search for sustainable Indian agriculture for the future, escape from these ideological poles is crucial.

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NOTES

1. D. A. Cleveland, "Balancing on a Planet: Toward an Agricultural Anthropology for the Twenty-first Century," *Human Ecology* 26 (1998): 323-40.
2. For example, R. Goodland ("The Concept of Environmental Sustainability," *Annual Review of Ecology and Systematics* 26 [1995]: 1-24) uses these same terms, and P. B. Thompson (*The Spirit of the Soil: Agriculture and Environmental Ethics* [London and New York: Routledge, 1995]) uses the parallel adjectives *environmental*, *utilitarian*, and *populist*.

3. R. Horsman, "United States Indian Policies, 1776-1815," in *Handbook of North American Indians, Volume 4: History of Indian-White Relations*, ed. W. E. Washburn (Washington, DC: Smithsonian Institution, 1988), 29-39; W. T. Hagan, "United States Indian Policies, 1860-1900," in *Handbook of North American Indians, Volume 4*, 51-65; L. C. Kelly, "United States Indian Policies, 1900-1980," in *Handbook of North American Indians, Volume 4*, 66-80; F. P. Prucha, "United States Indian Policies, 1815-1860," in *Handbook of North American Indians, Volume 4*, 40-50.

4. D. A. Cleveland, F. J. Bowannie, D. Eriacho, A. Laahty, E. P. Perramond, "Zuni Farming and United States Government Policy: The Politics of Cultural and Biological Diversity," *Agriculture and Human Values* 12 (1995): 2.

5. BIA, *Federal Indian Policies ... from the Colonial period through the early 1970's* (Washington, DC: United States Government Printing Office, 1972), 1.

6. A. E. Deer, *Statement of Ada E. Deer before the Senate Committee on Indian Affairs, July 15, 1993* (U.S. Department of the Interior, Bureau of Indian Affairs, Washington, DC, 1993). Manuscript available from the BIA, Washington, DC.

7. R. L. Barsh, "Indian Resources and the National Economy: Business Cycles and Policy Cycles," in *Native Americans and Public Policy*, eds. F. J. Lyden and L. H. Legters (Pittsburgh: University of Pittsburgh Press, 1992), 193-221. First published in *Policy Studies Journal* 16: 799-825 (1988): 195.

8. C. P. Morris, "Termination by Accountants: The Reagan Indian Policy," in *Native Americans and Public Policy*, 63-84. First published in *Policy Studies Journal* 16:731-750 (1988): 71.

9. G. A. Marsh, "Walking the Spirit Trail: Repatriation and Protection of Native American Remains and Sacred Cultural Items," *Arizona State Law Journal* 24:1 (1992): 79; see also R. F. Berkhofer, *The White Man's Indian: Images of the American Indian from Columbus to the Present* (New York: Vintage Books, 1975).

10. H. Daly and J. Cobb, *For the Common Good* (Boston: Beacon Press, 1989).

11. M. P. Todaro, *Economic Development*, 5th ed. (New York: Longman, 1994), 288, 310.

12. D. Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Pantheon Books, 1985), 114.

13. Worster, *Rivers of Empire*; M. Reisner, *Cadillac Desert: The American West and Its Disappearing Water*, Revised ed. (New York: Penguin Group, 1993).

14. E. Checchio and B. G. Colby, *Indian Water Rights: Negotiating the Future* (Water Resources Research Center, University of Arizona, Tucson, Arizona, 1993).

15. Checchio and Colby, *Indian Water Rights: Negotiating the Future*.

16. Kelly, "United States Indian Policies, 1900-1980."

17. Checchio and Colby, *Indian Water Rights: Negotiating the Future*.

18. D. A. Cleveland and F. Bowannie Jr., "The Nutria Upper Diversion Dam," *Zuni Farming* 3 (1994): 12.

19. D. H. Getches, "Indian Water Rights Conflicts in Perspective," in *Indian Water in the New West*, eds. T. R. McGuire, W. B. Lord, M. G. Wallace (Tucson: University of Arizona Press, 1993), 7-26.

20. Checchio and Colby, *Indian Water Rights: Negotiating the Future*, 13.
21. Cleveland, et al., "Zuni Farming and United States Government Policy: The Politics of Cultural and Biological Diversity."
22. U.S. Congress, *Public law 103-177. An act to improve the management, productivity, and use of Indian agricultural lands and resources* (Washington, DC: U.S. Government Printing Office, 1993), Sec. 4(11).
23. U.S. Congress, *Public law 103-177. An act to improve the management, productivity, and use of Indian agricultural lands and resources*.
24. D. A. Cleveland, D. Soleri, S. E. Smith, "Do Folk Crop Varieties Have a Role in Sustainable Agriculture?," *BioScience* 44 (1994): 740.
25. D. A. Cleveland and S. C. Murray, "The World's Crop Genetic Resources and the Rights of Indigenous Farmers," *Current Anthropology* 38 (1997): 477-515; D. Soleri and D. A. Cleveland, with D. Eriacho, F. Bowannie Jr., A. Laahty, and Zuni Community Members, "Gifts from the Creator: Intellectual Property Rights and Folk Crop Varieties," in *IPR for Indigenous Peoples: A Sourcebook*, ed. T. Greaves (Society for Applied Anthropology, Oklahoma City, Oklahoma, 1994), 21-40. This attitude of the dominant society toward Native American intellectual property in general has been interpreted as part of the practice of cultural imperialism, the legal equivalent of the concept of *terra nullius* used by the colonial powers (L. A. Whitt, "Cultural Imperialism and the Marketing of Native America," *American Indian Culture and Research Journal* 19 [1995]: 1-31).
26. See, e.g., T. J. Gulya, "Native American Variety May Provide Sunflower Crop with Crucial Resistance," *Diversity* 8:4 (1992): 29-30. This example illustrates the common assumption that Native American crop genetic resources are "public" property (as discussed below), and so while the author expresses gratitude to the Havasupai farmers who developed this variety, this is done without recognition that they might have some rights in this intellectual property that continue after the seeds have been given to outsiders. The seeds were first collected by Native Seeds SEARCH, a nonprofit organization in Tucson dedicated to conserving Native American crop genetic resources (see *The Seedhead News*, No. 36 [1992]), and employees of this organization have since suggested that this unresolved situation offers the opportunity for all involved parties to negotiate benefits (G. P. Nabhan, A. Joaquin Jr., N. Laney, and K. Dahl, "Sharing the Benefits of Plant Resources and Indigenous Scientific Knowledge," in *Valuing Local Knowledge*, ed. S. B. Brush and D. Stabinsky, (Washington, DC: Island Press, 1996), 186-208.
27. Soleri and Cleveland, with Eriacho, Bowannie Jr., Laahty, and Zuni Community Members, "Gifts from the Creator: Intellectual Property Rights and Folk Crop Varieties."
28. E.g., D. Soleri and D. A. Cleveland, "Hopi Crop Diversity and Change," *Journal of Ethnobiology* 13 (1993): 203.
29. For example, Mataatua, *The Mataatua Declaration on Intellectual and Cultural Property of Indigenous Peoples*, First International Conference (HUI) on the Cultural and Intellectual Property Rights of Indigenous Peoples, 12-18 June

1993, Whakatane, Aotearoa (New Zealand); Pacific Concerns Resource Center, ed., *Proceedings of the Indigenous Peoples' Knowledge and Intellectual Property Rights Consultation* (PCRC, Suva, Fiji, 1995); United Nations, *Report of the Working Group on Indigenous Populations on its Eleventh Session* (UN, New York, 1993, E/CN.4/sUB.2/1993/29 [23 August 1993]). Reprinted in *Cultural Survival Quarterly* 17:1 (1994):65-68.

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31. C. V. Blatz, "Coming Full Circle: Ethical issues in Traditional and Industrialized Agriculture," in ASA Special Publication, Number 57, *Agricultural Ethics: Issues for the 21st Century*, eds. P. G. Hartel, K. P. George, J. Vorst (Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1994), 33-42.

32. See J. Jackson, "Culture, Genuine and Spurious: The Politics of Indianness in the Vaupés, Columbia," *American Ethnologist* 22 (1995): 3, sometimes referred to as "green Orientalism"; see L. Lohman, "Green Orientalism," *The Ecologist* 23 (1993): 202.

33. T. Turner, "An Indigenous People's Struggle for Socially Equitable and Ecologically Sustainable Production: The Kayapo Revolt against Extractivism," *Journal of Latin American Anthropology* 1 (1995): 98.

34. J. A. Sandor and N. S. Eash, "Significance of Ancient Agricultural Soils for Long-term Agronomic Studies and Sustainable Agriculture Research," *Agronomy Journal* 83 (1991): 29.

35. Sandor and Eash, "Significance of Ancient Agricultural Soils for Long-term Agronomic Studies and Sustainable Agriculture Research," 29-37.

36. For example, A. Bebbington, "Modernization From Below," *Economic Geography* 69 (1993): 274.

37. Soleri and Cleveland, "Hopi Crop Diversity and Change."

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39. E.g., R. F. Berkhofer, *The White Man's Indian: Images of the American Indian from Columbus to the Present* (New York: Vintage Books, 1975); L. Lohman, "Green Orientalism," 202; E. W. Said, *Orientalism* (New York: Vintage Books, 1978).

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42. I. Scoones and J. Thompson, *Challenging the Populist Perspective: Rural People's Knowledge, Agricultural Research and Extension Practice*, Discussion Paper 332 (Institute of Development Studies, University of Sussex, Brighton, UK, 1993).

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